Version 10.22

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MUSES Project

Title: Analytical Framework (AF) – Analysing Multi-Use (MU) in the European Sea Basins
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MUSES PROJECT

ANALYTICAL FRAMEWORK ANALYSING MULTI-USE IN THE EUROPEAN SEA BASINS

v. 10.21

MUSES DELIVERABLE:
D2.1: ANALYTICAL FRAMEWORK

28 February 2017

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1. The research context

1.1. The Purpose

The purpose of this document is to establish a framework for the analysis of Multi-Use (MU) in the sea basin context, which will provide the project consortium with the practical research tools necessary to examine theoretical understanding and practical experience related to MU. This framework will guide further analyses and also feed into Work Package (WP) 3 - Case Study Analysis. For this specific purpose, this analytical framework (AF) will be considered in the preparation of the Case Study Methodology (D3.1), aiming at maximizing the degree of commonality between the two scales of analysis (Sea Basin scale and local scale).

The analytical framework is intended to guide the process of information and data gathering and stakeholder engagement, providing the needed degree of homogeneity to the analysis of different Sea Basins. The framework should be interpreted as a flexible tool, and it may be modified and adapted through the implementation process, according to the emerging needs. In the event of changes or additions to the framework described herein being encountered, a technical note will be prepared by the WP2 leader, describing the amendments to the methodology. After WP2 completion, a revised version of this framework will be prepared, incorporating all changes.

1.2. Project goals

The project will review existing planning and consenting processes in relation to international quality standards for Maritime Spatial Planning (MSP) and compliance with EU Directives (e.g. Directive 2014/89/EU) used to facilitate marine and coastal development in the EU marine area to ensure that they are robust, efficient and facilitate sustainable Multi-Use (MU) of marine resources. The project will build knowledge of the appropriate techniques to minimize barriers, impacts and risks, whilst maximizing local benefits and reducing gaps in knowledge to deliver efficiencies through integrated planning, consenting processes and other techniques. The key research questions of the project are twofold:

a) What are the most important barriers, drivers, impacts and added value of MU in line with the specificities of various EU seas and oceans.

b) What actions are the most promising in order to make the best use of the MUs added value and minimize its potential negative impacts.

The overall goal of the MUSES project is to develop and propose an Action Plan (AP) underWP4 which will facilitate implementation of multi-use in European Seas, based on innovation and Blue Growth potential.

The Action Plan will demonstrate the capacity of ocean space to accommodate Multi-Use, highlight where benefits can be realised, draw attention to barriers that can be overcome and provide recommendations on what actions are needed in order to enable this. The Action Plan will be fed into EU macro-regional and sea basin strategies (e.g. EU Strategy for the Baltic Sea region, /EUSBSR/, EU Strategy for the EUSAIR, Atlantic Action Plan), on-going activities of Regional Seas Conventions, network roadmaps (e.g. SUBMARINER Roadmap), industry forums (e.g. Ocean Energy Forum) and national and EU maritime spatial planning policy processes.

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1.3. Definition of spatial domain and scales

The analysis will consider the EU marine waters as defined in Directive 2014/89/EU. According to this directive "'marine waters' means the waters, the seabed and the subsoil, as defined in point (1)(a) of Article 3 of Directive 2008/56/EC and coastal waters as defined in point 7 of Article 2 of Directive 2000/60/EC and their seabed and their subsoil".

Marine waters of non-EU Member States and high seas may be considered where relevant for multi-uses in the EU marine waters or when multi-uses have well defined present or future potentials.

Future potentials will be evaluated on the basis of:

a) existing strategic documents covering MU at global, EU, sea basin and if appropriate at national level
b) the literature findings and the experience of the completed and ongoing international projects
c) other available information.

The ultimate goal of this analysis is to identify, drivers and obstacles of/to MUs at sea-basin scale and sub-sea-basin scale. Sea basin perspectives will be examined for the five main European seas: Baltic Sea, North Sea, Eastern North Atlantic, Mediterranean Sea, and Black Sea. This goal links directly to the ultimate scope of the project which is the development of an Action Plan for MU under WP4. Analysis at the national level and sub-national level will be instrumental in achieving this goal.

From a practical point of view, the analysis will start at national scale (by developing country fiches). Where necessary consideration will also be made at a marine sub-regions level (within the country) according to Marine Strategy Framework Directive (MSFD) – Directive 2008/56/EC. Analysis of "transboundary areas" will be developed where existing or potential multi-use clearly involves more than one country and requires a transboundary approach.

1.4. Regulatory framework and technological context

Regulatory framework is given by national and international law regulating use of the sea. Technological context is given by research development that can be tracked by screening the reports of the relevant transnational research projects and the available professional literature (such as Buck & Langan (2017)).

1.5. MU-related projects .

The MUSES project capitalizes on the experience of existing research in particular the transnational projects and initiatives that advanced the MUs concept in economic, societal, ecological and technical terms. The most important projects and studies are listed below that give a starting point for the MUSES research and analysis.

