MUSES Multi-Use in European Seas

SEA BASIN OVERVIEW

Factsheets

Multi-Use in European Seas

MUSES Multi-Use in European Seas

TITLE: Sea Basin Overview Factsheets

LEAD AUTHORS: Ivana Lukic, Angela Schultz-Zehden, Joseph Onwona Ansong et al.

EDITOR: Rebecca Bamlett

PUBLISHER: SUBMARINER Network for Blue Growth, Berlin; Marine Scotland, Edinburgh

SUGGESTED CITATION: Lukic, I., Schultz-Zehden, A., Ansong, J. O. et al., 2018. Sea Basin Overview Factsheets

ACKNOWLEDGEMENT: The full list of contributing authors is listed bellow.

marinescotland Scottish Government Riaghaltas na h-Alba gov.scot

Stephen Joseph Sangiuliano
Andronikos Kafas

ISMAR

Daniel Depellegrin
Andrea Barbanti
Alessandro Sarretta
Chiara Venier

Instytut Morski w Gdańsku

Jacek Zaucha
Joanna Przedrzymirska
Marija Lazic

THETIS knowledge for a better environment

Martina Bocci
Emiliano Ramieri
Chiara Castellani

hcmr ΕΛΚΕΘΕ

Vassiliki (Celia) Vassilopoulou
Zacharoula Kyriazi
Maniopoulou Maria

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

Maximilian F. Schupp
Bela H. Buck

University of Dundee

Vincent Onyango
Eva Papaioannou

Fundação Gaspar Frutuoso

Universidade dos Açores

Marta Vergílio
Mario Caña Varona
Helena Calado

ECORYS

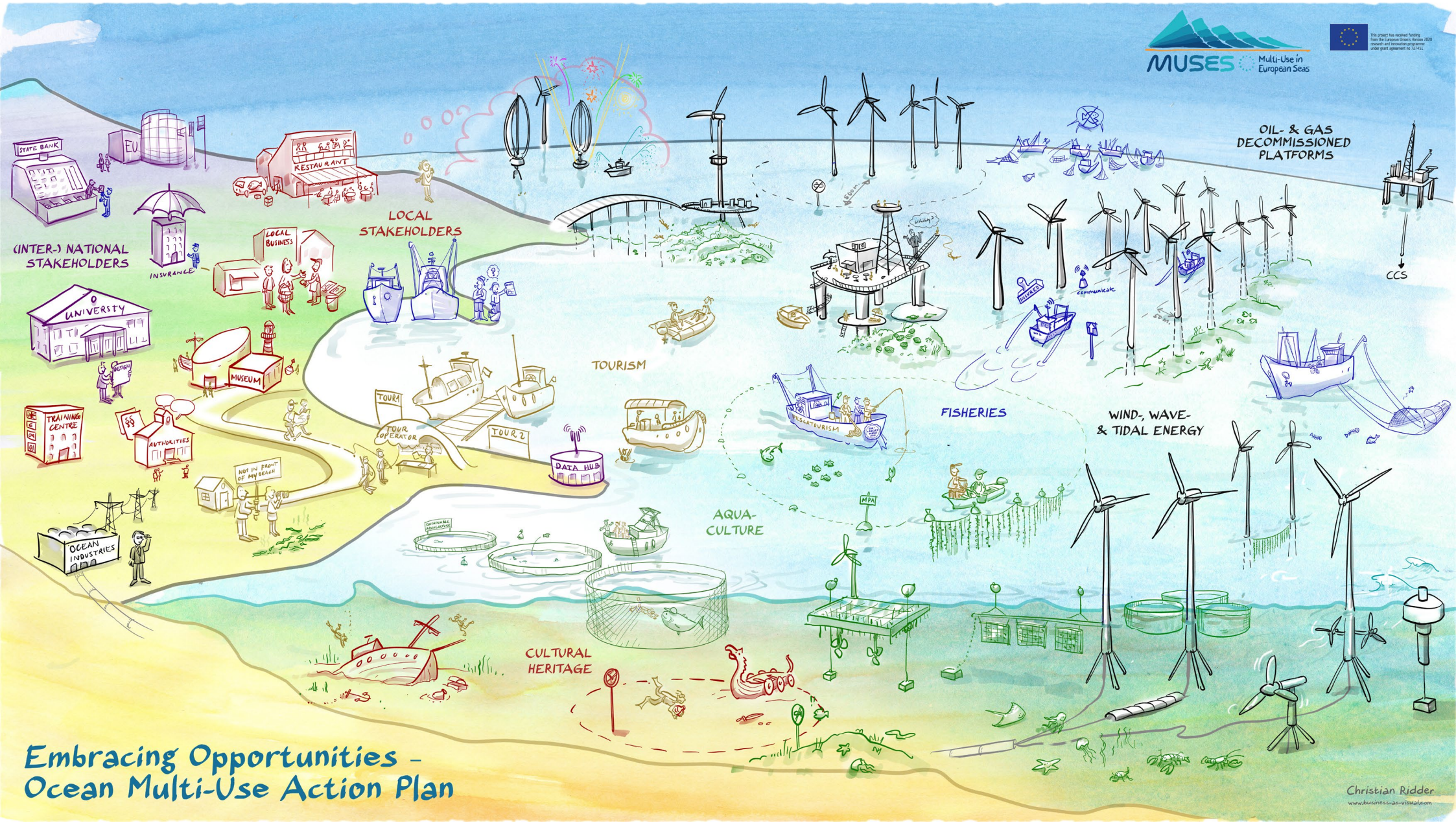
Rianne Läkamp
Ilse van de Velde
Aneta Kovacheva

SUBMARINER NETWORK

Hilary L. Karlson
Frida Franzen
Susanne Altvater

MUSES Multi-Use in European Seas

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



DEVELOPED DURING THE MUSES 2ND STAKEHOLDER WORKSHOP IN VENICE, ITALY 27TH OF JUNE 2018.

MUSES Multi-Use in European Seas

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

ABBREVIATIONS

ASCAME	The Association of the Mediterranean Chambers of Commerce and Industry
BSR	Baltic Sea Region
CIA	Cumulative Impact Assessment
CLLD	Community-Led Local Development
CPF	Common Fisheries Policy
CSR	Corporate Social Responsibility
CPMR	Conference of Peripheral Maritime Regions
DABI	Drivers, Added Value, Barriers, Negative Impacts
DG	Directorate General
DNV GL	Det Norske Veritas (Norway) and Germanischer Lloyd (Germany)
DONG	Dansk Olie og Naturgas
EA	Eastern Atlantic
EBSAs	Ecologically or Biologically Significant Marine Areas
EC	European Commission
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMFF	European Maritime Fisheries Fund
EU	European Union
EWEA	European Wind Energy Association
FEAP	Medcom: Federation of European Aquaculture Producers-Mediterrenean Commission
FLAG	Fisheries Local Action Group
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group
GFCM	General Fisheries Commission for the Mediterranean
ICES	International Council for the Exploration of the Sea
ICZM	Integrated Coastal Zone Management
IMTA	Integrated Multi-Trophic Aquaculture
IMO	International Maritime Organization
LNG	Liquefied Natural Gas
MAGRAMA	Ministry of Agriculture, Food and Environment
MMO	Marine Management Organization
MU	Multi-Use
MUSES	Multi-Use in European Seas
MPA	Marine Protected Area
MRE	Marine Renewable Energy
MS	Member State
MSP	Maritime Spatial Planning
NEAt fish	National Environmental Assessment of Tournament Fishing
NGOs	Non-Governmental Organisations
NSR	North Sea Region
O&G	Oil and Gas
OREDP	Offshore Renewable Energy Development Plan (Ireland)
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	The Convention for the Protection of the Marine Environment of the North East Atlantic
OWF	Offshore Wind Farms
ORE	Offshore Renewable Energy
OREI	Offshore Renewable Energy Infrastructure
PLOCCAN	Oceans Platform of the Canary Islands
SACs	Special Areas of Conservation
SMEs	Small and Medium Enterprises
SNA	Stakeholder Network Analysis
SSE	Scottish Southern Electric
TRL	Technology Readiness Level
TUPEM	Titles for private use of maritime space (Títulos de utilização privativa do espaço marítimo) [PT]
UCH	Underwater Cultural Heritage
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WP	Work Package

BE	Belgium
BG	Bulgaria
CY	Cyprus
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
GR	Greece
HR	Croatia
IT	Italy
IE	Ireland
LT	Lithuania
LV	Latvia
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
SE	Sweden
SI	Slovenia
UK	United Kingdom

MUSES Multi-Use in European Seas

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

INTRODUCTION

MUSES (Multi-Use in European Seas) is a two year Horizon 2020 research project which builds on existing knowledge to explore the real opportunities for multi-use (MU) in European seas. The objectives of this project were to:

- Explore the opportunities for MU in European seas, including the scope for innovation and Blue Growth potential;
- Present practical solutions on how to overcome existing barriers and minimise risks associated with MU development, whilst maximising local benefits;
- Provide an understanding of environmental, spatial, economic & societal benefits of co-location;
- Highlight inappropriate regulatory, operational, environmental, health & safety, societal and legal aspects.

These factsheets provide a brief overview of the results from the 20 months multi-level analysis of the MU concept undertaken by MUSES across the five European sea basins. The main opportunities for and barriers to MU development are presented, alongside key recommendations for promoting MU in the future, generated from extensive discussion with stakeholders.

WHAT IS MULTI-USE?

THE CONCEPT OF MU is still relatively new and has been advanced largely by research institutes and commercial enterprises. Within the scope of the MUSES project it is understood as: "***an intentional*** *joint use of resources in close geographic proximity. This can involve either a single user or multiple users. It is an umbrella term that covers a multitude of use combinations in the marine realm and represents a radical change from the concept of exclusive resource rights to the inclusive sharing of resources by one or more users*" [1].

The **OBJECTIVES** of a MU approach are to:

- Ensure that activities/uses in the same and/or adjacent marine areas are **compatible**;
- Minimise the necessary infrastructure by offering multiple uses of installations, thus **decreasing costs** and avoiding dispersion of constructions that might affect the environment;
- **Protect the environment** and encourage the best possible management of marine resources;
- **Promote spatial efficiency** by organising combined uses into "hubs" and keeping as much space as possible free for future purposes;
- Make optimum use of **new technologies and innovations** for compatibility, contributing to environmental protection and savings in costs, space and energy;
- Promote mutual understanding and **cooperation**, thus avoiding possible antagonisms, negative reactions and delays to investments and operation.

MUSES Multi-Use in European Seas

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

CONTEXT

WHY MULTI-USE OF OCEAN?

