



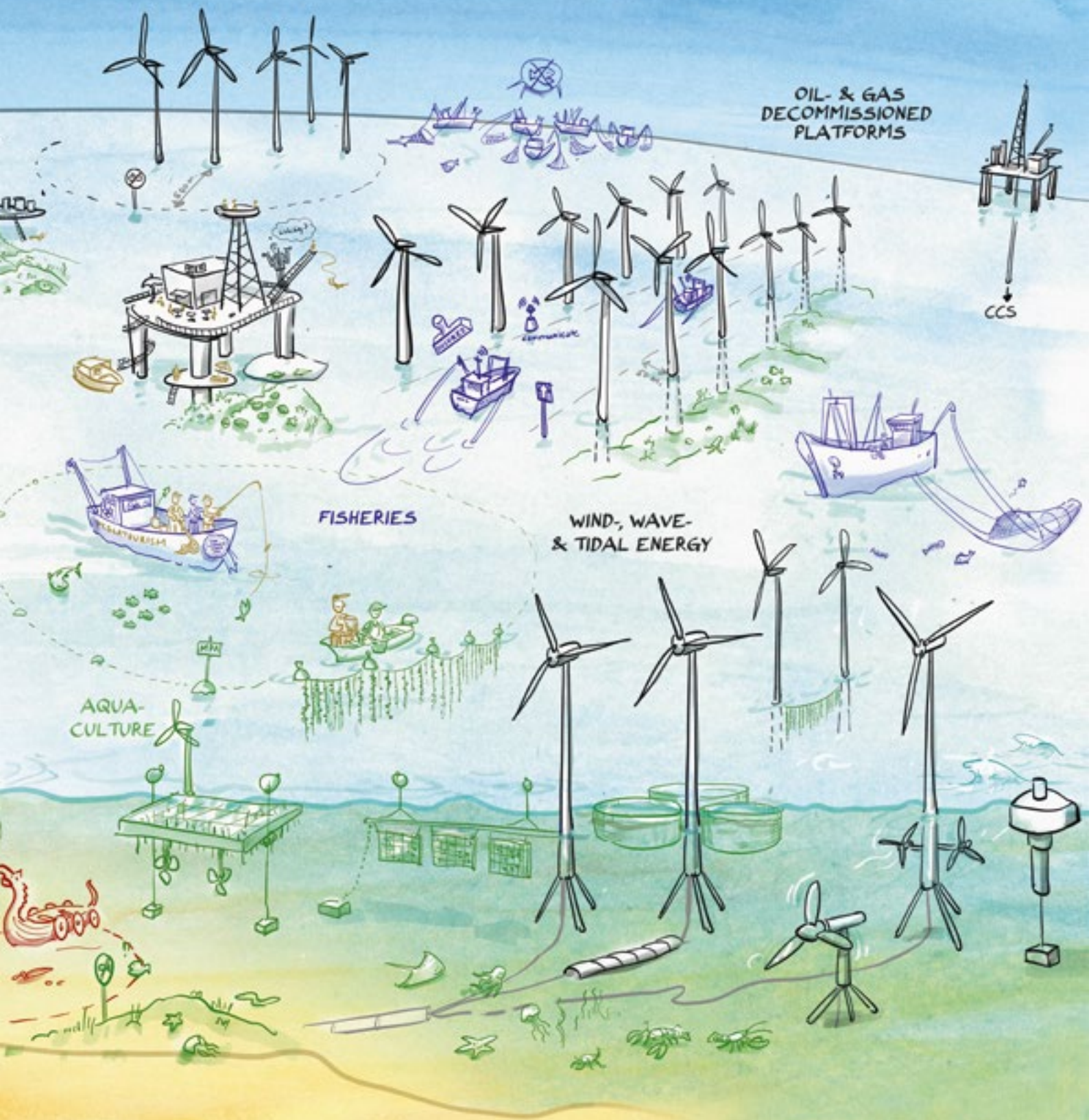
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 727451

# OCEAN MULTI-USE ACTION PLAN EXECUTIVE SUMMARY



# Embracing Opportunities - Ocean Multi-Use Action Plan





**OIL- & GAS DECOMMISSIONED PLATFORMS**

**FISHERIES**

**WIND-, WAVE- & TIDAL ENERGY**

**AQUA-CULTURE**

## **Project: MUSES (Multi-Use in European Seas)**

**Title:** Ocean Multi-Use Action Plan

**Project Coordinator:** Bruce Buchanan (Marine Scotland)

### **Task Leader(s):**

Ivana Lukic, Angela Schultz-Zehden and Joseph Onwona Ansong (SUBMARINER Network for Blue Growth)

### **Author(s):**

Angela Schultz-Zehden, Ivana Lukic, Joseph Onwona Ansong, Susanne Altvater, Rebecca Bamlett, Andrea Barbanti, Martina Bocci, Bela H. Buck, Helena Calado, Mario Caña Varona, Chiara Castellani, Daniel Depellegrin, Maximilian Felix Schupp, Ioannis Giannelos, Andronikos Kafas, Aneta Kovacheva, Gesche Krause, Zacharoula Kyriazi, Rianne Läkamp, Marija Lazić, Athena Mourmouris, Vincent Onyango, Eva Papaioannou, Joanna Przedzimirska, Emiliano Ramieri, Stephen Sangiuliano, Ilse van de Velde, Vassiliki Vassilopoulou, Chiara Venier, Marta Vergílio, Jacek Zaucha, Bruce Buchanan

**Editor:** Rebecca Bamlett

**Submission date:** 30 September 2018

### **Suggested Citation:**

Angela Schultz-Zehden, Ivana Lukic, Joseph Onwona Ansong, Susanne Altvater, Rebecca Bamlett, Andrea Barbanti, Martina Bocci, Bela H. Buck, Helena Calado, Mario Caña Varona, Chiara Castellani, Daniel Depellegrin, Maximilian Felix Schupp, Ioannis Giannelos, Andronikos Kafas, Aneta Kovacheva, Gesche Krause, Zacharoula Kyriazi, Rianne Läkamp, Marija Lazić, Athena Mourmouris, Vincent Onyango, Eva Papaioannou, Joanna Przedzimirska, Emiliano Ramieri, Stephen Sangiuliano, Ilse van de Velde, Vassiliki Vassilopoulou, Chiara Venier, Marta Vergílio, Jacek Zaucha, Bruce Buchanan (2018). Ocean Multi-Use Action Plan, MUSES project. Edinburgh.

### **Acknowledgement**

The MUSES project and partners would like to relay a heartfelt thank you to all the stakeholders and interviewees who were contacted through various interviews and workshops, were engaged in reviewing the action plan and contributed their time and knowledge to the project and the outcome of this report. Gratitude also goes to the ICES MSP Working Group for Marine Planning and Coastal Zone Management (WGMPCZM) for co-organising a workshop on Co-existence and Synergies in MSP and the workshop participants who contributed to discussions.

# ABOUT THE ACTION PLAN

## DEAR READER,

Combining maritime uses, either through joint operations or joint installations, can reduce spatial pressures on European Seas and create new opportunities for socio-economic development, along with potential environmental benefits.