- **MERMAID** (2012-2015) – Innovative Multi-purpose off-shore platforms: planning, Design and operation
  http://www.vliz.be/projects/mermaidproject/index.html
  MERMAID project develops theoretical concepts for the next generation of offshore platforms which can be used for multiple purposes, including energy extraction, aquaculture and platform related transport.

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- **TROPOS** (2012-2015)– Modular multi-use deep water offshore platform harnessing and servicing Mediterranean, subtropical and tropical marine and maritime resources. http://www.troposplatform.eu/
  TROPOS Project develops a floating modular multi-use platform system for use in deep waters in the Mediterranean, Tropical and Sub-Tropical regions.

- **H2Oceans** (2012-2014) **–** Development of a wind-wave power open-sea platform equipped for hydrogen generation with support for multiple users of energy
  http://www.h2ocean-project.eu/index.php
  H2Oceans Project develops a wind-wave power open-sea platform equipped for hydrogen generation with support for multiple users of energy. Multiple applications on-site include wind and wave power, the conversion of energy into hydrogen that can be stored and shipped to shore as green energy carrier and a multi-trophic aquaculture farm.

- **MARIBE** (2015-2016)– Marine Investment for the Blue Economy
  https://maribe.eu/
  MARIBE project explores cooperation opportunities for companies that combine different Blue Growth economy sectors. The project aims to contribute overcoming a series of technological and non-technological challenges and assessment of the most promising and sustainable business models.

- **ORECCA** (2010-2011) **–** Off-shore Renewable Energy Conversion platforms – Coordination Action
  http://www.orecca.eu/documents
  ORECCA project creates a framework for knowledge sharing and develops a roadmap for research activities in the context of offshore renewable energy that are a relatively new and challenging field of interest.

- **MARINA Platform** (2010-2014)– Marine renewable integrated application platform
  http://cordis.europa.eu/project/rcn/93425_en.html
  'MARINA Platform' Project aims to bring offshore renewable energy applications closer to the market by creating new infrastructures for both offshore wind and ocean energy converters. It addresses the need for creating a cost-efficient technology development basis to kick-start growth of the nascent European marine renewable energy (MRE) industry in the deep offshore – a major future global market.

- **Policy instruments for multiple platforms at sea** (2016)
  http://eprints.lse.ac.uk/66579/1/__lse.ac.uk_storage_LIBRARY_Secondary_libfile_shared_repository_Content_Koundouri,P_The%20Governance%20of%20Multi-Use%20Platforms%20at%20Sea_Koundouri_The_Governance_of_Multi-Use_Platforms_at_Sea.pdf
  Analysis of the policy, economic, social, technical, environmental, and legal (PESTEL) factors influencing governance arrangements for MUs in four case study sites in different sea basins around Europe. The research concludes with policy recommendations on a governance regime for facilitating the development of MUS in the future.

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- **TripleP@Sea –** Multi use platforms Noordzee (MUPS) (2012-2015)
  http://www.wur.nl/en/Expertise-Services/Research-Institutes/Environmental-Research/show/TriplePSea-Multiuse-platforms-Noordzee-MUPS-1.htm
  This programme focuses on offshore production of natural resources in multi-use platforms. In particular the focus is on the production, processing and profitability of seaweed as a source for feed, chemicals and fuel.

- **Offshore Wind Farms and their potential for shellfish aquaculture and restocking (DTU AQUA)** (2014)
  https://www.researchgate.net/publication/265275142_Offshore_wind_farms_and_their_potential_for_shellfish_aquaculture_and_restocking
  The study timing at investigating whether shellfish production can be combined with the industry in Danish waters. Three of the world's largest offshore wind farms (Horns Rev 1, Anholt & Nysted) are used as cases

- **Statoil study** (poster from Wind Europe 2016)
  https://windeurope.org/summit2016/conference/allposters/PO353b.pdf
  The study focuses on the risks and opportunities of both co-location and MUP (Multi -use platform) scenarios. In total six commercial projects from the offshore project developers' portfolio (both EU and non -EU) have been examined. Moreover, new opportunities for future co-location and MUP commercial development have been outlined according to the prospective work combining both European Blue Growth goals and the offshore project developers' long-term project portfolio.

- **Windfarms, MCZ and fishing in UK - COWRIE** (2010-2011)
  https://www.thecrownestate.co.uk/media/5875/km-ex-pc-fishing-032011-benefits-and-disadvantages-of-co-locating-wind-farms-and-marine-conservation-zones-with-a-focus-on-commercial-fishing.pdf
  The report outlying benefits and disadvantages of co-locating wind farms and marine conservation zones , with a focus on commercial fishing. The research was conducted in the UK, engaging a wide group of stakeholders.