The continued expansion of global population, as well as economic growth, will increase demand for maritime products and services which depend on limited ocean space and resources. A holistic and integrated management approach is required to ensure the development of our oceans is undertaken in a sustainable manner and that space is used efficiently, with sufficient areas set aside for nature protection and for the benefit of future generations.

SUSTAINABLE AND EFFICIENT USE of maritime space can be achieved by combining different maritime uses at the same location through joint operations or through MU offshore platforms.

The analysis undertaken by the MUSES project indicates that MU can have the following **BENEFITS**:

- contributes to more efficient use of ocean space and resources;
- provides economic benefits;
- enables certain uses to be developed in spaces where their development otherwise would not be possible – e.g. aquaculture development offshore through MU combination with an offshore wind farm (OWF);
- provides an alternative source of revenue for declining or restricted sectors e.g. pescatourism serves to diversify the fisheries sector;
- diversifies maritime sectors to reduce environmental pressures and provide alternative sources of recreation and well-being.

AVAILABILITY OF SPACE is a relevant factor influencing the development of a MU combination.

- In small sea areas, where space is scarce, MU is seen as an opportunity to use space more effectively and efficiently.
- In open seas, MU is rather seen as an opportunity to derive additional economic and environmental benefits.

POLICY DRIVERS

Recent increases in offshore development have been stimulated in part by the European Commission's **BLUE GROWTH** strategy, a long-term strategy to promote smart, sustainable and inclusive growth and employment opportunities in Europe's maritime economy. In order to support sustainable development and growth in the maritime sector, while reducing cross-sectoral conflicts in maritime space, EU Member States have been called on to implement the EU **MARITIME SPATIAL PLANNING** (MSP) Directive (2014/89/EU), which includes applying an ecosystem-based approach to planning, and promotion of the coexistence of relevant activities and uses (Article 5). MUSES has found that multiple strategic national policies and plans already provide specific support to the MU concept [2].

MUSES Multi-Use in European Seas

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

NATURAL CHARACTERISTIC FAVORING MULTI-USES

PHYSICAL CONDITIONS play a crucial role in MU development. Seas with high waves, winds, and tides are favourable areas for combinations involving offshore renewable energy. Warm and salty seas favour aquaculture, desalinisation, and tourism.

SPACE AVAILABILITY, or lack thereof, increases competition between users and is a crucial factor driving the MU approach. In smaller seas, space is scarce and must be used sparingly. In some cases, MU is the only option for a given sector (user) to receive adequate space allocation.

ECOLOGICAL RICHNESS and ecological value of sea space may influence MU development. In sea basins considered biodiversity hotspots and which are suffering from growing pressures on the marine environment (e.g. the Eastern Atlantic, the Mediterranean or the Black Seas), MU might include nature protection.

MARITIME SECTORS

The **tourism** sector is generally a driver for MU in Southern Europe (Mediterranean and South East Atlantic), where demand for touristic activities has been steadily growing over the years.

MU involving the **energy** sector and the use of offshore installations (e.g. wind and aquaculture farm) is mainly relevant in northern Europe; the north-east Atlantic, North Sea and the south-west Baltic Sea.

MUs involving **aquaculture, fisheries and environmental protection** appear significant across all sea basins.

The large number of **Oil & Gas** (O&G) installations in the Northern Adriatic and the North Sea set to be decommissioned in the coming decades, as well as the need to lower the costs and environmental impacts of such activities, has led to interest in their re-use (e.g. for carbon capture and storage, aquaculture or tourism).

OVERVIEW OF PHYSICAL CONDITIONS IN THE ANALYSED SEA BASINS

Sea Basin	Area [km²]	Physical characteristics					
		Wind	Waves	Tides	Temperature [°C]	Salinity [psu]	Avarage depth [m]
EA	3,930,002	Excellent	Powerful	Strong	Surface: 7–15 Deep waters: 5.5–7.5	≥ 35	5000 (ocean)
NS	570,000	Excellent	Strong (slower and higher amplitude in comparison to the open ocean)	Strong	~17 (summer) ~6 (winter)	25–34.5	90
BSR	415,266	Good	Moderate	Weak	Surface: -0.5–20 (depending on the season)	18 (west) – 0 (north-east)	54
MED	2,505,000	Moderate and good	Varies	Weak	Surface: 21–28 (summer) 10–17 (winter)	36.5–39	1,500
BS	436,000	Moderate	Moderate	Weak	Surface: up to 30 (summer) Deep Waters: 8.5 (summer)	17–18	1253

CAUTIONARY NOTE

Although there are often distinct benefits to MU, it may not be the best option in all situations. It is important to carefully consider local conditions when making a decision on whether to favour single- or multi-use in a given location.

MUSES Multi-Use in European Seas

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

BARRIERS

MULTIPLE BARRIERS are still stalling the development of multi-use from concept to real life implementation. These barriers include mainly: technological aspects, regulation, funding, environmental concerns, and stakeholder perceptions.

For the majority of multi-use combinations, unclear **licensing**, **liability** and insurance implications, as well as lack of planning and specific financial incentives targeting multi-use are the main barriers hindering commercial advancement. Moreover, lack of specific **skills** (communication, marketing, business development) and low financial capacity of small scale fishers and aquaculture developers impedes development.

Development of additional uses at existing OWFs, such as aquaculture, is uncommon and can be done only in certain cases, under strict conditions. This may require renegotiation of **investment** and **insurance** premium agreements obtained at the pre-planning stage of offshore wind development. While, in theory, agreements to share additional costs can be made between both sectors, there is often a lack of **financial motivation** for investors to engage in such endeavours.

ACTORS

To advance MU development, RESPONSIBLE ACTORS, such as public regulatory bodies, including sectoral and/or cross-sectoral regulators and/or policy makers need to be more involved and act as facilitators to drive multi-use. Furthermore, facilitation policies need to be developed to address these barriers at both strategic and project levels.

Policy makers have been identified as responsible for communicating opportunities and bringing together relevant sectors for multi-use development. Further coordination between actors responsible for alignment of policy with its implementation mechanisms is also needed.

Regulatory support for multi-use, although present in some countries, has been insufficient to drive the implementation of the concept.

Considering the limited experience and financial power of certain sectors to initiate multi-use, the drive for development of such combinations has to come from policy developers and regulators.

The role of **clusters, networks and other intermediaries** is highly significant in fostering public-private and cross-sectoral cooperation required for overcoming challenges in multi-use implementation.

MUSES Multi-Use in European Seas

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

ANALYSIS OVERVIEW

MU COMBINATIONS REVIEWED ACROSS THE FIVE EU SEA BASIN

MU	Eastern Atlantic	North Sea	Baltic Sea	Mediterranean Sea	Black Sea
OWF & Fisheries		✓			
OWF & Aquaculture		✓	✓	✓	
OWF & Tourism		✓	✓		
OWF & Wave energy		✓			
Wave energy & Aquaculture	✓	✓		✓	
Tourism & Aquaculture	✓			✓	
Tourism & Fisheries	✓			✓	✓
Tourism & UCH & Environmental protection	✓		✓	✓	✓
Re-use of O&G decommissioned installations		✓		✓	

MU COMBINATIONS EXPLORED ACROSS THE TEN CASE STUDIES

	Eastern Atlantic			North Sea			Baltic Sea		Mediterranean Sea	
Case number on the map	1	2	3	4	5	6	7	8	9	10
Case study area	Northern Atlantic Sea	South coast of mainland Portugal	Azores Archipelago	East coast of Scotland	North coast of Scotland	North Sea of Germany	Island of Gotland – Sweden	Southern Denmark	Northern Adriatic Sea	Aegean Sea
OWF & Fisheries					✓	✓				
OWF & Aquaculture						✓	✓	✓		
OWF & Tourism							✓			
OWF & Environmental Protection & Tourism								✓		
Wave energy & Aquaculture	✓									
Tidal energy & Environmental Protection				✓						
Tidal energy & Environmental monitoring				✓						
Tourism & Fisheries		✓	✓						✓	✓
Tourism & Aquaculture		✓							✓	
Tourism & Environmental Protection		✓	✓						✓	
Tourism & UCH									✓	
Tourism, UCH & Environmental Protection			✓							
Oil & Gas & Tourism & Aquaculture									✓	
Oil & Gas & Renewable Energy									✓	
Renewable Energy & Desalinisation										✓
Shipping terminal & Green energy generation	✓									

MUSES Multi-Use in European Seas

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

EASTERN ATLANTIC

MUSES Multi-Use in European Seas

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

OVERVIEW OF OPPORTUNITIES

The Eastern Atlantic (EA) provides conditions suitable for a variety of ocean multi-use concepts. However, the **renewable energy** sector is dominant, enabling combinations with aquaculture, tourism and environmental protection. Multi-use combining offshore wind or wave energy generation with aquaculture is seen as an opportunity for moving aquaculture to 'further exposed sites' [3], lowering visual and environmental impacts of aquaculture in coastal areas.

Aquaculture may also be combined with **wave energy** to service exclusively the energy requirements of farming operations or provide power to onshore facilities. Such solutions are especially relevant for areas where supply of grid-based electricity is expensive or unavailable.

GOOD PRACTICES

- This multi-use has already been applied in Mingary Bay, Scotland and is planned in Clift Sound. This activity also included the development of a "hybrid" storage system to convert and store the wave energy, providing the necessary power on demand.

The combination of **Underwater Cultural Heritage (UCH) and tourism** exists along the Atlantic coast of France, Portugal, Spain and the UK. Popular UCH and Tourism MUs include:

GOOD PRACTICES

- the marine park of Iroise in France, the Islas Cíes (Galicia) and Bahia de Santander (Cantabria) in Spain;
- the Coronation wreck in England (approximately 1,000 licensed visitors in its first year of operation).

The Portuguese archipelago of Azores is a location where this MU is not yet developed but opportunity has been identified given the high number of potentially suitable UCH sites.

The EA also hosts good examples of replica sites, developed to safeguard particularly valuable UCH from potential damage (e.g. Atlantic museum, 15 metres deep, in Lanzarote, Canarias, Spain).

In Portugal, Spain and France, **tourism**, **fisheries** and **environmental protection** appear to be the most pro-active sectors in terms of MU development. Moreover, tourism and fishing activities are taking advantage of Marine Protected Area (MPA) designations to develop eco-tourism activities, further advancing *pescatourism* (fishery and tourism). Sustainable **aquaculture** tourism is also popular in many estuaries, bays, and along coastal areas of the EA (e.g. Ria Formosa in Algarve, Portugal).

EU funding sources such as the **EMFF** (European Maritime Fisheries Fund), have been vital in supporting initiatives that contribute to the diversification fishers' income, with special attention to tourism opportunities. Other National sector funding schemes, and investments in Research & Development have also supported the MU concept in the EA.