'Multi-use' implies a radical change from the concept of exclusive resource rights to an inclusive sharing of resources by one or more users. Thus multi-use often does not come naturally, but shall be motivated by clear drivers and added-values. This also implies that 'multi-use' solutions are not exclusively better than 'single-use' options. It is important to carefully consider local conditions when making a decision on whether to favour single – or multi-use in a given location.

Further development of multi-use requires actions mainly from the users themselves, but also backed by research and legislation at all levels.

Based on two years of systematic research, combined with extensive stakeholder involvement, within the framework of the Horizon 2020 funded MUSES project, the Action Plan details what actions are required and by whom in the coming years to turn the concept of Multi-Use in European sea basins into real life implementation.

This Executive Summary offers a brief overview of the overall Action Plan. The Action Plan consists of following parts:

- **PART 1** introduces the multi-use concept, its policy background and the MUSES methodology. It summarises its stage of development, possible benefits of and opportunities for multi-use, as well as what kind of support the multi-use concept receives across Europe.
- **PART 2** specifies the actions required for each of the nine multi-use combinations across Europe deemed "most important" by the MUSES Project. It commences with tourism-related multi-uses which are largely based on operational synergies, before going on to discuss energy-related multi-uses which often entail a higher level of physical integration. For each combination, we explain what the multi-use entails and its current state of development, and summarise its associated positive drivers/benefits as well as negative barriers/impacts. Most significantly, we then conclude with the key recommendations which need to be considered to advance each MU. Where possible, we indicate where the action is needed, who should be responsible for implementing it and whether it should be pursued at local, national, sea-basin or wider European level.
- **PART 3** presents the overarching conclusions and recommendations across all multi-use combinations. This is particularly advantageous as some actions are not specific to one combination only and require action by the same specific actors and regulators.



All the chapters in Part 2 have been designed so that they can be read as standalone. Thus, readers are welcome to read only the chapters in which they have an interest.

Most importantly, we hope to inspire as many stakeholders as possible to pro-actively consider and take forward the actions specified. As such, the Action Plan should also be understood as a 'living document'.

Even though the MUSES project will have come to a close by October 2018, all MUSES partners are committed to further develop and fine-tune actions in conjunction with the relevant actors indicated in the Action Plan.

Please don't hesitate to get in touch with any of us to further discuss any of the actions in the Action Plan.



THIS PICTURE TAKEN DURING THE SECOND MUSES PROJECT STEERING GROUP MEETING IN EDINBURGH, SCOTLAND (APRIL, 2017).

## WHAT IS MULTI-USE OF THE SEA?

Multi-use (MU), as defined within the MUSES project, is an **intentional joint use of resources in close geographic proximity**. It represents a radical change from the concept of exclusive resource rights to the inclusive sharing of resources by one or more uses [1].

The Action Plan focuses on the following **nine MU combinations**, which were found to be of highest relevance across Europe:

- 1) Tourism, fisheries & environmental protection
- 2) Tourism, underwater cultural heritage & environmental protection
- 3) Tourism and aquaculture
- 4) Offshore wind farm and tourism
- 5) Offshore wind farm and fisheries
- 6) Offshore wind farm and aquaculture
- 7) Oil and Gas and Decommissioning – Repurposing
- 8) Offshore wave energy and aquaculture
- 9) Offshore wind and marine renewable energy

The **degree of connectivity** between different maritime uses **can vary** with respect to **spatial, temporal, provisioning and functional dimensions** [2] – ranging from two uses merely sharing the ‘same’ maritime space to shared platforms and other infrastructure. In the definition provided by the MUSES project, MUs are therefore not limited to **joint use of installations**, but also encompasses **joint activities**.

Ideally the joint use of two maritime activities is planned as part of the same process (**joint development**). In some cases, however, it is also possible to develop MU by integrating a second use with an already existing use (**staggered development**) [1]. The higher the level of connectivity, the higher the need is for the two or more maritime activities to coordinate right from the beginning.

A related issue concerns whether a **primary user** exists (e.g. a user who has been given primary rights to a certain maritime zone, has an existing permit or whose use is already fully developed). In such cases, the **secondary user**<sup>1</sup> needs a legislated claim for using the primary user’s priority areas, and only if their use has been proven not to be detrimental. This leads to a **power imbalance** between the primary and secondary users. However, even when the two uses are developed and operated by the same entity, existing **legislation often hampers** MU as the two regimes established for each single use often contradict each other.

<sup>1</sup> A secondary user refers to a user that intends to establish itself in a maritime zone in which a primary user already has a permit, or is developed already.

## WHY MULTI-USE?

Demand for and pressure on ocean space and the environment is continuously increasing. Global megatrends such as population growth, climate change and environmental degradation require new blue solutions. Sustainable development of the ocean can no longer rely on single-sector management, but requires a more holistic, integrated approach. At the same time innovation and resulting new knowledge also provides new opportunities. MU solutions can lead to substantial benefits including:

- more **efficient use of ocean space** and resources by concentrating uses in one area and leaving other **areas free for future** generations;
- provide economic benefits to marine users from synergetic use, **maximising the economic benefit from a certain area**;
- **enable certain uses to develop** in maritime areas, where this would otherwise not be possible due to the dominance of other maritime uses;
- **reduce the environmental impact** of a given use by merging it with another activity;
- provide **additional socio-economic benefits** to the coastal region.

## WHY AN ACTION PLAN?

Since 2007, the European Union (EU)'s overarching **Integrated Maritime Policy** [3] seeks to provide for **increased coordination** between different policy areas and cooperation of maritime players across sectors and borders. This has led to important initiatives in the areas of **Blue Growth**, environmental protection, marine data and knowledge, marine research and sea basin wide programmes and strategies.

The **Maritime Spatial Planning Directive** [4] requires all EU Member States (MS) to develop Maritime Spatial Plans up to 2021 and thus to strategically consider the best location and conditions for each use. In doing so, MS are asked to seek not only best available data and broad public participation, but also opportunities for co-location of maritime activities.

However, even where MU solutions may produce significant benefits, **multiple barriers** are stalling the transfer of MU from concept to implementation. Whereas earlier projects have mainly dealt with technological development, major barriers exist relating to regulatory, financing, liability and insurance issues; environmental concerns; stakeholder perceptions; and lack of appropriate skills.

Even though action ultimately has to be undertaken by the users themselves, results of the MUSES project show that **MU needs to be proactively facilitated and incentivised** through public regulatory bodies and respective support programmes, going well beyond mere spatial planning solutions.

The aim of this **Action Plan is to provide orientation and recommendations** of what should be done, by whom and where in order to further develop the MU concept. In doing so the report puts less emphasis on detailed technological requirements, rather focusing on aspects related to stakeholder coordination, research, planning, regulation, legislation, skills development and financing.