- **ICES** work on Conflicts and Co-Existence in MSP
  http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/SSGEPI/2016/01%20WKCCMSP%20-%20Report%20of%20the%20Workshop%20on%20Conflicts%20and%20Coexistence%20in%20Marine%20Spatial%20Planning.pdf
  and an executive summary
  http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/SSGEPI/2016/02%20WKCCMSP%20Report%20-%20Executive%20Summary.pdf
  Report of the Workshop on Conflicts and Coexistence in Marine Spatial Planning (WKCCMSP), 8–12 February 2016, Geesthacht, Germany.

Other current Ocean Energy (technology oriented) projects:

A representative from the MUSES Consortium attended a H2020 Contractor Workshop – Ocean Energy Projects event that was organised by the Innovation & Networks Executive Agency (INEA)

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on 23 November 2016. The projects listed below are the current Ocean Energy Projects that also attended this event.

- **PowerKite** (2016-2018) –Power Take-Off System for a Subsea Tidal Kite
  http://powerkite-project.eu/
  The PowerKite project will design, build and deploy a power take-off system (PTO) for novel tidal energy collector concept, the Deep Green subsea tidal kite. The overall objective of the PowerKite project is to gather experience in open sea conditions to enhance the structural and power performance of the PTO for a next generation tidal energy converter to ensure high survivability, reliability and performance, low environmental impact and competitive cost of energy in the (future) commercial phases.

- **TIPA** (2016-2019) –Tidal Turbine Power Take-Off Accelerator
  http://cordis.europa.eu/project/rcn/205920_en.html
  The ambition of this project is to design, build and test an innovative Direct Drive Power Take-Off (PTO) solution for tidal turbines. The aim of the project is to reduce the lifetime cost of tidal power by 20%, demonstrated by accelerated life testing of a next-generation tidal turbine power take-off (PTO) solution.

- **TAOIDE** (2016-2019) – Commercialize ORPCs Power Systems for European Market
  http://www.marei.ie/taoide/
  The project aims at developing a fully-integrated generator to grid energy delivery system with high reliability and availability, suitable for use in multiple architectures of marine renewable energy systems. The tested and validated design will also have developed maintenance strategies and standard operating procedures for the marine renewable energy industry.

- **OPERA** (2016-2019) – Open Sea Operating Experience to Reduce Wave Energy Cost
  http://opera-h2020.eu/
  The project collects, analyses and shares open-sea operating data and experience to validate and de-risk several industrial innovations for wave energy, taking them from a laboratory environment to a marine environment, opening the way to long term cost-reduction of over 50% in the wave energy industry.

- **Wetfeet** (2015-2018) – Wave Energy Transition to Future by Evolution of Engineering and Technology
  http://www.wetfeet.eu/
  The project addresses the major constraints that have been delaying wave energy's progress by identifying and developing components, systems and processes to improve the sector as a whole.

- **WaveBoost** (2016-2019) – Advanced Braking Module with Cyclic Energy Recovery System (CERS) for enhanced reliability and performance of Wave Energy Converters
  http://www.wavec.org/en/projects/waveboost#.WKNrfRqmkdU
  The project aims at providing a step-change improvement to the reliability and performance of PTOs (Power-Take-Offs), by developing and validating an innovative braking module with a Cyclic Energy Recovery System (CERS).

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- **CEFOW** (2015-2020) **–** Clean Energy from Ocean Waves
  http://www.wavehub.co.uk/wave-hub-site/cefow
  The project aims at deploying multiple wave energy converters with improved power generation capability and demonstrating that they are able to survive challenging sea conditions over a period of several years.

- **FloTEC** (2016-2019) **–** Floating Tidal Energy Commercialisation
  http://www.scotrenewables.com/projects/flotec
  The project aims at advancing Scotrenewables already floating tidal technology to a 25% lower Levelised Cost of Energy (LCoE). Part of the project is preproduction model developed through a series of targeted innovations that will be delivered in an SR2000 Mark 2 machine.

Other projects and initiatives concerning MSP on sea basin and case study level might be also considered if relevant for the purpose of the MUSES project (some of them cover other sea basins as well):

A. General MSP projects

- **SUBMARINER** (2010-2013) –Sustainable Uses of Baltic Marine Resources(Compendium and Roadmap)
  http://www.submariner-project.eu/index.php?Itemid=224
  The Compendium presents state of knowledge on environmental, institutional and regulatory conditions for key innovative marine uses, an overview on obstacles and limitations to more widespread adoption or expansion of these uses as well as recommendations to address these obstacles.
  The Roadmap promotes new innovative marine uses in the field of sustainable and innovative uses of marine resources. The focus is on the key issues that require joint efforts in the sea basin in order to enhance blue-green growth in the region while sustaining and improving marine natural capital.