GOOD PRACTICES

- **The MarGalaica project** launched a comprehensive website with 57 fishing companies offering 97 different tourism products along the Galician coast.
- The French Department of Fishing and Aquaculture host a national **working group on pescatourism** which provides guidance on safety and fiscal legislation.
- A series of training courses were organized as part of the MarGalaica project in Spain to provide fishermen and other actors with the skills necessary to work with visitors, and a quality charter known as the **"Fisterra Standard"** was developed.

The **"Blue Fund"** which was recently created in Portugal could serve as a source of funding for MU initiatives.

MUSES Multi-Use in European Seas

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

OVERVIEW OF MAIN BARRIERS

Tourism and aquaculture / fisheries:

- This MU faces legislative restrictions with regards to hosting tourists on board aquaculture or fishing vessels, In many cases, there is an absence of adequate insurance regulations against accidents. Moreover, fishers often lack specific skills to initiate this MU related to, for example, communication, marketing, safety onboard and business development.
- Due to safety regulations, in Portugal for instance, a limited number of tourists (less than 13) are allowed on fishing vessels. This can reduce profits and increase costs incurred by fishers offering this activity.

Tourism and UCH:

- Tourists can lack specialist skills for underwater exploration (e.g. diving certification) and there is a risk of damage to the UCH objects and fragile environment. Alternatively, new equipment must be designed (e.g. vessels to observe the sea floor).

Wave/ Wind and aquaculture MU:

- This MU has already been developed in UK, but wider application of the concept would require further technological and commercial readiness, which depend strongly on the specific environmental, regulatory and market conditions of each country. Moreover, this MU is contingent on the maturity of each single sector and prospective safety, environmental and financial risks.

MULTI-USE POLICY OVERVIEW

Country	MU at national policy level	MU at individual administrative decision level	Economic incentives for MU	MU at MSP level - explicit reference to MU in National Marine Plans	MU in strategic documents	Other	Barriers noted in reports and documents
UK	YES	YES	Not specific but available from general and sector policies	YES – Not as MU but other terms: "Co location" "Co existence"	"Co-existence" appears in some sector policies	The main goal is efficient resource use (as sharing facilities)	→ Power imbalances between developers → Technology constraints (esp. wave, tide) → NGOs (e.g. birds, marine mammals) and local society/economy (commercial fishers) objections esp. for offshore wind → Regulatory framework unclear on MU in licensing and planning – difficult to licence combined activities as MU (especially when an installation of one use is already in place or permitted)
IE	Not specific but stated in sector and research policies	NO	Not specific but available from sector policies (e.g. aquaculture funds also aim at diversification of uses)	YES – Not as MU but other terms: "Co location" "Co existence"	Sector plans (as OREDP) make explicit reference to "in combination" of wave, tide and wind.	Sector plans also present mitigation measures addressing interactions with other marine uses	→ No concrete guidelines exist to enable MU in licensing / planning → Potential power imbalances between developers → Technology constraints (esp. wave) → Onshore renewable energy promoted over offshore in the past → Need for stakeholder and local MU engagement
FR	NO	NO	NO – But available for R&D	NO – But present at MSP National Law as "multi-purpose"	Planned sector actions (as marine renewables)		→ Complex and long legal, administrative and licensing processes → Low Technological Readiness Level (TRL)
ES	NO	NO	NO – But available for R&D	NO – But present at MSP National Law as "coexistence"	No national Marine Strategy	Specific initiatives: e.g. PLOCAN is an Oceanic Platform of the Canary Islands funded by industry and R&D	→ No comprehensive Marine Strategy → Administrative and licensing processes are too complicated and long and, in some cases, addresses several levels (autonomous island communities)
PT	NO	NO	Not specific but available from sector policies, R&D and on Blue Fund	NO – But present at MSP National Law as "coexistence"	Specific sector regulations mention possibility of combination	Blue Fund and Titles for private use of maritime space (TUPEM) are too recent to evaluate contribution to promote MU	→ Complex and long legal, administrative and licensing processes → Lack of funding → Low TRL

MUSES Multi-Use in European Seas

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

CASE STUDIES

WAVE ENERGY & AQUACULTURE

WEST COAST OF SCOTLAND

In the case study area, a combination of wave energy and aquaculture has already been implemented (commercial use) in Mingary bay, while trial testing of relevant concepts is also planned in Clift Sound, Shetland Islands.

This MU concept involves energy required for aquaculture operations being supplied directly from the wave farm. This reduces dependence on diesel, minimizes the carbon footprint and can potentially provide green credentials to aquaculture developers and their products. Secured, direct electricity sales to the aquaculture farm and potential cost reductions, due to joint operations and maintenance, pave the way for further development of the wave energy sector which is still in its infancy and struggles in terms of technological and commercial readiness [5].

Presented on a map as **1**

TOURISM AND FISHERIES

SOUTH COAST OF MAINLAND PORTUGAL – ALGARVE REGION

The favourable environment of the Algarve makes this region one of the main tourism destinations in Portugal. Its economy is dominated by the tourism sector but still preserves important traditional maritime activities such as fisheries and aquaculture. Existing MUs are mainly related to these traditional uses and other "soft" uses of the ocean such as aquaculture (e.g. tuna farming) with tourism, and UCH with tourism and environmental protection. Increasing interest in marine renewables and the promotion of a more technologically advanced offshore aquaculture industry by the Portuguese Government (e.g. the use of tidal energy is currently being tested), paves the way for further development and widening of the MU concept [6].

Presented on a map as **2**

TOURISM AND FISHERIES

AZORES ARCHIPELAGO

Fisheries and tourism are two main contributors to the maritime economy of the Azores. On the other hand, natural landscapes and marine wildlife are the "Brand" of the Azores, which is of outstanding importance in maintaining quality tourism opportunities.

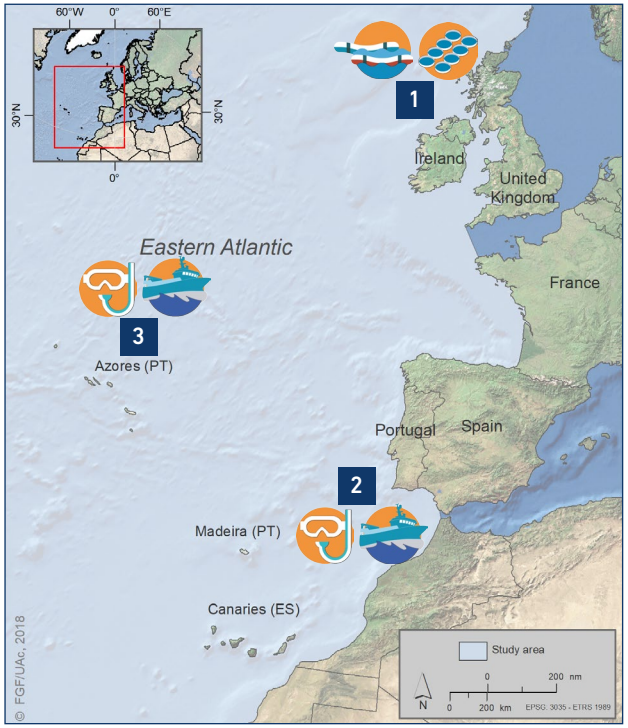
Therefore, sustainable integration of tourism with other uses such as fisheries, nature conservation and the preservation of marine ecosystems, has strong potential in this case study area.

The most important actions for further MU development in the Azores are

- creation of a more consistent legal and administrative framework focused on MU;
- capacity building for fishers;
- investment in promoting and marketing MUs and their benefits, including the involvement of social media [7].

Presented on a map as **3**

LOCATION OF MUSES CASE STUDIES IN THE EASTERN ATLANTIC



MUSES Multi-Use in European Seas

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

ACTORS

Sea basin and **macro regional level actors** have been recognised as particularly important in promoting MU concepts across the Atlantic, as well as facilitating the exchange of good practices in relation to regulation, policy and capacity building. Analysis from cases studies shows that the role of **FLAGs** (Fisheries Local Action Groups), have been vital in supporting initiatives and project related to pescatourism.

A SELECTION OF SEA BASIN ACTORS RELEVANT TO MU IN THE EASTERN ATLANTIC

Atlantic Action Plan support team	Atlantic Arc Commission	**ICCAT** International Commission for the Conservation of Atlantic Tunas
NASCO North Atlantic Salmon Conservation Organization	**NEAFC** North East Atlantic Fisheries Commission	North Sea Region Programme Secretariat
OSPAR Oslo and Paris Convention	South Western Waters Advisory Council	The North Western Waters Regional Advisory Council

RECOMMENDATIONS

The following recommendations apply to the MU of tourism and aquaculture/ fisheries:

- → **Support the creation of clear and comprehensive legislation** for pescatourism and aquaculture tourism using best practices from the Mediterranean countries;
- → **Train fishers** with the skills and knowledge necessary for these activities, especially those related to safety and service-oriented business;
- → **Build a knowledge base** on the benefits and value chain through research;
- → **Promote the MU combination**, its products and benefits, using completed projects as examples.

While the MU of aquaculture and renewable energy is, at present, limited to the UK, its potential can be also utilised across other EA countries. There is a need to **identify specific locations** where investing in and **incentivising MU development** (incl. preferential access to funds) can be particularly beneficial (island communities, remote coastal areas).

MUSES Multi-Use in European Seas

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

NORTH SEA

MUSES Multi-Use in European Seas

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

OVERVIEW OF OPPORTUNITIES

Combination of multiple energy sectors (usually as part of the same physical platform), to maximise energy generation in a given location at sea, is being increasingly considered in the UK. For example, there is already experience combining offshore **wave and tide energy** in northern Scotland (Pentland Firth and Orkney waters), while a pilot test hybrid of **wind and wave** technology is to be commissioned (Caithness). The UK currently has the largest amount of installed offshore wind capacity in Europe (40.8% of all installations).

Tourism and offshore wind MU has already been established in many North Sea MS. However, levels of integration vary from joint human resources and organised boat visits within the wind farm zone, to renewable energy museums and visitor centres on land. It is interesting to note that the 500m safety zone around the wind farm (applicable in some countries) was not found to be a barrier to a successful boat tour – visibility of the wind farm was not compromised by the prescribed distance.

The situation combining **fisheries within offshore wind farms**, is quite different, given that Member States have very different approaches with regards to the integration of these two sectors. Scotland appears to be the most advanced in this regard, while other countries are also increasingly considering this MU. In the Netherlands, legislation regarding the safety zones around OWFs was recently relaxed for three windfarms.

Salinity and water quality in the North Sea provide suitable conditions for **aquaculture** development. Moreover, many of the North Sea countries have aquaculture development goals as part of their maritime policies. MU with offshore renewable energy is seen as an opportunity for moving aquaculture offshore and scaling up production. However, rough sea conditions still present a great challenge for the development of technological solutions that would enable this MU.