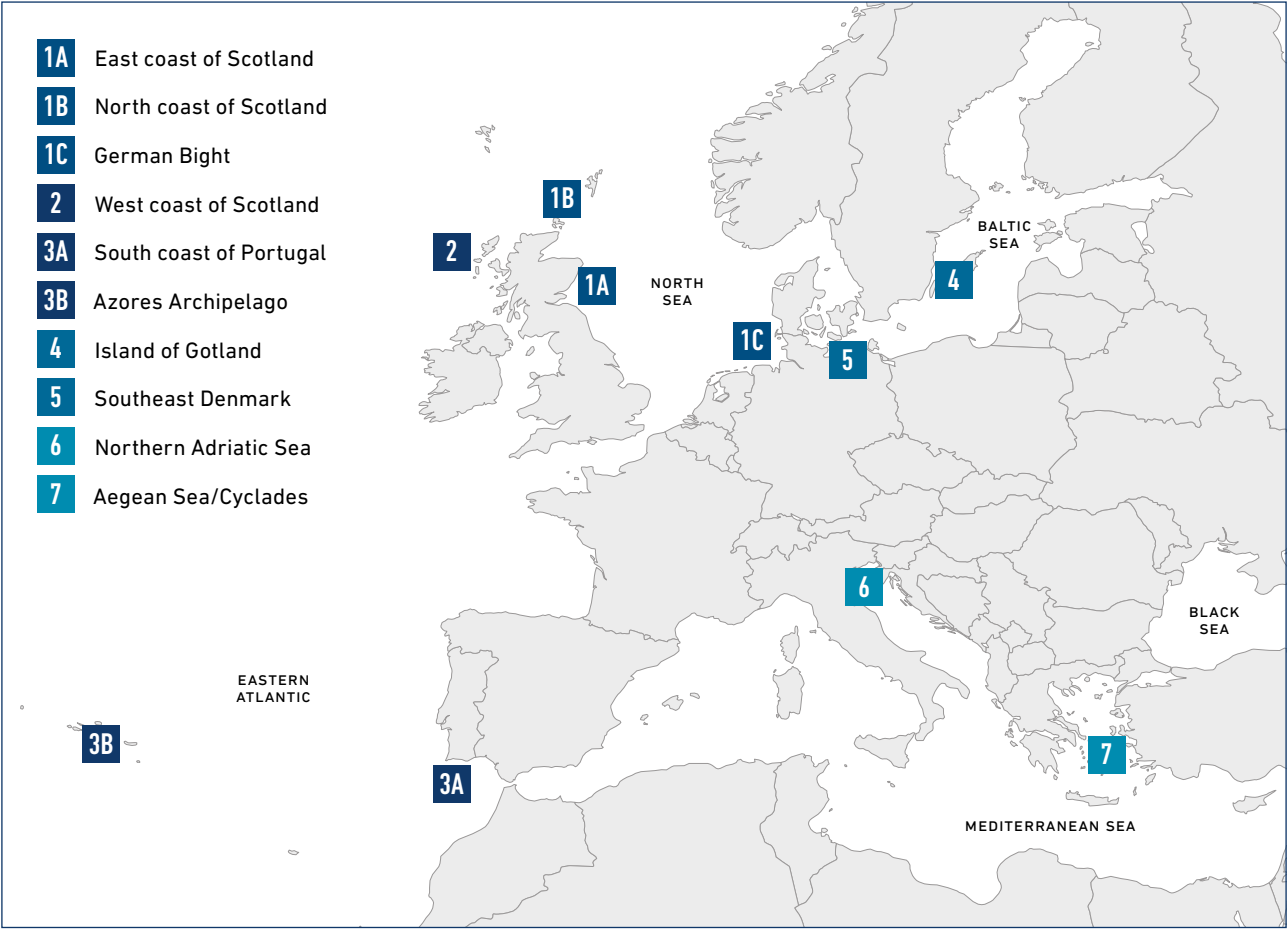
## DEVELOPMENT OF THE ACTION PLAN

The Action Plan is based on 22 months of systematic research undertaken by a European wide consortium, coupled with an extensive stakeholder engagement process involving more than 200 different actors throughout Europe. The following steps were applied to develop the Action Plan:

- 1 Development of the **analytical framework and common definition of MU**, to be employed in all the steps of MUSES research;
- 2 Desk research of past and ongoing MU related projects, policy documents and reports to provide an **overview of MU initiatives and potential at sea basin, national and case study levels** for 11 MU combinations. This was followed by:
  - **Identification of MU Drivers, Added values, Barriers, and negative Impacts (DABI)** for each selected MU combination;
  - **Interviews with stakeholders, three workshops and additional desk research** to fill identified research gaps. Analysis of stakeholder profiles was conducted in parallel to advise ongoing engagement processes at national and case study level;
  - **Analysis of MU potential and evaluation of overall MU effects** were conducted as separate, but complementary, processes at national and case study levels;
  - **Analysis of Focus Areas:** Case studies were further analysed through key questions including addressing MU development potential, boosting the blue maritime economy and improving environmental compatibility.
- 3 Results of country-based analyses were documented and subsequently analysed at Sea Basin level to provide an overview of the **profile and state of development of MU practices** across the sea basin, including intra-country and trans-boundary aspects;
- 4 The final step comprised the **integrative analysis of findings** at the sea basin, national and case study levels which generated a large number of recommendations and actions. Additional consultations with stakeholders (via interviews and workshops), as well as their review of the draft action plan, allowed for the finalization of the project's final output.



GEOGRAPHICAL LOCATION OF MUSES CASE STUDIES.



# ACTIONS REQUIRED TO ADVANCE MULTI-USE

## TOURISM, FISHERIES & ENVIRONMENTAL PROTECTION

→ This MU involves professional fishers (mostly small scale) hosting tourists on a fishing vessel to discover fishing traditions. This MU predominantly involves the combination of fisheries and tourism otherwise known as pescaturism.



**Existing Cases / Future Potential:** Pescaturism [5] is well developed throughout southern Europe with many successful, existing examples. The Fisheries Area Network (FARNET) [6], financed via the European Maritime and Fisheries Fund, has been instrumental in promoting pescaturism through its Fisheries Local Action Groups (FLAGs) [6].

**Drivers / Benefits:** This form of MU provides fishers with an additional, **complementary income source** and **diversifies the tourism activities of a region**. It can **contribute to environmental protection** as it can reduce fishing impacts and provides tourists with an insight into the world of fishing and how this can be done sustainably. It therefore also **improves the image of the profession** and makes it more attractive for young people, as well as raising the profile of the given region.

**Challenges / Barriers:** Fishers who would like to engage in pescaturism often face the following barriers and challenges: 1) **safety requirements** for the vessel, 2) **different tax regimes** for fishing and tourism derived income, 3) limits on how many tourists can be hosted on board, and 4) **lack of experience and skills** of fishermen on how to work with tourists.

### SUGGESTED ACTIONS:

- 1) **Build on existing good practices**
  - foster knowledge exchange and transfer throughout Europe
  - promote this MU by showcasing existing projects and benefits derived from them
- 2) **Train fishers on skills and knowledge necessary for pescaturism**, especially those related to safety and service-oriented businesses
  - develop comprehensive and bespoke training guidelines for fishermen
  - allocate funding towards such capacity building
- 3) **Create local and regional networks** to foster interaction between fisheries communities and tourism stakeholders and to increase marketing efforts
- 4) **Support the creation of clear legislation** for pescaturism by:
  - developing guidance for national authorities which builds on existing best practices
  - promoting comprehensive assessments at national level
  - creating sectoral working groups
- 5) **Operationalise the MU** by integrating and mainstreaming it into various EU policies
  - e.g. by **including pescaturism into sea-basin programmes** and strategies
- 6) **Undertake further studies** to better understand the economic and environmental benefits



## TOURISM & AQUACULTURE

→ This MU combination involves the diversification of tourism services to include aquaculture related activities such as visits to aquaculture sites, diving/ snorkelling in proximity or even within the aquaculture installation and sport fishing/ angling next to the aquaculture installation.