B. Eastern Atlantic

- **TPEA** (2012-2014)– The Transboundary Planning in the European Atlantic project - http://www.tpeamaritime.eu/wp/
  The project investigated the possibility of the delivery of a commonly-agreed approach to cross-border maritime spatial planning (MSP) in the European Atlantic region. It focused on three key aspects of MSP: stakeholder engagement; governance and legal frameworks, and data management. Among the most important of the project's outcomes there is a Good Practice Guide. It presents the key lessons and principles (illustrated with examples) to emerge from the TPEA project. The guide is intended to assist authorities with responsibility for MSP, agencies and other institutions supporting the implementation of MSP, coastal and marine stakeholders and other parties with an interest in the outcomes of MSP, and the scientific MSP community.

- **SIMCELT** (2016-2017)– Supporting Implementation of Maritime Spatial Planning in the Celtic Seas
  http://www.simcelt.eu/
  The project aims at promoting practical cross-border cooperation between Member States on the implementation of the Maritime Spatial Planning Directive in the Celtic Seas. SIMCelt

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focuses on informing practical aspects of MSP implementation, with a specific focus on transboundary cooperation. The identification and sharing of best practice, enhances understanding of and address the issues and challenges to MSP implementation that span the Celtic Seas.

- **PISCES** (2009-2012)**–** Partnerships Involving Stakeholders in the Celtic Sea Ecosystem
  http://www.projectpisces.eu/
  The project focussed on three main areas: (i) developing practical guidelines for the ecosystem approach that will translate legal requirements (e.g. in the EU Marine Strategy Framework Directive) into practical action, (ii) demonstrating the opportunities and an example of best practice for working at a regional level both within the Celtic Sea and across Europe, and (iii) evaluating the best way to involve stakeholders in the decision-making process.

- **COEXIST** (2010-2013) – Interaction in European coastal waters: A roadmap to sustainable integration of aquaculture and fisheries
  www.coexistproject.eu
  This multidisciplinary project evaluated competing activities and interactions in European coastal areas. The ultimate output was a roadmap to better integration, sustainability and synergies across the diverse activities taking place in the European coastal zone with focus on aquaculture and fisheries.

- **SEANERGY 2020** (2010-2012) **–** Delivering Offshore Electricity to the EU: spatial planning for offshore renewable energies and electricity grid infrastructures in an integrated EU Maritime Policy
  www.seanergy2020.eu
  The project provided an in-depth analysis of the national and international Maritime Spatial Planning (MSP) practices, policy recommendations for developing existing and potentially new MSP for the development of offshore renewable power generation, and promoted acceptance of the results.

- **MESH ATLANTIC** (2010-2013) – Mapping Atlantic Area Seabed Habitats
  www.meshatlantic.eu
  The project promoted harmonised production and use of marine habitat maps covering the Atlantic Area. The key outputs of the project was three different sets of maps made homogeneous across the area in the Eunis nature classification. These maps are primarily those which already exist, but need enhancement and harmonisation, detailed bespoke maps covering a limited set of Natura 2000 sites - with some transnational ones – as well as a broad-scale modelled map resulting from the assemblage of readily available data layers.

- **CELTIC SEAS PARTNERSHIP** (2012-)
  www.celticseaspartnership.eu
  The Celtic Seas Partnership follows on from the success of PISCES, building on the stakeholder momentum that was generated and the key project outputs. It operates on a greater scale than PISCES as it covers the Celtic Seas and not just the Celtic Sea.

- **AtlantOS** (2015-2019) –A long-term observing system in the Atlantic Ocean
  https://www.atlantos-h2020.eu/

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This is a large- scale research and innovation project aiming at delivering an advanced framework for the development of an integrated Atlantic Ocean Observing System. The project's ambition is to improve Atlantic observing to obtain an international, more sustainable, more efficient, more integrated, and fit-for- purpose ocean observing system.

- **PEGASEAS** (2013-2015) – Governance at Multiple Scales in the Channel
  https://webgate.ec.europa.eu/maritimeforum/en/node/3595
  The project aims at to promoting the efficient governance of the Channel ecosystem. It seeks to identify common governance outcomes, outputs and lessons learnt from a suite of INTERREG IVA Channel Area Projects relevant to the effective governance of the Channel ecosystem. The project has identified some key lessons related in the field of the efficient governance of the Channel ecosystem. All these led to the production of 13 reports, including 2 reports on the theme "Governance at multiple scales in the Channel".

- **Enabling Technologies and Roadmaps for Offshore Platform Innovation (ENTROPI)** (2017-)
  The project aims to advance Key Enabling Technologies (KETs) along the value chain to accelerate the deployment of multi-use offshore platforms, particularly for renewables and aquaculture. Focusing on the Atlantic sea basin, the project will develop the investment case for 3 bankable demonstration projects, each supported by a public-private partnership.