GOOD PRACTICES

→ Belgium has recently opened its four OWFs to aquaculture which will serve as good examples to other countries considering such solutions in the future.

Combinations of **aquaculture (seaweed and shellfish) and environmental protection** (Natura 2000), have mostly been implemented at a small-scale in Denmark where environmentally friendly seafood is produced. Such practices can be potentially replicable to remote areas of the North Sea or Atlantic where food security might be a challenge.

The **decommissioning of O&G installations** is also a relevant topic in the North Sea. To reduce decommissioning and removal costs, regulators and energy companies are increasingly considering approaches for their re-use for other purposes such as renewable energy (e.g. wind energy or hydrogen storage) or carbon capture and storage. However, a clean sea bed policy has been adopted as a regulatory framework for some Member States based on the OSPAR regulation, decision 98/3. The significant distance to shore and technological characteristics prevent some O&G installations in the North Sea from being suitable for other uses.

Scotland has an ambitious renewable energy target of meeting **100%** of Scotland's **electricity needs from green sources by 2020**, including offshore wind.

MUSES Multi-Use in European Seas

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

OVERVIEW OF MAIN BARRIERS

Combinations with OWFs:

- Power imbalance between the two developers, unclear procedures for joint licensing and difficulty adding another use, such as aquaculture, to existing licenses.
- Low motivation to invest in solutions is driven by unknown environmental cumulative impacts. Given that OWFs close to shore are more suitable for MU, opposition is possible from local communities and NGOs.
- Member States have different regulations with regards to fishing within the wind farms which is informed by cable burial rules and perceived risks.

Aquaculture and environmental protection:

- There are possible cases of incompatibility of aquaculture with existing MPA regulations, limiting the MU to specific locations
- Aquaculture farmers lack entrepreneurial skills and capacity to indulge in this MU

O&G re-use:

- National clean sea-bed policies based on OSPAR decision 98/3
- Distance to shore
- Technological characteristics of O&G installations and high risks given the novelty of the concept.

MULTI-USE POLICY OVERVIEW

Country	MU at national policy level	MU at individual administrative decision level	Economic incentives for MU	MU at MSP level - explicit reference to MU in National Marine Plans	MU in strategic documents	Barriers noted in reports and documents
DE	NO	NO	NO	YES	YES (German Maritime Spatial Plans)	→ Current Spatial Planning Policy is largely sectoral, with 'priority' areas assigned for single uses. → No assigned priority areas for commercial fisheries (special consideration given but no rights) → Power imbalances between maritime users (e.g. fisheries vs. wind energy industry) → Fishing operations (both passive and active) are not permitted within OWFs → Lack of clear/open communication between stakeholders → Lack of pilot facilities to showcase MU combinations
DK	NO	NO	NO	NO (but MSP in development and expected to consider the benefits of MU in Danish waters)	NO	→ Siting challenges, including connection to the grid and geomorphological conditions → No traditions for cooperation between the different sectors involved → Unclear insurance policy frameworks → Lack of larger pilots (diverse types and locations) and funding for scaling up → Lack of knowledge on the complications of licensing a joint OWF and aquaculture development → For OWF developers, unclear drivers/benefits for combining with aquaculture ventures → Lack of political encouragement
NL	YES (North Sea 2050 Spatial Agenda)	NO	NO	YES (annex of the National Waterplan specifically address MU as an objective)	NO (depending on definition of strategic document)	→ OWF developers hesitant to co-locate due to complex administrative requirements and necessary infrastructure modifications → Power imbalances between maritime users (e.g. fisheries vs. wind energy industry) → Cables for OWF are above ground, making bottom trawling (99% of Dutch Fishery sector) impossible
BE	YES	YES	YES	YES (Belgian Maritime Spatial Plan)	NO	→ Lack of space for expansion of certain sectors, limiting certain MU potential (e.g. aquaculture) → Uncertainties over the ecosystem impacts, affordability, as well as public opposition issues → The maritime plan prohibits breeding of mussels on a commercial scale
UK	YES (Marine Policy Statement (2011))	YES (UK: Scottish and Welsh National Marine Plans, sub-national / regional plans)	NO (not as MU but available from general and sectoral policies]	YES	YES	→ Power imbalances between developers → Technology constraints (esp. wave, tide) → Regulatory framework unclear on MU (esp. when one use is already in place). Issues with local acceptance
FR	NO	NO	NO (available on R&D)	NO (present in MSP National law as 'multi-purpose')	Planned sector actions (marine renewables)	→ Legal, administrative and licensing processes are overly complex → Low TRL for local conditions

MUSES Multi-Use in European Seas

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

CASE STUDIES

OFFSHORE WIND AND COMMERCIAL FISHERIES

EAST COAST OF SCOTLAND

The case study focused on an existing MU combination of commercial fisheries (especially static gears) and offshore wind farms that is already encouraged in Scotland's marine legislation and National Marine plan. The case study identified and assessed current MU barriers, opportunities for further expansion and documented stakeholder experiences and perceptions at a local level.

The case study provides concrete recommendations in the sphere of funding, defining the role of government subsidies and innovation-leading, self-insured, utility-scale, OWF developers, as well as recommendations for marine planning and licensing, and technological innovation that can facilitate further implementation of this MU concept. It is argued that lessons learned from this case study are easily transferable to a number of other MU locations around the UK, North Sea and other EU sea basins [9].

Presented on a map as **4**

TIDAL ENERGY DEVELOPMENT AND ENVIRONMENTAL PROTECTION AND MONITORING

NORTH COAST OF SCOTLAND – INNER SOUND OF THE PENTLAND FIRTH – NORTH SEA

The Inner Sound is recognized as a highly active site that hosts some of the greatest resources for marine renewable energy generation in the world, with tidal current speeds reaching 5 m/s. The case study explored tidal energy development and its interactions with the marine environment. Given the pre-commercial status of the tidal energy industry, added values and negative impacts emanating solely from tidal energy development, as well as MU with environmental protection, future development is speculative as there is currently insufficient data to support decision-making. The determination of the viability of co-locating tidal energy development with environmental protection areas and the primary MU combination analysed in this case study, is intrinsically dependent on the improvement of monitoring tools, techniques, and platforms characteristic of environmental monitoring of tidal energy developments, the secondary MU combination analysed in this case study [10].

Presented on a map as **5**

MUSES Multi-Use in European Seas

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

OFFSHORE WIND FARMS AND MARINE AQUACULTURE OR FISHERIES

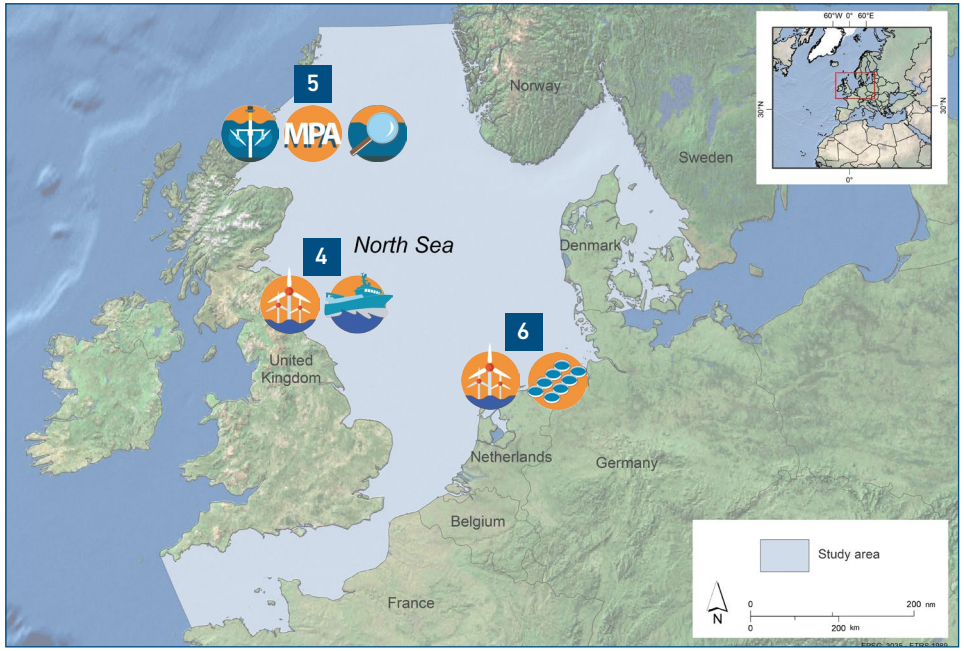
GERMAN NORTH SEA EEZ – NORTH SEA

This Case Study focused on the combination of offshore wind and fisheries or marine aquaculture in the German North Sea EEZ. The Case Study area encompasses all those areas designated as priority areas for the development of offshore wind power generation in the German Marine Spatial Plan.

Fisheries are a traditional use of the sea and are especially deeply rooted in coastal communities. At the same time, they do not have assigned priority areas under the German MSP due to the high spatial variability of their fishing grounds. Instead, they are awarded special considerations in the priority areas of other uses. This provision, though legally binding, does not yet compel MU. Marine aquaculture does not exist in the German EEZ, yet the MSP sets forth a framework for future development of this sector, which explicitly considers its combination with other uses like OWFs. These two uses, one established and one new, offer great potential for future MU [11].

Presented on a map as **6**

LOCATION OF MUSES CASE STUDIES IN THE NORTH SEA



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

ACTORS

In the North Sea, **industry actors and research institutions** have had a strong role in developing the MU of offshore wind and aquaculture, and facilitating trial projects. In addition to **EU programmes, both national and industry foundations** have invested in MU projects.

Offshore wind developers, specialised engineering consultancies, research centres and even classification bodies have been involved in multiple projects to date. However, as the aquaculture sector grows, as does the interest of **mussel and seaweed business developers** in MU. For example, Deepdock Ltd, a UK mussel cultivator, has successfully completed trials within the North Hoyle wind farm (RWE) in 2010, while further development is expected to take place in existing and future OWFs in Wales, and western England and Scotland.

A SELECTION OF SEA BASIN ACTORS RELEVANT TO MU IN THE NORTH SEA

- DECOM North Sea
- **NS COMM** CPMR – North Sea Commission
- **BDF** North Sea Region Programme Secretariat
- **NSAC** North Sea Advisory Council (fisheries)
- North Sea Energy Cooperation
- **CCB** North Sea Energy Forum
- **HELCOM** North Sea Countries' Offshore Grid Initiative
- **OSPAR** Oslo and Paris Convention

RECOMMENDATIONS

For **wider outreach and facilitation of MU policy development**, involvement of maritime industry clusters and government led initiatives is crucial. **Further involvement of public/private clusters**, such as the North Sea Energy Political Initiative and the French Maritime Cluster would facilitate broader acceptance of the concept.