**Existing Cases / Future Potential:** This MU has so far been **implemented on a small (recreational) scale** in the Mediterranean and Atlantic Seas. Most projects involve tourist visits to aquaculture site; however, the most prominent cases are in Malta and South Portugal, where diving is organised within open bluefin tuna farming cages.

**Drivers / Benefits:** Most importantly, this MU may **resolve the potential conflict** for space among tourism and aquaculture, by opening up the aquaculture site for tourism activities. Moreover, such MUs provide an **alternative income source** for aquaculture operators and **increase acceptance, awareness and value** of the locally produced fish products. The creation of such MUs aiming to diversify the aquaculture sector are already incentivised by the EMFF and also FLAGs which promote the diversification into tourism across Europe.

**Challenges / Barriers:** Aquaculture operators face similar barriers and challenges to fishermen branching into pescaturism in relation to **legislation regarding hosting tourists on board** their vessels; regulations related to insurance against accidents; **lack of standards and guidelines** for aquaculture operators; and limited entrepreneurial and customer service **skills**.

### SUGGESTED ACTIONS:

Actions are largely similar to pescaturism. However, contrary to pescaturism, there are very few existing cases on which to build on. Actions therefore include:

- 1) **Create local and regional networks and clusters** to foster interaction between aquaculture operators, tourism stakeholders and local operators in the field of food supply to enhance collaborative efforts and subsequent joint marketing efforts.
- 2) Explore possibilities to develop **new forms of multi-functional sites** when planning new aquaculture plants, where small touristic infrastructures can be put in place.
- 3) **Provide training and capacity building to aquaculture operators** to improve their service skills. Educational opportunities to visit aquaculture farms should also be organised to increase the number of young people looking to take a job in aquaculture.
- 4) **Identify the most suitable type of boat** for both the aquaculture plant operations and hosting tourists/ students.
- 5) **Support the creation of clear legislation and guidelines/ standards** for tourism activities within aquaculture farms.



## TOURISM, UNDERWATER CULTURAL HERITAGE & ENVIRONMENTAL PROTECTION



→ Within the context of the MUSES project, this MU has been defined as the combination of touristic or recreational activities with the protection of underwater archaeology and its adjacent marine ecosystems. This can take the form of 'dry footed access', with land-based museums to display the richness of local UCH or use of glass bottom boats to UCH locations. It can also involve in situ access to scuba divers for viewing UCH sites. Moreover, where relevant, this MU involves conscious efforts to link environmental and UCH protection measures.

**Existing Cases / Future Potential:** Examples of both forms of this MU exist in the Baltic and Eastern Atlantic. Also, the Black Sea's HERAS project is promoting such MUs. It has also has very good potential for development in the Mediterranean Sea in view of its rich UCH sites, warm temperatures and clear waters.

**Drivers / Benefits:** Conscious management of tourism activities involving UCH can lead to win-win situations for both tourism and UCH protection as it **raises public awareness** and appreciation of the value of UCH sites while providing an **income** stream for **better management of UCH sites**.

**Challenges / Barriers:** The main reasons for the lack of existing UCH-related MUs are strict protection measures and resistance from UCH authorities regarding tourist access to UCH sites due to **risk of damage and theft** of UCH artefacts. Moreover, scuba diving attracts a **limited number of tourists** and 'dry access' solutions are costly. This, coupled with generally **limited funding and skills** of UCH authorities or museums to engage in MU initiatives, has limited its development.

### SUGGESTED ACTIONS:

- 1) **All EU MS** need to ratify the Convention for the Protection of UCH and further **strengthen the national legal frameworks on UCH protection**.
- 2) MSP and other area-based management approaches should be used as an opportunity to gather **better information about respective UCH sites** and have a **systematic approach to UCH management** regarding which sites can be opened to tourists and which should be strictly prohibited.
- 3) **Enhance cooperation** between UCH authorities, diving centres, regional authorities, tourism operators and business investors in order to
  - **co-design approaches**, guidelines and training for divers to access UCH sites without damaging them;
  - **co-create 'dry' UCH tourism activities** which showcase the 'culture of the sea'.
- 4) **Support research and technological development** to improve the identification and analysis of UCH sites, while also improving 'dry access' to tourists; e.g. use of underwater technologies to provide tourists with real time experience of underwater wrecks.
- 5) **Explore innovative financing methods** for UCH management and value development such as charged and controlled public visits; development of UCH related retail activities; and investments into UCH research, museums, underwater technology, etc.

## OFFSHORE WIND FARM & TOURISM

→ This MU encompasses shared use of sea space, and joint on/ offshore infrastructure and operational activities. Activities can entail OWF sightseeing boat tours; shared onshore facilities such as OWF related information centres and museums; and even specially designed offshore platforms around the turbines, which serve as a resting ground for seals, facilities for divers or restaurants. The unique wind farm layout may also serve as an attraction and landmark for tourists visiting the region.

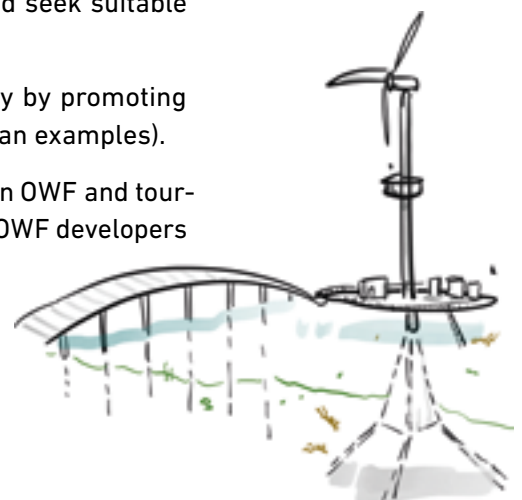
**Existing Cases / Future potential:** Examples of this MU already exist in all countries where OWFs have already been installed (North & Baltic Sea). Combining OWF development with tourism activities from the outset may also be of prime interest for all countries/ regions which plan to develop major OWF developments in the future. Its potential to prevent conflicts arising from OWF installations with coastal communities is therefore of high relevance to the Atlantic and Mediterranean.

**Drivers / Benefits:** One of the main drivers for this MU is the fact that it can potentially **overcome issues of OWF project acceptance** by **offering socio-economic benefits to local communities** in the form of additional jobs and income from the OWF operation, transforming the potentially negative OWF image into a positive tourism experience. The MU may therefore also **reduce negative costs to OWF operators**, associated with planning delays and conflict resolution, as well as contributing to the positive image of OWF by increasing knowledge about the importance of green energy. Furthermore, if the OWF has a unique design and layout, it can become a symbol for the local region, building a **sense of pride among locals** [7] [8] and stimulating regional development in remote areas.