C. North Sea

- **Billia Croo Fisheries Project** (2010 - 2012) - EMEC Lobster release at Billia Croo wave energy test site.
  http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiLqenF0aPSAhWC2BoKHdjqCrgQFggaMAA&url=http%3A%2F%2Fwww.emec.org.uk%2F%3Fwpfb_dl%3D63&usg=AFQjCNGEjGH-afK7i75sedcUXg4DKGTQiQ
  The European Marine Energy Centre (EMEC) wave energy converter test site, at Billia Croo, Orkney Islands, is within an area commonly used as a lobster fishery. The project investigates the possible effects of marine energy converter deployments on resident crustacean species. The project aims were to determine the likely influence of a small-scale refuge area on local lobster population and to explore the potential for using such areas to augment local lobster stocks by using them as nursery grounds for the release of hatchery-reared juveniles.

- **Beppo – Blue Energy in Ports** (2013-2015)
  http://www.beppoproject.eu/
  The BEPPo project, focused on Blue Energy (wave/tidal) and its complementarity with traditional (gas/oil/coal) & new (wind/biomass) sources of power, building on the innovation capacity of ports to become bases for the production of integrated sustainable renewables, thus ensuring reliable & affordable supplies of clean, green energy. It provides a unique opportunity to develop marine energy platforms in ports and promote local business opportunities to accelerate economic growth in port regions.

- **North Sea Solutions for Innovation in Corrosion for Energy (NeSSIE)** (2017-)
  (New Project) - seeks to deliver new business and investment opportunities in corrosion solutions and new materials for offshore energy installations. The project aims to draw on North Sea region expertise in traditional offshore sectors such as oil and gas and shipbuilding

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in order to develop solutions for emerging opportunities in offshore renewable energy sources including wave, tidal and offshore wind energy.

- **PLENOSE: Large Multipurpose Platforms for Exploiting Renewable Energy in Open Seas** (2014-2018)
  http://www.plenose.unirc.it/about-us/
  The PLENOSE project objective is to share the expertise of the partners in the fields of Marine Engineering, Structural Dynamics, Reliability Assessment, Random Processes and the necessary skills for performing experiments in artificial and in natural basins. The scientific goal of the PLENOSE project is to define and validate a technique for the design of artificial islands consisting of floating or fixed structures, with the well-defined purpose of exploiting renewable energies in open seas. The multipurpose 'energy island' may produce energy from sun, wind and waves, with several advantages.

- **Smart Sustainable Combinations in the North Sea** (2015–)
  http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjnicve3aPSAhVlCsAKHdP6B5wQFggaMAA&url=http%3A%2F%2Fwww.europeanpowertogas.com%2Ffm%2Fdownload%2F99&usg=AFQjCNFRwmyfy4XQh3T5qgX3yABRZbjtyg
  This report considers the combined use of existing oil & gas infrastructure for the renewables sector, the combined use of storage facilities, energy conversion activity (offshore) and the ecological value.

D. Baltic Sea

- **BaltSeaPlan** (2009-2012) – Trans-boundary Maritime Spatial Planning in the Baltic Sea (Vision 2030)
  http://www.baltseaplan.eu/index.php/BaltSeaPlan-Vision-2030;859/1
  The politically agreed document outlined how coherent MSP should be jointly performed within sea basin shared by several countries. One of the key principles for such a MSP is spatial efficiency meaning that the uses are concentrated as much as possible to keep other areas free. Multiple spatial uses are promoted, and it was noted that Baltic Sea space is not a repository for problematic land uses

E. Mediterranean Sea

- **ADRIPLAN** (2013-2015) **–** ADRIatic Ionian maritime spatial PLANning
  http://adriplan.eu/
  The project delivered a commonly-agreed approach to cross-border MSP in the Adriatic-Ionian region. The recommendations for the evaluation of cross-border MSP, based on an integrated overall assessment (environmental, legal, administrative, economic and social) were produced. Their elaboration was based on the best knowledge available, the participation of a wide spectrum of stakeholders, and taking into account multiple demands and potentials.

- **COCONET** (2012-2016) **–**Towards COast to COast NETworks of marine protected areas (from the shore to the high and deep sea), coupled with sea-based wind energy potential
  http://www.coconet-fp7.eu/index.php/about-coconet
  The project produced the guidelines to design, manage and monitor a network of MPAs, and an enriched wind atlas for both the Mediterranean and the Black Seas. It identified groups of

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putatively interconnected MPAs in the Mediterranean and the Black Seas, shifting from local (single MPA) to regional (Networks of MPAs) and basin (network of networks) scales, as well as from coastal to deep sea and off shore areas, the latter being areas of potential establishment of Offshore Wind Farms.

- **SHAPE** (2011-2014)**– S**haping an **H**olistic **A**pproach to **P**rotect the **A**driatic **E**nvironment between coast and sea
  http://www.shape-ipaproject.eu/
  The project worked towards development of a multilevel and cross-sector governance system, based on an holistic approach and on integrated management of the natural resources, risk prevention and conflicts resolution among uses and users of the Adriatic coast and sea. It promoted the application and the successful implementation of the Integrated Coastal Zone Management Protocol in the Mediterranean and the Roadmap for Maritime Spatial Planning in the Adriatic region.