EXAMPLE

→ Existing examples of this include: Belgium Vision process MU stakeholder group, the MVI North Sea Energy Lab (including discussions on re-use of decommissioned O&G installations)[8], and FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group).

More specific research on cumulative impacts is needed as well as development of a proof of concept and business case that can be pitched to investors. For this, the **commercial readiness level**, as well as technological readiness level, should be addressed, analyzing consenting procedures, technological, safety and commercial risk, liability and insurance implications, and overall costs and benefits of the given site.

EXAMPLE

→ In Belgium, exceptions to regulations have been made to facilitate several experimental research projects on this MU in order to gain more knowledge about environmental implications.

Not all OWFs and decommissioned O&G gas platforms are suitable for MU, mainly due to distance from shore, environmental conditions and their technological characteristics.

More integrated involvement of spatial planners for MU site assessment is required. This should include consideration of socio-economic and technological aspects and provide viable support to decision makers developing **consenting** procedures, **liability** and **insurance** regulation, and deciding on financial **incentives**.

MUSES Multi-Use in European Seas

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

BALTIC SEA

MUSES Multi-Use in European Seas

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

OVERVIEW OF OPPORTUNITIES

The Baltic Sea has hosted many MU related projects to date, mainly driven by the large number of existing and planned OWFs and existing UCH sites. MU of **aquaculture with offshore wind farms** is seen as a potential opportunity to reduce costs of the two operators and open more suitable areas for aquaculture (including sites further offshore).

GOOD PRACTICES

→ A number of past projects have studied this MU, including theoretical concepts in Kriegers Flak, southern Sweden, as part of the MERMAID project [12] and tests in the real environment of the Rødsand 2 OWF off the south coast of Lolland, Denmark, as part of the SUBMARINER project [13].

Combinations with **extractive aquaculture** are found to be in general more suitable, given the lower environmental impacts and low maintenance requirements.

In the Baltic, the Danish Wave Energy Test Center has hosted trial sessions of wave MU concepts (e.g. in combination with aquaculture). However, the technology readiness level is still low for the Baltic conditions with major barriers including small waves, winter ice, and the lack of a wave energy market and incentives.

In the coastal areas of Denmark, Sweden, Germany **offshore wind farms** are already being consciously integrated into regional **tourism** activities.

GOOD PRACTICES

→ Several EU projects have also been exploring OWE development in the Baltic from tourism perspectives, amongst others. These include: 4POWER, OFF.E.R and Baltic InteGrid.

By initiating offshore wind with tourism MU (e.g. boat tours for sightseeing), OWF developers may build a sense of pride around the OWF, so it becomes a symbol for the local region. This may, in turn, overcome acceptance issues and the "NIMBY" phenomenon (Not In My BackYard). As such, MU presents a mitigation option for potential negative impacts of the OWF. Tour operators see this MU as an innovative way to attract visitors and offer further educational content to their tours.

This MU also provides benefits to local communities in terms of employment and new sources of recreation. Added financial value can also be derived if the two sectors share some of the operational activities, such as environmental monitoring, surveillance and data collection.

MS which have yet to develop OWFs are considering such solutions in their maritime spatial planning processes.

Although many MU combinations with the offshore wind sector have been examined in the southern Baltic in the past, MUSES have found that other less visible combinations involving UCH, environmental protection and tourism, might also have a strong potential in contributing to Blue Growth in the region. The Baltic Sea hosts exceptionally well preserved wooden shipwrecks, designated as **UCH**, attracting tourists (particularly divers) from all over the world. Coastal tourism is also an important blue growth sector in the Baltic, although highly seasonal (mainly summer). **Tourism** combined with UCH (e.g. diving and walking trails) provides additional, innovative tourism opportunities that could potentially sustain the tourism sector all year round. Such initiatives could also provide an additional sustainable source of funding for UCH and environmental protection.

Combination with offshore wind could enable scaling up of **extractive aquaculture**. Calculations of annual biomass production (mussels and seaweed) in the Rødsand 2 OWF (DK), imply that nitrogen could be considerably reduced, potentially **contributing to lower levels of eutrophication in the Baltic** [14] [17].

MUSES Multi-Use in European Seas

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

OVERVIEW OF MAIN BARRIERS

Offshore wind related MU:

- **Low financial power** of individual aquaculture and tourism operators due to dispersion of the sector, implying that significant investments are required for aquaculture to be developed further offshore;
- **Lack of cost benefit analysis. Negative perceptions about financial viability** (mainly resulting from the high insurance premiums, distance to shore, low product quality/value for invested resources);
- **Lack of legal and planning incentives** to promote MU of OWFs with other activities;
- Difficulty obtaining necessary environmental permits due to **environmental impact** uncertainties and varying perceptions.

Tourism and UCH MU:

- **Low visibility** of the sectors involved and associated services, low individual **funding power**;
- **Short season** limiting suitable sites and economic sustainability throughout the year.

MULTI-USE POLICY OVERVIEW

Country	MU at national policy level	MU at individual administrative decision level	Economic incentives for MU	MU at MSP level - explicit reference to MU in National Marine Plans	MU in strategic documents	Barriers noted in reports and documents
FI	NO	NO	NO	YES (not explicitly MU, but other terms)	YES	
EE	NO	NO	NO	YES (not explicitly MU, but other terms)	YES	→ Heritage Conservation Act and Regulation No 9 requires that divers have specific training and a UCH permit, restricting opportunities for UCH exploration → Seasonality due to climatic conditions (e.g. ice cover)
LT	NO	NO	NO	NO	NO	
LV	NO	NO	NO	NO (rather based on avoiding conflicts)	NO	
PL	NO	?	NO	YES (MSP under development, incl. key sea areas with assigned priorities and secondary functions)	YES (MSP)	
SE		YES	NO	Yes (Swedish MSP Roadmap Marine Spatial Planning – Current Status, 2016)	YES (MSP Roadmap)	→ Relevant authority for policy making, planning and permitting of maritime uses depends on the sector, specific topic and distance from shore → Cost-benefit analysis must be conducted for OW developments, currently discouraging new ventures due to the high financial cost involved
DK	YES The Act on MSP, 2016	YES (for individual themes such as fishing)	NO	YES	YES	→ Lack of legal and planning incentives → Licensing procedures differ depending on type of organisms cultivated and locality of the planned aquaculture site → Environmental impact uncertainties make it difficult to obtain necessary environmental permits
DE	NO	YES (endorsement of MU, referring to specific MU combinations)	NO	YES/NO (rather integrative planning in order to co-ordinate growing spatial conflicts of maritime uses)	YES	→ Lack of legal and planning incentives for MU with offshore wind → Current MSP specifies 'priority' areas assigned to single-use only → Stringent, complicated and lengthy permitting processes (aquaculture and OW) → Concerns regarding the environmental impact of all types of aquaculture → Open net cage farming is not allowed → Cost of sustainable aquaculture Best Available Technology (BAT), most of which still in the research stage → Lack of pilot facilities and areas to showcase MU combinations

MUSES Multi-Use in European Seas

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

CASE STUDIES

OFFSHORE WIND, TOURISM AND AQUACULTURE

SWEDISH ISLAND OF GOTLAND

The study area is located in the southern part of Gotland, the largest island of the Baltic Sea. Gotland is one of Sweden's most renowned tourist destinations. In Sweden, mussel aquaculture for the culinary market occurs in the west coast. In the Baltic Sea, mussels are too small to be used as food (due to low salinity) and can instead be used as feed for poultry and fish. Bockstigen, Sweden's first wind farm (1998), situated around 4 km from the coast, is exploring opportunities for combination with boat trips or aquaculture (seaweed and mussels).

Key questions, to be answered by future studies and pilots, include the logistics of attaching aquaculture infrastructure to OWF foundations, appropriate depths to put lines, how to cope with ice formation, etc. Moreover, cumulative and in-combination effects need to be carefully assessed to address potential impacts of increased tourism activity. While developers are open to join pilot projects, policy support is required [16].

Presented on a map as **7**

OFFSHORE WIND AND AQUACULTURE

SOUTH COAST OF LOLLAND-FALSTER – DENMARK – BALTIC SEA

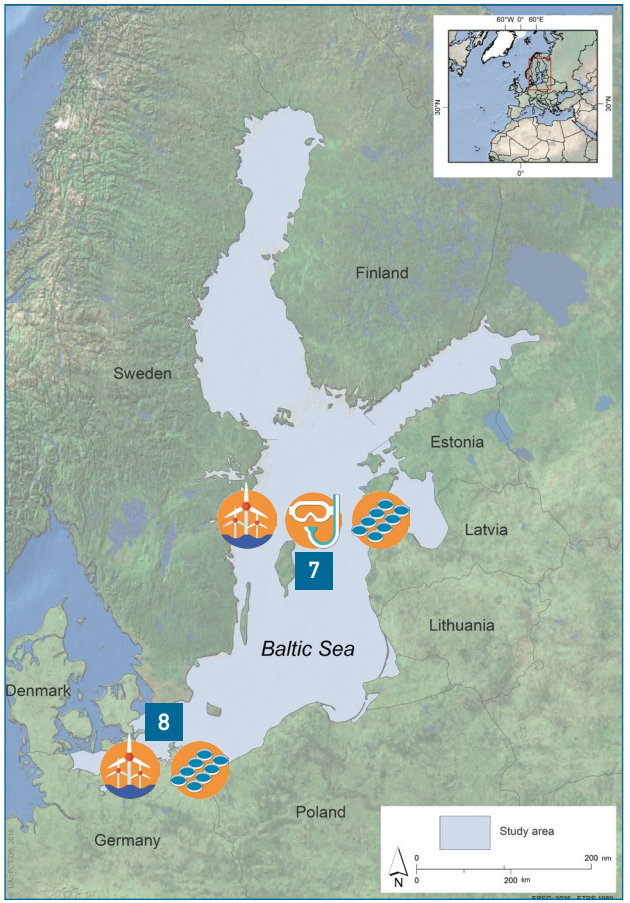
This case study focuses on the MU combination of offshore wind farms and mariculture as an approach to nutrient remediation, against the background of the current state of algal blooms in the Baltic sea waters and existence of Denmark's oldest OWF in Lolland-Falster.

The main economic drivers of the island include maritime transport (trade and ferry lines), wind energy and tourism (land and sea). MU combinations in the marine sector have never occurred in Denmark or been considered at the local level. Therefore, this case study provides an opportunity to take advantage of the economic drivers of offshore wind and tourism and the need for nutrient remediation, to test and explore possibilities for making additional gains and integrate current sectors for economic, environmental as well as social (local and institutional) benefits.

The success of any proposed MU combination depends on in-depth assessment of the impacts (social, economic and environmental) of these combinations, proof of concepts and business models for financial and investment support. Integration into local marine and coastal development planning and cross-sectoral multi-stakeholder dialogue, backed by strong institutions with the capacity to function effectively, is also vital [17].