**Challenges / Barriers:** There are more barriers associated with developing the MU within the OWF zone compared to outside. Complicated licensing, **high insurance premiums** and uncertainties over **who should cover these costs** (OWF or tourism operators) are among the main regulatory barriers affecting its economic viability. Natural barriers relate to **distance from shore, weather and tide conditions and seasonality**. Moreover, despite the existence of good practices, it is not common practice to consider this MU from the outset of an OWF planning process.

### SUGGESTED ACTIONS:

- 1) **Facilitate transfer of good practices** from existing cases across MS/ sea basins and to countries/ regions where OWF is still in pre-planning stage.
- 2) **Involve the local tourism sector and regional development agencies early in MSP** and specific OWF planning processes to facilitate cooperation and seek suitable solutions from the outset.
- 3) **Support the development of viable business models**, potentially by promoting cooperative ownership involving local communities (Danish/ Belgian examples).
- 4) **Prepare guidance on how agreements can be established** between OWF and tourism operators as part of broader project development guidance for OWF developers (esp. with regards to consultation and mitigation processes).
- 5) **Mainstream such MU solutions into local development and cohesion policies.**





## OFFSHORE WIND FARM & AQUACULTURE

- In general, the MU concept of offshore wind and aquaculture can entail:
  - direct attachment of installations (i.e. fish cages or mussel/ seaweed long-lines) to offshore wind turbine foundations or development of a new infrastructural solutions (i.e. in the form of fully integrated multi-purpose platforms);
  - the co-location of aquaculture installations within the security zone of the OWF farm. For instance, seabed cultivation of mussels within the vicinity of the OWF.



**Existing practice / Future Potential:** Despite multiple research projects, there is still a very limited number of pilots in the real environment. Most have considered operations in Belgium, the Netherlands, Germany and the UK within the North Sea. Projects in the Baltic have concentrated on mussel or seaweed cultivation due to restrictions on fish aquaculture. This MU may provide an interesting option for new OWF developments in the Mediterranean, esp. France. Moreover, there is high interest and drive for MUs related to offshore aquaculture from large industrial actors in Norway – not necessarily with OWF, but also with the Oil & Gas industry.

**Drivers / Benefits:** The main driver behind this MU is the lack of suitable space in inshore sheltered areas to reach the **targets given for increase of aquaculture production** (60% for finfish and 25% for shellfish by 2020). The MU may provide an opportunity to move aquaculture offshore to further exposed sites and create **costs saving** through joint development and shared operations and maintenance. Moreover, using energy from the OWF for aquaculture operations could potentially ensure **green credentials** and allow aquaculture products to be marketed at a premium.

**Challenges / Barriers:** Drivers and opportunities do not match perfectly: **Extractive aquaculture** (seaweed and shellfish) is relatively low maintenance and therefore favoured by OWF developers since it involves less frequent visits to and smaller-scale operations taking place within the OWF. However, the financial benefits of a seaweed farm are small compared to any projected risks. Moreover, solutions do not yet exist to ensure timely harvesting and distribution of aquaculture products further offshore. **Fed aquaculture** (fish), while offering good financial return, **has high maintenance requirements** thereby increasing traffic at the site, while **impacts on the environment and the OWF installation** itself are still unknown.

Despite valid drivers, the MU faces substantial challenges related to:

- **Insufficient technology readiness level**, especially for harsh conditions in offshore areas, and compatibility of technologies used for different types of aquaculture (e.g. cage vs line) and OWF (e.g. floating vs jacket vs monopile);
- **Unknown cumulative effects:** especially with regards to combinations with fish aquaculture;
- **Unassessed risk and unclear permitting processes/ insurance implications**, as well as a lack of planning and financial incentives, needed to enhance commercial drive for such MUs.
- It is difficult to further develop this MU by adding aquaculture installations to an already operational (or even only licensed OWF) in places where OWF operators are able to veto any kind of development deemed detrimental to their activities.

## SUGGESTED ACTIONS:

- 1) **Address the power imbalance between the two sectors** through facilitation policy and regulation, especially within the currently ongoing MSP processes
  - **identify suitable areas for test pilot projects** which can then provide results necessary for future development.
- 2) **Synthesise knowledge from existing pilots and increase awareness** of the opportunities and benefits among all relevant actors.
- 3) **Support the development of full-scale pilot projects by**
  - **encouraging the involvement of established businesses** to address low investment capacity of the (small-scale) aquaculture sector;
  - **providing regulatory and financial incentives** to retailers, established aquaculture companies and utilities.
- 4) **Ensure the strategic research agenda corresponds to the needs** of the current decision-making system and supports continuous improvement.



## OFFSHORE WIND FARM & FISHERIES

- This MU entails OWF and fisheries sharing the same space, so that fisheries are not excluded from either the OWF development area (which can include a maximum 500m safety zone during OWF operation) or along the offshore export power cable corridor. It may also include access to the same staff pool, equipment (vessels) or infrastructure (port facilities). Moreover, monitoring may be conducted by fishermen as a service, with both users adhering to the same emergency system.

**Existing practice/ Future potential:** This MU is relevant for all countries with OWF development but **practice across MS varies substantially**. Fishermen using mobile gear are generally not suitable for OWF areas. Where law does not require connecting **cables to be buried, bottom-contact gears cannot be used** as they might cause damage to cables and to the fishing gear [9]. In Denmark and the UK, fishery is allowed, to a certain extent, within the OWF area during operation. In the Netherlands, legislation regarding safety zones has recently changed so that fishery is now possible within 500m of the OWF. In Belgium and Germany, fishing is currently not allowed within the OWF safety zones, but there are some research pilots in Belgium.

**Drivers / Benefits:** The main benefit of including a fishery within OWF areas is the potential **resolution of conflict** between these two uses, facilitating public acceptance of the OWF. Small-scale fishermen may especially experience loss of income by moving fishing grounds. Moreover, studies indicate that OWF foundations are particularly **valuable fishing grounds** as they serve as artificial reefs.

**Challenges / Barriers:** **Environmental impacts** and **safety risks** of fishing within the wind farms are **perceived differently** by involved actors (authorities, developers, fishers) across countries, resulting in different regulatory frameworks. Moreover, there is a **lack of strategic support** facilitating the transfer to other types of fishery (changing fishing gear, replacement of fishing quotas).

## SUGGESTED ACTIONS:

- 1) **Highlight and exchange knowledge on existing practices across countries** to create mutual understanding of the associated risks and ways to mitigate them.
- 2) **Ensure better cooperation** among the two sectors, following the lead of groups such as 'FLOWW'.
- 3) **Establish a collaborative and co-ordinated research and innovation** programme at national or EU wide level to ensure suitable **data collection** and monitoring; technology innovations (e.g. for cable installation, protection methods or gear modifications); management strategies to minimise risks; and further testing of these at real sites.
- 4) **Use MSP as a tool to identify and drive synergies between the two sectors**
  - **adopting clear regulatory and technical guidelines and policies** that promote the co-existence of OWF and fishery at the pre-planning stage;
  - **ensuring better involvement of the fishing sector in the OWF planning process** to identify the most suitable short and long-term options;
  - **ensuring that the OWF developer and/or government provide mitigation measures** in case exclusion of fishery is inevitable.
- 5) **Provide financial support** towards the transition to an innovative fishery fleet.
- 6) **Undertake research on possible effects of floating wind farms on fishery.**

## OIL & GAS DECOMMISSIONING – REPURPOSING

→ This MU looks into how decommissioned offshore platforms can take on a new life without being completely removed. Decks, jackets and pipelines can be reused according to their original design (possibly elsewhere) or the structures and wells can be repurposed for alternative uses. Such new uses can span from artificial reefs ('rigs to reefs') to supporting LNG docking stations, aquaculture installations or renewable energy devices.