- **MSP Med** (2014-2015)**–** Paving the Road to MSP in the Mediterranean
  http://www.pap-thecoastcentre.org/about.php?blob_id=101&lang=en
  The project facilitated the implementation of the ICZM Protocol, which includes several explicit references to MSP providing the legal basis for planning and management in the Mediterranean. The project contributed by offering some responses to the question "how" as regards the implementation of the Protocol at the national and regional level. Project activities evaluated related methodologies and existing tools, proposed possible cooperation and management schemes and identified possible ways to deal with key challenges, in order to meet the common objectives of MSP and ICZM.

- **MARISCA** (2015-2016)**–** MARIne Spatial Conservation planning in the Aegean sea
  http://www.marisca.eu
  The project contributed towards the protection and conservation of biodiversity in the context of an integrated Marine Spatial Plan (MSP) in the Aegean Sea. A network of Marine Protected Areas (MPAs) and protection zones has been proposed for the conservation of all important and vulnerable habitats and species, as defined by national and community legislation and international agreements.

- **PROTOMEDEA** (2015-2018)**–**Towards the establishment of Marine Protected Area Networks in the Eastern Mediterranean
  http://www.protomedea.eu
  This ongoing project aims at the design of an MPA network in Greece and Cyprus that will meet the requirement of the Common Fisheries Policy (CFP) in achieving the Maximum Sustainable Yield (MSY) and fisheries enhancement. Within the project mapping of existing Marine Protected Areas (MPAs) and planning of proposed MPA networks will be performed in two areas of the Eastern Mediterranean, the Aegean Sea and Cyprus.

F. Black Sea

- **CREAM** (2011-2014) – Customer-driven Rail-freight services on a European mega-corridor based on Advanced business and operating Models

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http://www.cream-fp7.eu/CREAM project aims to establish a collaboration network of the key stakeholders in Mediterranean and Black Sea fisheries research and management, in order to facilitate the full application of the Ecosystem Approach to Fisheries.

- **MARSPLAN BS** (2015-2017) – Cross-Border Maritime Spatial Planning in the Black Sea
  http://www.bgports.bg/bg/page/142
  The MARSPLAN BS Project main objectives are: to support the implementation of the EU Directive for Maritime Spatial Planning in the Black Sea Basin, starting with its Member States, Romania and Bulgaria; to create an MSP institutional framework for Romania-Bulgaria cross-border; to develop the cooperation with all Black Sea countries in the field of MSP; to consolidate the cross-border cooperation and the information exchange between Romania and Bulgaria; to set out the vision and strategic goals for Black Sea area on MSP, taking into account the land sea interaction; to elaborate MSP Plan for the Romania – Bulgaria cross-border area; to contribute to a wider dissemination of all gathered information concerning MSP field, Black Sea area, best practices and stakeholders.

- **MISIS** (2012-2014) – MSFD Guiding Improvements in the Black Sea Integrated Monitoring System
  http://www.misisproject.eu/
  The overall goal of MISIS is to support efforts to protect and restore the environmental quality and sustainability of the Black Sea. Additional specific objectives are: - to improve availability and quality of chemical and biological data to provide for integrated assessments of the Black Sea state of environment, including pressures and impacts (in line with Annex I and III of the MSFD); to increase number and size of protected areas in the Black Sea as well as to improve their degree of protection; to enhance stakeholders participation and public awareness on environmental issues.

- **SRCSSMBSF** (2011-2013) – Strengthening the Regional Capacity to Support the Sustainable Management of the Black Sea Fisheries
  http://www.rmri.ro/WebPages/SRCSSMBSF/srcssmbsf_meetings.html
  The project aims to facilitate the cooperation between Black Sea coastal states in the field of marine ecosystem and resource management. Knowledge sharing and research activities are a key element of the project implementation, serving to provide an objective analysis of fish stocks, as well as valuable strategic management advice.

- **SymNet** (2011-2013) – Industrial Symbiosis Network for Environment Protection and Sustainable Development in Black Sea Basin
  http://www.projectsymnet.eu/
  The SymNet project aimed to establish an industrial symbiosis system as an innovative approach in order to minimize the environmental degradation in response to climate changes, while increasing economic and social development in the Black Sea Basin. The project looked closer into the current status of the manufacturing, logistics, tourism and energy sectors of industry and the existing commercial networks in the Black Sea Basin as well as the dynamics of these four sectors in the participating countries-Bulgaria, Romania, Turkey and Moldova.

- **ICZM** (2013-2014) – Improvement of Coastal Zone Management in the Black Sea Region

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http://blacksea-cbc.net/projects-call-2/improvement-of-the-integrated-coastal-zone-management-in-the-black-sea-region-iczm/
The project aims at developing and promoting common instruments and methodologies on Integrated Coastal Zone Management in 5 states, as well as to create a methodological framework, which could be incorporated into the administrative practice of all partner regions.