Presented on a map as **8**

LOCATION OF MUSES CASE STUDIES IN THE BALTIC SEA



MUSES Multi-Use in European Seas

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

RECOMMENDATIONS

MU with OWF

Future OWF developments in the central and north Baltic have an opportunity to consider MU options right from the pre-planning stage to ensure their easier realisation.

EXAMPLE

→ In Poland, nine binding concessions have already been given for OWFs and their suitability for MU is being discussed through the ongoing MSP process.

Early engagement of local communities to discuss site selection, layout and design, as well as clarification of relevant regulations, funding and ownership of an OWF can contribute to higher rates of acceptance, the identification of suitable tourism activities related to OWF and the establishment of necessary agreements between the two users.

In Germany, the new Arkona wind farm could potentially be suitable for the development of such MU activities in the future. However, further support for local tour operator activities is necessary, by means of **entrepreneurial guidance, financial support and wider promotion**.

EXAMPLE

→ Middelgrunden OWF in Denmark provides a good example of early engagement of the local community, resulting in cooperative ownership and attractive layout of the wind farm.

For combinations of OWF with seaweed or shellfish aquaculture, **more site specific studies** on pilots in the real environment will be needed to assess cumulative impacts and identify profitable sites.

EXAMPLE

→ The Baltic Blue Growth project [15] is developing a pan-Baltic map on viable regions for mussel growth which can be used in future MU siting exercises.

MU with Tourism

While diving is not possible in all areas of the Baltic due to low visibility, other options, such as virtual tours and walking cultural trails, can establish synergies with UCH and are also less dependent on seasonality. Sufficient **funding, marketing and promotion** of UCH tourism activities at the Sea Basin level is needed in order to realise such endeavors.

Sea basin/macro-regional projects involving the business community built on the results of initiatives carried out so far shall be further encouraged, while **macro regional strategies can serve as strong cooperation platforms** and dissemination mechanisms.

→ Projects such as BalticRIM are important in this regard, aiming to identify UCH sites suitable for combined use.

→ The Finnish Heritage Agency shares information with the public on UCH diving permitted areas. This has fostered better relationships and coordination between the UCH authorities and diver clubs to promote Tourism, UCH and Environmental Protection MU and divers feel a sense of pride and duty in monitoring and conserving these sites.

MUSES Multi-Use in European Seas

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

ACTORS

National wind industry associations, and public-private clusters and partnerships (e.g. State of Green, Denmark, and the German Offshore Wind Energy Foundation) support MU and are likely to be important in the future to bring relevant public and private actors together.

For less visible tourism combinations, **intermediaries and associations** have a strong role in creating new perspectives for business partnerships by gathering relevant tourism stakeholders and maintaining networks of local tour operators.

A SELECTION OF SEA BASIN ACTORS RELEVANT TO MU IN THE BALTIC SEA

BASREC
Baltic Sea Region Energy Cooperation

BALTFISH FORUM

BDF
Baltic Development Forum

BSAG
The Baltic Sea Action Group

BSSSC
Baltic Sea States Sub Regional Co-operation

CBSS
Council of the Baltic Sea States (Monitoring Group on (underwater) cultural heritage)

CCB
Coalition Clean Baltic

CPMR BSC
CPMR Baltic Sea Commission

HELCOM
Baltic Marine Environment Protection Commission

NCM
Nordic Council of Ministers

SUBMARINER
SUBMARINER Network for Blue Growth EEIG

Interreg BSR
EU Strategy for the Baltic Sea Region (array of instances participating in the coordination and implementation)

VASAB
Vision and Strategies Around the Baltic Sea

WWF – Baltic
World Wildlife Fund

MUSES Multi-Use in European Seas

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

MEDITERRANEAN SEA

MUSES Multi-Use in European Seas

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

OVERVIEW OF OPPORTUNITIES

Tourism, Fisheries & Environmental Protection (*pescatourism*)

Tourism & Aquaculture

Aquaculture & Wind /wave

Tourism & UCH

O&G related MU

The continuous growth of **tourism** in the Mediterranean is informing the diversification of the sector, where local fishers and their wider communities, see increasing demand as an opportunity for alternative sources of income. **'Pescatourism'** is a popular activity whereby fishers engage tourists in sustainable fishing boat tours. This MU has been identified (including pilots) in six out of the eight Mediterranean countries analysed including Italy, Spain, France, Cyprus, Greece and Malta. For example, in Italy, 43 FLAGs were identified to be exploring eco-tourism activities, some of which have formed around existing MPAs. Amongst these is the FLAG of Costa dei Trabocchi which supports the diversification of artisanal fishers into pescatourism, improving their marketing activities and engagement in direct sales. In some cases, pescatourism or aquaculture have also been combined with environmental protection and conservation.

GOOD PRACTICES

→ The Piran Bay in Slovenia hosts a fish farm (sea bass and mussel production) in a fishing reserve area and Natural Park.

Aquaculture is also an eminent traditional coastal sector in the Mediterranean Sea, especially in France, Greece and Italy, and in some cases combined with tourism and environmental protection.

GOOD PRACTICES

→ For example, active experience of this combination was identified in the Cavallino-Jesolo mussel plant in the northern Veneto region, Italy, where sport-recreational fishing and guided tours take place within aquaculture locations. In Malta, another form of this MU exists which involves organised diving in open sea Blue fin tuna farming cages, located 1 mile offshore.

The main driver is related to the economic benefits of combining both sectors, resulting in reduced costs, as well as the availability of funds (EMFF) to diversify the aquaculture sector. Moreover, aquaculture can be potentially combined with a **small scale wind or wave energy** installation to limit the fossil fuel dependence of aquaculture operations and lower costs long term. However, in the Mediterranean, such concepts are still in the early exploratory phase.

Underwater Cultural Heritage (including underwater objects, artefacts, ship wrecks, sunken ruins and cities) is also largely present in the Mediterranean and has potential for combination with tourism activities, such as recreational diving and environmental protection.

Another well-established sector is **O&G extraction** (especially in the Northern Adriatic Sea). There are currently 20 O&G platforms in the Northern Adriatic planned to be decommissioned in 2020. Authorities are screening opportunities to re-use existing platforms after decommissioning for MU purposes such as renewables energies (e.g. wind energy or hydrogen storage), logistic support for aquaculture devices or as tourist attractions (e.g. marinas, gastronomic experiences, and diving)

The Mediterranean has exhibited **continuous tourism growth** over the past two decades [18] [19].

MUSES Multi-Use in European Seas

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

OVERVIEW OF MAIN BARRIERS

Aquaculture or fisheries with tourism:

- Restrictions, as well as lack of clarity and detail in legislation which limits the hosting of tourists on board fishing/aquaculture vessels
- A possible increase in touristic pressures in already overcrowded areas, with the potential for cumulative impacts on coastal regions. This may also lead to competition and conflict with other conventional touristic services

Renewable energy related MU:

- Maturity of renewable energy as a single sector is still very low limiting the development of a MU. Barriers include the low TRL, high risks and insurance premium as well as the regulatory framework.

O&G related MU:

- Lack of pilots and assessment of the applicability of international practices
- Unknown risks and liability implications for infrastructure reuse, during /after the reuse period
- High costs of decommissioning

UCH related MU:

- The risk of UCH object theft is very high and therefore archaeological authorities are often reluctant to provide information about, and facilitate access to, UCH sites.

MULTI-USE POLICY OVERVIEW

Country	MU at national policy level	MU at individual administrative decision level	Economic incentives for MU	MU at MSP level - explicit reference to MU in National Marine Plans	MU in strategic documents	Barriers noted in reports and documents
ES	NO	NO	NO	NO (no National Marine Plans in place)	Initial analysis and studies under the Marine Strategy Framework, has been useful for the initialisation of MSP processes in Spain, constituting analysis of the blue economy sectors. It also briefly considers potential interactions and co-existence	→ No regulatory framework of legislation, covering the MU definition which inhibits the efficient co-existence of sectors → Security and defence policy needs to be taken into account as it could be non-beneficial to other blue economy sectors
FR	YES	NO	NO	NO (no National Marine Plans in place)	National Strategy for Sea and Coast; Technical notes of the Ministry of Ecological and Solidarity Transition	
IT	YES	YES	YES	NO (no National Marine Plans in place)	National Strategic Plan for Aquaculture 2014–2020; European Maritime and Fisheries Fund – Operational Programme for Italy (2014)	
SI	YES		YES	NO (no National Marine Plans in place)	YES – Diversification of fisheries and of tourism products are the main concepts possibly supporting MU	
HR	NO	NO	YES	NO (no National Marine Plans in place)	National Strategic Plan for Aquaculture Development 2014–2020 and National Strategic Plan for Development of Fisheries (2013)	
GR	YES	YES	YES	NO	There is implicit mention of no prohibited coexistence in sectoral plans/laws	→ Potential restrictions such as keeping a specific distance between two or more uses in the same area or obligations to comply with safety and environmental standards
MT	YES	YES	YES	YES	NO	
CY	YES	YES	YES	YES	NO	

MUSES Multi-Use in European Seas

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

CASE STUDIES

TOURISM AND O&G DECOMMISSIONING DRIVEN MU

NORTHERN ADRIATIC SEA

The Northern Adriatic hosts a broad range of maritime uses, nature protection and underwater cultural heritage sites. Coastal and maritime tourism is very diverse and is the main socio-economic driver in the region. The Veneto and Emilia Romagna regions also have strong, historical traditions in aquaculture (clam and mussels) and fisheries, accounting for 65.7% and 10% of the total national production respectively. The only O&G activity takes place through methane gas extraction in the marine area of the Emilia-Romagna Region where there are approximately 68 offshore platforms, most of them within 12 nautical miles from shore.

The case study explored the potential of four MU combinations related to coastal and maritime tourism:

- Tourism and Fisheries
- Tourism and Aquaculture
- Tourism and Environmental Protection
- Tourism and Underwater Cultural Heritage

As well as a further two related to decommissioning of O&G offshore platforms:

- O&G decommissioning and Renewable Energies
- O&G decommissioning, Tourism and Aquaculture [20].

Presented on a map as 9

MARINE RENEWABLE ENERGY & DESALINATION, FISHING & TOURISM

THE SOUTH AEGEAN: THE CASE OF MYKONOS ISLAND, GREECE

In Mykonos, tourism is the cornerstone of the local economy. The island is world famous as a touristic attraction particularly for those who seek "destinations of luxury" or "fun".

The main focus of the Greek case study was to examine potential synergies between offshore renewable energy & desalinisation, as well as between fishing activities and recreational/touristic ones. The former does not currently exist in Mykonos, while the latter is operational but at an early stage.