**Current practice / Future potential:** There are no examples of repurposed O&G structures in the EU. However, a multitude of O&G structures in the North Sea (UK, NL, DK), as well as the Northern Adriatic Sea (Italy), are set to be decommissioned in the coming years and respective authorities are currently developing plans and guidelines for decommissioning and reuse.

**Drivers / Benefits:** Reuse of O&G platforms could potentially lead to **cost saving, both for companies and tax payers**, as complete removal of the structures is extremely expensive. Although O&G companies should have pre-emptively factored the costs of removal into the overall business calculation; it should be noted that in some countries these costs are up to 75% tax deductible, meaning that more than half of the costs are to be borne by the tax payer [10]. Costs savings may also be achieved for the new use as it makes use of the O&G platform installations and may therefore enable fish aquaculture to move further offshore. Moreover, efficient and **sustainable use of sea space** (more space left free from use and available for future generations) is achieved



by **reusing an area which has already been in industrial use for many years**, rather than installing new infrastructure in another pristine marine area.

**Challenges / Barriers:** The main barrier to reuse of O&G installations is the lack of clear regulation and guidance that specifies the **ownership rules** and **liability during reuse period**, as well as responsibility for its final dismantling and monitoring activities. Combined with the above described tax regime and negative public perceptions, O&G companies are not sufficient incentivised to investigate this MU further. It must also be noted that a multitude of first generation O&G platforms have reached end of life.

#### SUGGESTED ACTIONS:

- 1) **Adopt a comprehensive legal framework that clarifies liability rules** between current and future O&G platform users.
- 2) **Develop general suitability criteria** (detailing which sites and types of platforms, including their technological characteristics, are suitable for which type of reuse) to aid the decision-making process on which O&G sites to focus on.
- 3) **Undertake pilot assessments** of selected O&G platforms that considers
  - **social and environmental impact assessments;**
  - **reuse options;**
  - **recommendations for investment mechanisms**, including business plans based on the valorisation of the whole value chain.
- 4) **Establish a North/ Adriatic Sea networking platform** for information exchange and networking on O&G reuse options including an online platform which acts as a repository of practice, procedures and guidelines, as well as active networking and knowledge exchange activities.
- 5) **Raise awareness of reuse options and establish suitable conditions** (transparency, trust, sharing of knowledge and practices) for joint identification of viable options; co-design processes; evaluating the social sustainability of projects under development; and promoting a faster permitting process.
- 6) **Provide funding for research to advise risk assessment frameworks and de-risking methods;** licensing procedures for MU; EIA requirements considering the substantial and long-term liabilities involved; and public awareness and buy-in.

## OFFSHORE WIND & MARINE RENEWABLE ENERGY GENERATION

- This MU involves the combined deployment of offshore wind energy and marine renewable energy (MRE) sources, chiefly wave and tide, as part of the same physical platform, or as an indirect connection via the same cable array.



**Existing practice / Future potential:** The **North Sea** offers particularly good conditions for this MU combination and a pilot test hybrid (wind and wave) is already being planned in Scotland (Caithness). We understand that the developers aspiration is that this technology could enter construction and be operational and delivering power by 2022. The long-term goal is to develop a commercial scale project in staged development steps.

A feasibility study was also conducted in the Eastern Atlantic (**Spain, Cantabria**) associated with the MERMAID project. In the Baltic Sea, tests have been carried out on wave energy generation devices, but rather for export markets due to unsuitable physical conditions in the Baltic.

**Drivers / Benefits:** The main driver for this MU is its ability to generate **maximal energy per square nautical mile**, with the additional benefits of **reducing operational, maintenance and investment cost**. It also **mitigates potential conflict** by allowing space for other maritime uses.

**Challenges / Barriers:** The challenges hindering the development of this MU are less technical – more related to the **separate permitting and regulatory processes**, different tariff rates and lack of incentive schemes which limits the competitiveness of this MU.

#### SUGGESTED ACTIONS:

- 1) **Disseminate the benefits** and viability of existing initiatives, as well as wider interest from the industry side for such solutions, to increase chances for receiving the policy and regulatory support.
- 2) **Conduct comparative case study analysis** to identify suitable conditions for commercial deployment and upscaling.
- 3) **Enable exchange of information between different developers** on environmental impacts in an open process that can advise future **EIA requirements**.
- 4) **Design and support planning and financial incentive** schemes that cater for this type of MU where multiple energy resources are combined. This will involve working closely with industry and regulators to ensure appropriate support which considers existing regulations, the marine environment and capacities of the private sector.

## WAVE ENERGY & AQUACULTURE

→ This MU involves the combination of aquaculture farms and wave energy, either physically connected or co-located side by side, enabling the use of wave energy generated directly for the purpose of aquaculture operations (especially in remote areas). The generated electricity can also be connected to onshore enterprises and national grids.

**Current practice / Future Potential:** Commercial scale MU of existing finfish aquaculture and wave energy generation has been developed in Mingary Bay (Scotland) mainly due to the developer's interest in receiving *green credentials* due to use of renewable energy as an alternative to diesel. In general, smaller scale devices that are designed to operate in less energetic conditions might be more suitable for fish farm applications.

In many EU MS, both wave and aquaculture rely on small-scale developers with limited financial capacity. Therefore, such technologically and financially intensive solutions are especially suitable for northern countries where the salmon industry is well developed and could benefit from moving to a further exposed site. Such solutions may also be of interest for the tuna farming industry in the Mediterranean.



**Drivers / Benefits:** The main driver for this MU is the potential reduction in initial investment requirements for both developers due to shared operational and maintenance (O&M) costs throughout the lifetime of the MU.

**Challenges / Barriers:** This MU has not been widely applied or commercialised mainly due to low technology readiness; limited knowledge of safety, technical, environmental and financial risks and implications on insurance; and operational difficulties caused by unknown consequences of the interaction between the two uses

#### SUGGESTED ACTIONS:

- 1) **Identify suitable sites** for the development of this MU i.e. through the MSP/ORE planning process.
- 2) **Disseminate information** about suitable sites and life cycles of the two developments to increase awareness about potential opportunities.
- 3) **Define suitable means of support**, including:
  - **how this MU could be incentivised** (e.g. through preferential access to public funds or public infrastructure, tax breaks, subsidies, price regulation or preferential access to the national grid);
  - **consenting procedures** specifically for combined installations (e.g. 'auxiliary aquaculture infrastructure' vs 'renewable energy device').
- 4) **Create networking opportunities** for the various actors involved:
  - **Support business pitches for future pilots and associated innovative activities** and products along the value chain (e.g. low carbon footprint certification for aquaculture) and sharing of experiences at maritime events (development of local development strategies, action plans);
  - **Ensure involvement of a wide range of supporting actors/ advisors**, such as **business experts** to develop suitable business models, **insurance companies**, **consenting lawyers**, etc. to ensure identification of additional opportunities along the value chain and development of feasible solutions.