- **PlanCoast** (2006-2008) Tools and capacities for an effective integrated planning in coastal zones and maritime areas in the Baltic, Adriatic and Black Sea regions
  http://www.plancoast.eu/php/plancoast-challenge.php?id=2
  The aim of the PlanCoast project was to provide best practice examples and tools for effective integrated planning in coastal zones and marine areas. The key objective was to show the strengths of spatial planning instruments in facilitating effective Integrated Coastal Zone Management and maritime policy.

- **CoCoNET** (2015-2016) – Towards Coast to Coast Networks of marine protected areas (from the shore to the high and deep sea), coupled with sea-based wind energy potential
  http://www.coconet-fp7.eu
  COCONET identifies groups of putatively interconnected MPAs in the Mediterranean and the Black Seas, shifting from local (single MPA) to regional (Networks of MPAs) and basin (network of networks) scales. The project is meant to enhance policies of effective environmental management, also to ascertain if the existing MPAs are sufficient for ecological networking and to suggest how to design further protection schemes based on effective exchanges between protected areas.

- **MARSEA** (2016-2017) – Development of an integrated framework for marine spatial planning in Romania
  http://www.geo.unibuc.ro/marsea/
  The project represents a first attempt to answer the present need for MSP framework applying zoning for the preservation of the biodiversity and the sustainable use of resources in marine areas in the Black Sea.

- **COSMOMAR**
  http://www.cosmomar.ro/engleza/index.html
  The overall goal of the project is the development of a Competence Centre in spatial technologies for the South-East Region of Romania. The project aims at: collecting, archiving and preservation of oceanographic data, in order to maximize their use; increasing the availability of oceanographic data for a big group of users; promoting the exchange of information on national and international level; transferring the data to different users; transferring the data from different oceanographic data sources; providing data to implement EU policies on marine field.

G. Black Sea and Mediterranean Sea

- **PERSEUS** (2012-2015) – Policy-Oriented Marine Environmental Research in the Southern European Seas
  http://www.perseus-net.eu

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PERSEUS is the largest marine environmental research project funded by the European Commission under Ocean of Tomorrow 2011-3. PERSEUS focused on what changes are occurring in the ecosystems, why and what measures can be taken to turn back the tide on marine degradation, with science playing the leading role. PERSEUS is a one of a kind marine research project covering both the Mediterranean and Black Sea, together representing the Southern European Seas.

- **MESMA** (2009-2011) – Monitoring and Evaluation of Spatially Managed Areas
  http://www.mesma.org
  The project comprised an easily accessible information system, containing gathered facts on the distribution of marine habitats and species, economic values and benefits, and human uses and their effects, aiming to support activities needed for sustainable use and protection of vulnerable areas.. The project has focused on marine spatial planning and aimed to produce integrated management tools (concepts, models and guidelines) for Monitoring, Evaluation and implementation of Spatially Managed marine Areas, based on European collaboration. It developed a strategic tool that can be applied throughout Europe, and combined an optimized area use with a sustained ecosystem of high quality, taking into account the different ecological and economic features prevailing in diverse regions of the European seas.

- **PEGASO** (2010-2014) - People for Ecosystem-based Governance in Assessing Sustainable development of Ocean and Coast
  http://www.vliz.be/projects/pegaso/iczm-platform-5.html
  Building on existing capacities, PEGASO aimed at developing common approaches and tools to support integrated policies for the coastal, marine and maritime realms of the Mediterranean and Black Sea basins. PEGASO specifically referred to the ICZM Protocol for the Mediterranean to the Barcelona Convention.

Results from this overview will be considered within WP3, by identifying those elements of relevance at case-study level. They will include geographic-related aspects, sector related-aspects, solutions to overcome local barriers etc.

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2. Multi-use research in the MUSES project

2.1. Definition of Multi-Use

The discussions and developments of MU of marine resources in the political and academic arena have generated a variety of terms to describe the context. Each nomenclature is trying to capture and convey important information about the particularities of their investigated scenario. As a result many differing terms have emerged during the last 15 years for more or less the same concept idea: co- and translocation, multi- and multi-functional use, co-use, secondary and additional use and coexistence to name a few.

The information conveyed by these terms can cover every dimension from legal and business relationships of users to even temporal and physical aspects of the multi-use relationship.
Stakeholders involved in the discussion, investigation or implementation of marine MU concepts can easily get confused with this lack of a clear terminology, hindering the advancement of the field due to simple and avoidable misunderstandings. It is therefore paramount to use the right term for the right type of synergy and to differentiate clearly and concisely between concept models.