In all, nineteen stakeholders from different action arenas were contacted to gather their perceptions; the two MUs showed neutral potential, and drivers and barriers for their development were also explored.

Active involvement of local communities in such projects, as well as the adoption of a clear strategic vision by national policy developers related to energy development priorities would facilitate suitable investments [21].

Presented on a map as 10

LOCATION OF MUSES CASE STUDIES IN THE MEDITERRANEAN SEA

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

RECOMMENDATIONS

Tourism related MUs

MU concepts should be promoted through the sea basin wide strategies and initiatives, as important concepts that can contribute to the sustainable Blue Growth in the Mediterranean.

EU level **funding schemes have an important role in supporting MU pilot initiatives** related to fishery and aquaculture in combination with tourism. However, national and local authorities should also provide alternative solutions to support fishers by providing **incentives and micro credit to small scale fishers**, especially in cases where funding cannot be accessed from the EMFF.

It is essential that **legislation on tourism driven MU**, such as pesca-tourism and aquatourism, is well defined, as well as accepted **income levels, taxation levels, gear restrictions, and safety measures** to reduce the administrative burden that small scale fishers, especially those on islands and peripheral regions, face in engaging in pescatourism. **Working groups on tourism driven MU** should also be created to inform how such legislation and regulation could be best designed and implemented.

EXAMPLE

- The French Department of Fishing and Aquaculture host a national working group on pescatourism and the Spanish General Secretariat of Fisheries, through the General Directorate of Fisheries Management, have created the Technical Working Group for Fisheries and Aquaculture Diversification (DIVERPES). Both of these groups provide guidance on strategic priorities, objectives, promoting and applicable regulations in relation to pescatourism.
- The East Sardinia FLAG in Italy, established a microcredit fund as a response to fishermen's financial needs and to support initiatives related to the fisheries sector by using a private credit company and a member of the East Sardinia FLAG.

Offshore renewable energy related MU

Maritime clusters should be used as a conduit to support networking among relevant sectors and creating synergies for innovation. **Continuous support for the EU wide projects** on MU is important as these have a strong role in knowledge transfer among EU Member States and could ensure that some of the **MU solutions from northern EU are adapted and replicated in the Mediterranean**. Nevertheless, better involvement of industry actors and public authorities in such projects is crucial to ensure their commercial application.

Decommissioned O&G installations:

The creation of an international knowledge exchange platform is required to **share experience and guidelines for best available practices** in O&G platform decommissioning.

- The Italian Ministry of Economic Development together with the Ministry for Environment, Land and Sea are preparing a set of guidelines for O&G installation decommissioning and reuse, involving a wide pool of actors through the **"Forum on the future of Platforms"**.

MUSES Multi-Use in European Seas

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

ACTORS

Sea basin level institutions and strategies in the Mediterranean (such as the General Fishery Commission for Mediterranean and Black sea, EU Strategy for the Adriatic-Ionian Region and related action plans), regional/ national actors and **maritime clusters** have been identified as the actors necessary to provide the enabling environment and a framework for the implementation of MU.

A SELECTION OF SEA BASIN ACTORS RELEVANT TO MU IN THE MEDITERRANEAN

ASCAME
The Association of the Mediterranean Chambers of Commerce and Industry

CIESM
The Mediterranean Science Commission

CPMR-IMC
Conference of Peripheral Maritime Regions – Intermediterranean Commission

EUSAIR
EU Strategy for the Adriatic and Ionian Region Facility Point

FEAP-Medcom
Federation of European Aquaculture Producers-Mediterranean Aquaculture Commission

GFCM
General Fishery Commission for Mediterranean and Black sea

GSO BlueMed WG
Senior Officials Group of BlueMed Working Group

MEDPAN
Mediterranean Marine Protected Areas

Med-Reg
Association of Mediterranean Energy Regulators

OME
Mediterranean Energy Observatory

UfM
Union for the Mediterranean

UNEP-MAP
United Nations Environment Programme – Mediterranean Action Plan

WWF Med
World Wildlife Fund Mediterranean

WESTMED
Support team for the Western Mediterranean Maritime Initiative

MUSES Multi-Use in European Seas

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

BLACK SEA

MUSES Multi-Use in European Seas

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

OVERVIEW OF OPPORTUNITIES

Tourism & Fisheries

Fisheries & Environmental Protection

Tourism & UCH

Environmental Protection and Fisheries was identified in both Bulgaria and Romania. The main potentials and enabling factors for the MU combination in Romania (found in "Vama Veche – 2 Mai" Marine Reserve – a Natura 2000 marine site) are clear legislation both on protection of the marine area and on the fishing activities permitted there, with a ban on commercial fishing in the marine reserve.

The MU combination identified in Bulgaria is located in Chengene Skele Bay. It is a Natura 2000 site where a small fishermen village was established 40 years ago. The most relevant drivers for its development are its geographical location and available funding opportunities. Funds are provided under the Operational Programme "Environment" (for environmental protection measures), the "Maritime and Fisheries" Programme (for fishing activities and investments), and in Burgas' municipal Development Plan (for improvement of the residential area).

Environmental Protection, Tourism and Fisheries was identified in both Bulgaria and Romania (the MU combination in Bulgaria also includes aquaculture). The main potentials and enabling factors for the MU combination in Romania (found in "Danube Delta Biosphere Reserve" – a Natura 2000 site) again is clear legislation on the status and the activities permitted in the protected area, and the availability of funds for its development.

The MU combination identified in Bulgaria is located near cape Kaliakra (three Natura 2000 sites located both in the sea and on the shore). The most relevant drivers for development of the activities there are the existence of legal instruments on environmental protection, the soon-to-be-approved Integrated Management Plan of the area and availability of numerous archaeological sites, tourist attractions and fishing traditions.

Role of the General Fisheries Commission for the Mediterranean (GFCM)

GFCM has a strong role in both the Mediterranean and Black Sea, promoting the development, conservation, rational management and best utilization of living marine resources, as well as sustainable development of aquaculture in the region. It provides recommendations for management and capacity development and serves as an information exchange platform in the area.

Approximately **85%** of Mediterranean and Black Sea stocks assessed are fished at biologically unsustainable levels [22]

Tourism and Underwater Cultural Heritage was identified in both Bulgaria and Romania. The two driving factors for this MU combination are:

- the existence of policy and legislation on protection and preservation of national historical heritage;
- publicly available information on the locations of shipwrecks and other underwater relics, suitable for scuba diving.

MUSES Multi-Use in European Seas

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

OVERVIEW OF MAIN BARRIERS

The MU concept is relatively novel to the region and is not yet defined or explained in policy and legal documents.

Environmental Protection and Fisheries:

- Lack of funds for monitoring and protecting the Marine Reserve "Vama Veche – 2 Mai" and lack of personnel at the National Institute for Marine Research and Development "Grigore Antipa" – Custodian of Vama Veche. With regard to the MU combination identified in Bulgaria, the most relevant barriers hindering development are persisting problems of regulation of local estates and lack of sufficient funds for development of the fishers' village.

Environmental Protection and Tourism and Fisheries:

- In Bulgaria, restrictions include a ban on construction activities surrounding Cape Kaliakra and strict rules for environmental protection.
- In Romania (Danube Delta Biosphere Reserve), the MU combination's development, in particular tourism and fishing activities, is hindered by its remoteness from the main business hub (Bucharest) and tourist locations (e.g. Constanta), and from the main road networks.

Underwater Cultural Heritage and Tourism MU:

- the strict control applied by authorities over the protection of shipwrecks and other relics found on the seabed and rules prohibiting scuba diving.

MULTI-USE POLICY OVERVIEW

Country	MU at national policy level	MU at individual administrative decision level	Economic incentives for MU	MU at MSP level - explicit reference to MU in National Marine Plans	MU in strategic documents	Barriers noted in reports and documents
RO	NO	NO	NO	The Maritime Spatial Plan is not yet developed. There is one regional and four local plans finalized until 2014 under the Integrated Coastal Zone Management (ICZM) principle	Not mentioned	Not identified. Legislation on environmental protection states which activities are permitted in protected areas and which aren't.
BG	NO	NO	NO	NO	Not mentioned	Not identified. Legislation on environmental protection states which activities are permitted in protected areas and which aren't.

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

MAIN MUSES PROJECT DELIVERABLES

Case study comparative analysis discusses the development potential of MU in European seas across ten case studies. A total of 16 MU combinations already implemented, or with potential for implementation are considered, involving 13 maritime sectors (both commercial and non commercial uses). Results were based on about 120 interviews with stakeholders, a workshop and focus group discussions. Commonalities and contrasts amongst MU drivers and barriers are illustrated, as well as expected added values and potential negative impacts. The report also provides a structured overview of recommendations from local stakeholders of the actions required to boost MU development in case study areas [23].

MU concept in European Sea Basins details the state of development of the MU concept in EU Member States and a summary of comparisons between the 5 European Sea Basins. The identified MU combinations are analysed using data from interviews and workshops involving over 195 stakeholders. A total of 19 MU combinations are studied, identified over the course of the MUSES project. In depth analysis is conducted for 8 of these MUs. The most crucial Drivers, Barriers, Added values and Impacts (DABI) for given combinations in each of the sea basins are also presented [2].

The EU wide **Multi-Use Action Plan** provides both the conceptual orientation and concrete actions required for further developing MU in European seas, highlighting the need to deliver full blue growth potential within a sustainable and equitable approach. It builds on past research, ongoing MU experiences and extensive discussion with relevant stakeholders to ensure that the actions suggested are relevant, timely, and realistic. The Action Plan highlights actors responsible for taking forward proposed actions and, where relevant, the governance level (local, national, sea basin or international) at which the action should take place.

MU Analysis provides a clear overview of MU potential (including environmental, economic and societal benefits) for 13 MU combinations. It also highlights major barriers (inappropriate regulations, operational, environmental, health and safety, societal and legal aspects) stalling the transition of MU from concept to practical implementation. The report builds on efforts undertaken over the course of one year, at sea basin, national and case study levels, including stakeholder input and four local and EU wide stakeholder workshops. The report highlights good practices and case studies across EU related to MU concepts [24].

The overall aim of the **Stakeholder Profiles** report was to gain a better understanding of relevant actors in the context of MU implementation. The report takes into account actors at different geographical scales and those identified to be responsible for drivers and barriers for MUs. This document serves as practical guidance for those planning to develop certain MUs, to understand which actors might be in favour or against such developments, regardless of their attitude towards MU development in general. It provides a characterization of stakeholders including their power, organisation, activities in the field of MU, and overall attitude towards MU [25].