## OTHER MULTI-USE COMBINATIONS

Application of the MU concept should not be limited to the sectors and uses indicated in this report. A broader approach to synergies, MU and co-location allows for a much wider spectrum of opportunities and benefits. Additional MUs, explored only in certain locations, but whose application could potentially be widened in scope, are briefly discussed with associated recommendations. These MUs include:

- Shipping terminal and green energy generation;
- Tidal energy generation and environmental protection (and monitoring);
- Marine renewable energy and desalination/ hydrogen.



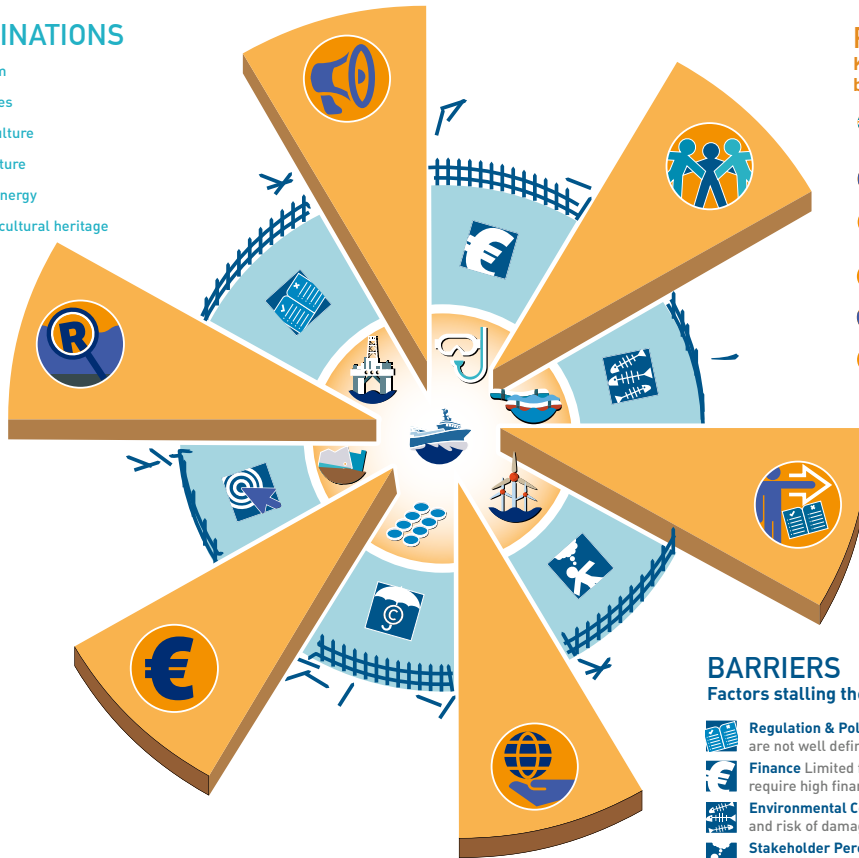
# CROSS-CUTTING ISSUES AND ACTIONS

The MU combinations analysed differ widely in terms of their state of development, stakeholders involved, investment and technology required. However, the MUSES project has uncovered a number of issues and recommendations which reappear, interconnected across various MUs and addressed to similar actors.

## BREAKING THROUGH THE BARRIERS FOR SUCCESSFUL MULTI-USE (MU)

### MULTI-USE COMBINATIONS

- Offshore wind & tourism
- Offshore wind & fisheries
- Offshore wind & aquaculture
- Wave energy & aquaculture
- Offshore wind & wave energy
- Tourism & underwater cultural heritage
- Tourism & fisheries
- Tourism & aquaculture
- Oil & gas decommissioning - repurposing



### PRIORITY LINES

Key thematic recommendations for addressing barriers to multi-use implementation

- Integration & Coordination** between different sectoral structures, institutions and actors through cross-sectoral platforms
- Policy & Regulation** which creates a strong framework for MUs at national level, with clear EU guidance
- Capacity Building & Training**, especially for fishers and aquaculture farmers, including knowledge exchange between stakeholders
- Funding & investment** for innovative and technological solutions to advance MU development
- Research & pilot** studies to inform business models and improve understanding of MU value chains
- Marketing & Dissemination** of good practices and information through integrated MU platforms which consider local needs

### BARRIERS

Factors stalling the development of multi-use opportunities

- Regulation & Policies** Unclear licensing processes for MUs as key terms are not well defined
- Finance** Limited financial incentives and funding targeting MUs which can require high financial investment and risk
- Environmental Concerns** about the impact of MUs on the environment and risk of damage to valuable sites
- Stakeholder Perceptions** of weak representation of their interests and differing insights into MU impacts and risks
- Technological Aspects** Low technology readiness especially regarding harsh environmental conditions in offshore areas and compatibility of technologies
- Liability & Insurance** High cost of insurance due to safety risks and limited understanding of liability in case of accidents



## INTEGRATION & COORDINATION

MU as a concept is still novel for **government authorities, sectoral bodies and policy makers**. These actors must adjust policy, planning, consenting and management reform in order to advance synergies between maritime uses that are usually managed under different sectoral institutions and owners. Integration and coordination at **vertical (across levels of governance) and horizontal levels (across sectors and policy topics)** is needed. This may be achieved by setting up cross-sectoral platforms to guide the development of MU, involving continuous stakeholder engagement, exchange of knowledge and integration of new MU actors.



## MARITIME SPATIAL PLANNING

MSP supports an integrated approach to and efficient use of maritime space. Current MSP processes offer an opportunity for **planning authorities**, together with stakeholders, to identify **suitable areas** and **comprehensive policies promoting MU, especially for new joint developments**. Moreover, data generated throughout the process should be shared with stakeholders to promote possible opportunities for MU development.



## POLICY & REGULATION

MU development may flourish under clear direction and comprehensive **national legal frameworks** which specify safety, insurance and permitting process standards. Clear direction and **guidelines from the EU** and the responsible directorates are needed for integrating operational issues about MU into EU and national policies. For example pescatourism will need a clear definition on which activities are involved, which taxation regime can be applied and indication of how Member States can adapt their institutions and regulations for its implementation.



## CAPACITY BUILDING

MU actors involved in developing MUs at the project and operational level such as ocean users, investors and businesses have different capacity building needs such as know-how, training, finance, logistics and public awareness that needs to be addressed to ensure the success of a MU venture. **Responsible sub-national and national authorities** should support these actors through comprehensive training, providing financial support and encouraging professional and personal networks between stakeholders at regional, national and international levels.

## PROMOTION & DISSEMINATION

Promoting good practices and disseminating information about the economic and societal benefits of MUs through **existing regional and sea basin forums and networks** is necessary to facilitate its replication and encourage investment. Such promotional support should consider the needs of actors at the local level to ensure that their issues and values are addressed. MU projects and business cases should put more focus on developing marketing strategies to increase the awareness and value of their products and services.

## FUNDING

The success of MU implementation mainly depends on an in-depth understanding of its appeal to stakeholders and its readiness for the target market. Targeted **incentives for MU** are needed to advance its implementation, while existing funding schemes directed towards single sectors should be adapted to consider MU. Funding should also **support those small scale or local MU solutions** that may not have a high contribution to the national GDP, but may render important socio-economic and cultural benefits for the local communities, as well as wider environmental benefits. However, for the long term financial viability of MU, there is a need for development of **new financial instruments, business models** and for **monetisation of possible services and products along the full value chain** of the MU.

## RESEARCH PRIORITIES

Research for MU is needed, not only for technological development, but to understand the economic, social, and environmental impacts of MU, along with related legal aspects such as liability and insurance issues. Identifying research areas and undertaking pilots in the real environment led by **research centres** would allow the development of full scale business models; enhance understanding of the MU value chain and the opportunities that it presents; and generate recommendations for advancing MU.



## CONCLUDING REMARKS

The research undertaken within the MUSES project throughout all European sea basins has revealed that **a much wider range of opportunities** for creating positive synergies among different maritime uses exist compared to what has been previously associated with the multi-use concept.

Even though we had to eventually focus our work on only some of these combinations, it should be kept in mind that the shift from a single sector to a multi-sector approach may unleash a wide scale of new opportunities both for socio-economic development as well as improvement of the environmental status of our oceans.

As shown in this Action Plan, **some of these multi-uses** – such as combinations of fishery with tourism or offshore wind farms – are **already a reality** today. Even though such combinations may not substantially impact general economic growth, they may provide other socio-cultural benefits for coastal communities and a **shift of perspective** on how different uses and users can work together rather than being separate.

A wider recognition and active promotion of **such small scale and local MU combinations** is needed to advance their function as tangible and beneficial multi-use. This can **build confidence in the MU concept** and **pave the way for future MU combinations**, which require joint planning and development efforts now to become a reality in the future.

Moreover, new technological solutions such as floating offshore wind farms, hydrogen energy storage or various wave energy generation technologies can tap into a wider range of socio-economic and environmental benefits if **multi-use solutions are considered in their designs right from the outset**, through the application of the life cycle assessment, systems design approach or circular economy principles. This would increase the **R&D competitiveness of the European market** as benefits can be derived from its recognition and promotion as an innovation hub for MU through technology and knowledge transfer to other parts of the world.

Nevertheless, **MU development is not possible everywhere**. Lack of suitable geo-morphological and environmental conditions, or high safety and environmental risks, that make the development of MUs unsuitable for certain areas. However, other **barriers such as stakeholder perceptions, lack of awareness, low capacity, as well as MU unfriendly policy and regulation, may be overcome** through sufficient stakeholder integration in planning and policy processes on all geographical and governance levels.

The **maritime spatial planning processes** currently undertaken in all EU coastal member states provide an opportunity to foster such interaction between the different maritime businesses as well as sector regulators, including those in charge of environmental protection – and thus foster the paradigm shift from a single sector perspective to an integrated view. **MSP is, however, only one out of many tools and actions, which need to be undertaken**. It is necessary, but not sufficient alone for enabling multi-use. Other sectoral planning and licensing processes including area-based management approaches such as multiuse MPA designation should be coordinated to ensure that MU development is realistic at the operational and project level to address the barriers noted above. Moreover, substantial efforts are needed in **capacity building, changes**

**in the underlying legal frameworks, funding structures** as well as even **research** in itself – all of which are still not designed towards **multi-disciplinary** work and solutions.

The composition of the MUSES project team in itself was designed to reflect a multitude of different perspectives – not only bringing together researchers from across Europe, but also from a variety educational and professional backgrounds. Even in this closed group it took time and substantial discussions to develop a joint understanding. Moreover, our numerous interviews and discussions with a wide range of stakeholders across Europe showed that **'multi-use' is still a very young concept which has not yet reached common, mainstream thinking**, even among those who deal with maritime affairs on a day to day basis.

It should not be underestimated that – as pointed out in our definition of MU – advancing the development of MU implies a **radical change** and thus requires a **paradigm shift** that is backed by the **willingness of policy makers, governmental authorities, businesses, investors** and other actors involved in MU to take up the recommendations and actions proposed in this Action Plan. Building trust among stakeholders to initiate multi-use initiatives takes time, capacity building and funding.

With this Action Plan the MUSES project team hopes that the **understanding of the opportunities inherent in multi-use have been raised** and **MU actors will be inspired to take up these recommendations and actions** to advance the development of MU.

# REFERENCES

- [1] J. Zaucha, MUSES Stakeholder Workshop Report: “Multi-use for Sustainable Blue Growth,” 2017. [Online]. Available: <https://muses-project.eu/muses/wp-content/uploads/sites/70/2017/07/MUSES-Stakeholder-Workshop-Report.pdf> . [Accessed 10 May 2018].
- [2] M. F. Schupp, M. Bocci, D. Depellegrin, A. Kafas, Z. Kyriazi, I. Lukic, A. Schultz-Zehden, G. Krause, V. Onyango and B. H. Buck, “Towards a Common Understanding of Marine Multi-Use: A Typology,” 2018.
- [3] European Commission, “Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions. An Integrated Maritime Policy for the European Union,” 2007. [Online]. Available: <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0575:FIN:EN:PDF>. [Accessed 10 May 2018].
- [4] European Commission, “The EU MSP Directive 014/89/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 July 2014 establishing a framework for maritime spatial planning,” 2014. [Online]. Available: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0089>. [Accessed 10 May 2018].
- [5] Pescatourism, “Pescatourisme 83 – FLAG Groupe Varois – FR,” 2009. [Online]. Available: <https://webgate.ec.europa.eu/fpfis/cms/farnet/pescatoursime-83-flag-groupe-varois-fr%20/>. [Accessed 10 May 2018].
- [6] FARNET, 2017. [Online]. Available: [https://webgate.ec.europa.eu/fpfis/cms/farnet2/on-the-ground/country-factsheets/italian-clld-programme\\_en](https://webgate.ec.europa.eu/fpfis/cms/farnet2/on-the-ground/country-factsheets/italian-clld-programme_en). [Accessed 10 May 2018].
- [7] “GWEC,” [Online]. Available: <http://gwec.net/offshore-wind-energy-creates-opportunities-tourism-sector-south-baltic-region/>. [Accessed 10 May 2018].
- [8] T. Wizelius, “Developing Wind Power Projects: Theory and Practice,” 2007.
- [9] J. Przedzimirska and J. Zaucha, “Multi-use concept in European Sea Basins,” 2018.
- [10] UKCS Decommissioning, “Cost Estimate Report,” 2017.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 727451

---

## MUSES PROJECT PARTNERSHIP

marinescotland



AWI ALFRED WEGENER-INSTITUT  
HELVOLTZ-ZENTRUM FÜR POLAR-  
UND MEERESFORSCHUNG



ECORYS