All public project deliverables are available at:
muses-project.eu/downloads/

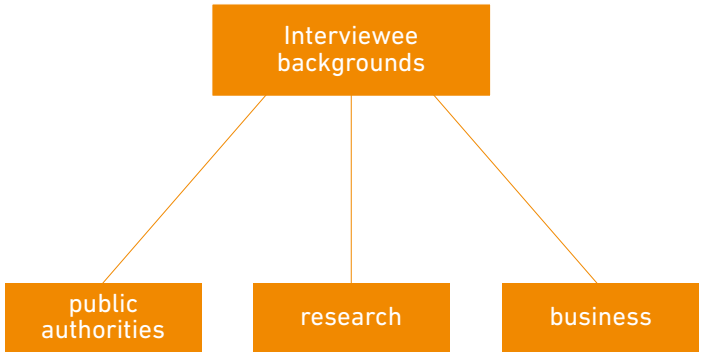
MUSES Multi-Use in European Seas

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

SEA BASIN OVERVIEW: RESEARCH PROCESS

MUSES project case studies, national and sea basin reports were analysed across sea basins to understand the **STATE OF DEVELOPMENT** of MUs across Europe. The analysis shows that a multitude of factors influence economic development across EU sea basins and consequently the opportunities for certain MU concepts. These relate mainly to geomorphological characteristics and environmental conditions, the availability of resources and national development targets addressing certain maritime sectors.

The MUSES project has conducted >195 INTERVIEWS alongside extensive desk research over a 20 month period to understand MU perspectives in all sea basins. This research process was the basis for the project reports which all fed in to these factsheets.



195
INTERVIEWS
IN **5** EU SEA BASINS:

MEDITERRANEAN SEA
53

BALTIC SEA
48

NORTH SEA
38

EASTERN ATLANTIC
37

BLACK SEA
19

117
INTERVIEWS

1
FOCUS GROUP

1
WORKSHOP

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

STEP BY STEP APPROACH

STEP 1
MU Definition & Typology

STEP 2.1
Overview of MU initiatives and identification of potentials in five European sea basins (the Eastern Atlantic, the North Sea, the Baltic Sea, the Mediterranean Sea and the Black Sea) was conducted at national (23 EU countries) and case study levels (11 case studies of subnational scale). During the initial scoping process (desk research of past and ongoing MU related projects, marine spatial plans, marine policy documents and industry reports), 19 MU combinations were identified.

STEP 2.2
Identification of MU Drivers, Added values, Barriers, and negative Impacts (DABI) was conducted for each of the MU combinations.

DRIVERS = factors promoting / supporting / facilitating / strengthening MU development.

BARRIERS = factors hindering / preventing / negatively affecting MU.

ADDED VALUES = the benefits or positive effects/impacts of establishing or strengthening MU

IMPACTS (NEGATIVE IMPACTS) = the consequences or negative effects/impacts of establishing or strengthening MU.

Drivers and barriers have been further defined in the Analytical Framework and divided into "real" and "perceived" in order to differentiate their origins and identify appropriate actions to address them.

STEP 2.3
Further data collection was conducted via interviews with stakeholders and additional desk research to fill identified research gaps. In parallel, analysis of stakeholder profiles [25] was conducted to advise ongoing engagement processes on the national and case study levels.

The muses public deliverables: "Analytical Framework" and "Case Study Methodology" outline in further detail the methodology applied on various levels

STEP 2.4
Analysis of MU potentials and evaluation of overall MU effects were conducted as two separate, but complementary, processes at national and case study levels.

STEP 2.5 (undertaken only for the case studies)
Analysis of Focus Areas – Case studies were further analysed through key questions defined for each of the following topics:

1. Addressing MU development potential
2. Boosting Blue Maritime Economy
3. Improving environmental compatibility

Results of case study analyses were compiled and published as **case study fiches**.

STEP 3:
Integrated sea basin analysis of MU

Results of country-based analyses were documented as country fiches and subsequently analysed at Sea Basin level. The **Sea Basin Final Report** [2] presents an overview of the profile and state of development of MU practices across the sea basin, including intra-country and trans-boundary aspects. Detailed results from case studies analyses were not included at this stage. Comparative analysis of Sea Basin potential and barriers was also conducted and presented in the **Sea Basin Comparative Report**.

STEP 4
Iterative analysis and generation of the action plan

The final step comprised the integrative analysis of findings at the sea basin, national and case study levels for eleven MU combinations [24]. Knowledge gaps were identified and filled through additional desk research and consultations with stakeholders. This fiche presents the summary of this analysis per sea basin. The analysis itself generated a large number of recommendations and actions which were fed in to the action plan. 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.

MUSES Multi-Use in European Seas

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

REFERENCES

[1] Zaucha J., Bocci M., Depellegrin D., Lukic I., Buck B., Schupp M., Caña Varona M., Buchanan B., Kovacheva A., Karachle P.K., et al. (2016). Analytical Framework (AF) – Analysing Multi-Use (MU) in the European Sea Basins. Edinburgh: MUSES project

[2] Przedrzymirska J., Zaucha J et al. (2018). Multi-use concept in European Sea Basins, MUSES project. Edinburgh.

[3] DEFRA .(2015). Accessed on 28.4.2018. United Kingdom multiannual national plan for the development of sustainable aquaculture. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/480928/sustainable
-aquaculture-manp-uk-2015.pdf

[4] Lukic I., Lazic M., Venier C., Castellani C., Papaioannou E., Caña Varona M. (2017). Stakeholder profiles – Report for the MUSES project, WP4 D. 4.1.

[5] Onyango V., and Papaioannou E. (2017). Case Study 2: Marine Renewables & Aquaculture Multi-use including the use of Marine Renewable Energy near The Point Of Generation (West Coast Of Scotland – Northern Atlantic Sea).

[6] Varona M.C., Calado H., Vergílio M. (2017). MUSES Case Study 3A. Development of tourism and fishing in the Southern Atlantic Sea (South Coast of Mainland Portugal – Algarve Region – Eastern Atlantic Sea). MUSES Deliverable D.3.3.

[7] Varona M.C., Calado H., Vergílio M. (2017). MUSES Case Study 3B. Development of tourism and fishing in the Southern Atlantic Sea (Azores Archipelago – Eastern Atlantic Sea). MUSES Deliverable D.3.3.

[8] MVI North Sea Energy Lab. (2018). Available at: http://www.mvi-labs.nl/northseaenergy

[9] Kafas A., (2017). MUSES Case Stud 1A: Offshore wind and commercial fisheries in the East coast of Scotland. MUSES Deliverable D.3.3.

[10] Sangiuliano S., J., (2017). MUSES Case Study 1B. Tidal energy development and environmental protection and monitoring (North Coast of Scotland - Inner Sound Of The Pentland Firth - North sea). MUSES Deliverable D.3.3.

[11] Schupp M.F. & Buck B.H., (2017). MUSE Case Study 1C. Multi-use of offshore windfarms with marine aquaculture and fisheries (German North Sea EEZ – North Sea). MUSES Deliverable D.3.3.

[12] Pirlet, H.; Claus, S.; Copejans, E.; Damgaard Christensen, E.; Guanche Garc.a, R.; M.hlenberg, F.; Rapp., K.; Schouten, J.-J.; Zanuttigh, B. (2014). The Mermaid project – Innovative Multi-Purpose Offshore Platforms. Flanders Marine Institute (VLIZ): Ostend. ISBN 978-90-820731-9-5. 20 pp.

[13] Christensen P.B., Poulsen M., Boelsmand J.E., (2013). Combined uses – Marine biomass from offshore wind parks. SUBMARINER Report 11/2013. Accessed on: 28.4.2018. Available at: http://www.greencenter.dk/sites/default/files/mediearkiv/Nyheder/submariner_report_11_2013_combined_uses_final.pdf

[14] Schultz-Zehden, A., Matczak, M. (Ed.) (2012). SUBMARINER Compendium: An assessment of innovative and sustainable uses of Baltic marine resources. Maritime Institute in Gdansk: Gdansk. ISBN 978-83-62438-14-3. 260 pp.

[15] Minnhagen, S. 2017. Farming of blue mussels in the Baltic Sea. A review of pilot studies 2007-2016. Baltic Blue Growth Project. Assessed on 20.5.2018. Available at: https://www.submariner-network.eu/images/BalticBlueGrowth_Deliverables/Farming-of-blue-mussels-Mytilus-edulis-trossulus-in-the-Baltic-Sea-a-review-of-pilot-studies-from-2007-2016.pdf

MUSES Multi-Use in European Seas

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

REFERENCES

[16] Franzén F., Nordzell F., Wallström J., Gröndahl F., (2017). Case study 4: Multi-use for local development focused on energy production, tourism and environment in Swedish waters (Island of Gotland – Baltic sea). MUSES project

[17] Karlson H.L., Jørgensen L., Andresen L., Lukic, I., (2017). MUSES Case Study 5. Offshore wind and mariculture: potentials for multi-use and nutrient remediation in Rødsand. (South Coast of Lolland-Falster – Denmark – Baltic Sea). MUSES Deliverable D.3.3.

[18] European Travel Commission (2017). European Tourism in 2017: Trends & Prospects (Q1/2017)

[19] Piante C., Ody D.,(2015). Blue Growth in the Mediterranean Sea: the Challenge of Good Environmental Status. MedTrends Project.

[20] Castellani C., Carrer S., Bocci M., Ramieri E., Depellegrin D., Venier C., Sarretta A., Barbanti A., (2017). MUSES Case Study 6. Coastal and maritime tourism and O&G decommissioning as drivers for potential multi-use in the Northern Adriatic Sea. MUSES Deliverable D.3.3.

[21] Maniopoulou M., Zacharoula K., Paraskevi K., Aikaterini D., Grigoria K., Vassiliki V., (2017). MUSES Case Study 7. Marine renewable energy sources & desalination, fishing & tourism in the South Aegean: the case of Mykonos island (Greece - Mediterranean Sea). MUSES Deliverable D.3.3.

[22] FAO. (2016).The State of World Fisheries and Aquaculture 2016. Contributing to food security and nutrition for all. Rome.200 pp.

[23] Bocci M., Castellani C., Ramieri E., (2018). Case study comparative analysis. MUSES project.

[24] Ivana Lukic, Angela Schultz-Zehden and Joseph Onwona Ansong et al. (2018). Multi-Use Analysis, MUSES project. Edinburgh.

[25] Bocci M., Ramieri E., Castellani C., De Pellegrin D., et al. (2017). Case study methodology, MUSES project. Edinburgh. Accessed on: 28.4.2018. Available at: https://muses-project.eu/muses/wp-content/uploads/sites/70/2017/07/D3.1-WP3-Case-study-methodology-web.pdf

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

MUSES Multi-Use in European Seas

TWITTER: @H2020MUSES

WEBSITE: muses-project.eu

EMAIL: ms.musesproject@gov.scot

MUSES Multi-Use in European Seas

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