The MUSES project considers a wide comprehensive approach to different types of MU, including both highly technological, innovative and industrial solutions such as MU platforms and other, "softer" approaches to sharing of sea-space e.g. coastal and maritime tourism, small scale fishery, conservation efforts or remediation.

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

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

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

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

Recognizing the multitude of possible multi-use scenarios in European seas, the MUSES project will predominantly investigate the following scenarios (Fig. 1):

Multi-use of geographical, human, biological resources:

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The multi-use of marine resources refers mainly to the geographical connection of resource uses to create added value for society and single actors. Examples of such a multi-use are the combination of offshore wind and tourism through offshore wind farm viewing boat tours.

Multi-use of technical resources (marine infrastructure & platforms)

In some cases an even closer (functionally & geographically) integration of uses is possible to create even more added value than a side by side scenario. This closer integration looks for synergies in integrating the operations and implementation of offshore activities and can start by e.g. the simple sharing of the use of offshore supply vessels to reduce individual operations costs. The synergistic integration of activities culminates in multi-use platforms. MU offshore platforms are engineering solutions, designed to incorporate modules of other compatible activities (e.g. TROPOS Project). Fully integrated multi-component and multi-purpose offshore platform serves as a main infrastructure shared by two or more ocean uses (e.g. H2Ocean project designed a platform coupling renewable energy harvesting + hydrogen generation + aquaculture + environmental monitoring). (Stuiver et al. 2016).

In terms of order in which the development occurs two scenarios will be considered as presented in Figure 1.

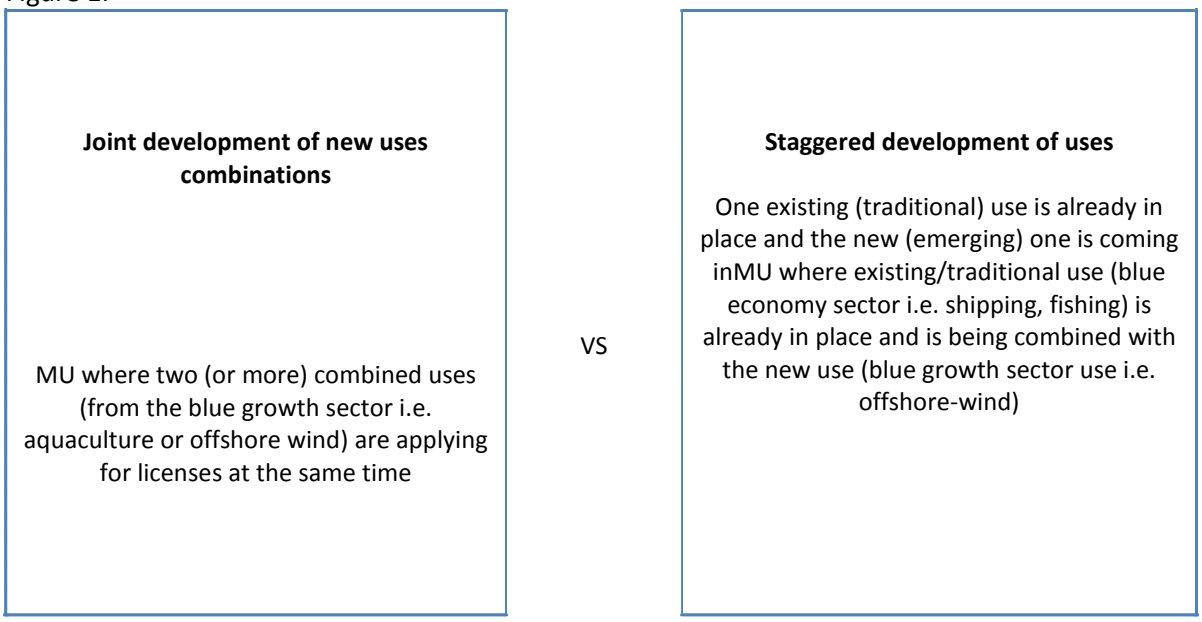

Figure 1. Order of developments
Source: own elaboration SUBMARINER and AWI

2.2. Multi-use Combinations

There is a wide variety of possible MU combinations. The list of combinations (Tab.1) have been compiled after identifying which combinations have been analysed by past projects. A total of 24 case studies analysed in past projects (MARIBE, MERMAID, H2Ocean and TROPOS), a number of other EU and national projects, as well as nine case studies considered in MUSES, have resulted in 11 uses considered for MU (presented in Figure 2.) which will be taken forward for analyses in WP2.

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Table 1. MU combinations identified in other project case studies/demonstration sites and analysed by MUSES

Project	Use	Co-Uses
EU funded projects		
COEXIST Project ID 245178	Fisheries and aquaculture	Other coastal activities (stakeholder)
H2Ocean Project ID 288145	Wind and Wave energy	Aquaculture, Hydrogen (stored and shipped to shore as green energy carrier)
MARIBE (Marine Investment for the Blue Economy - Baltic, North Sea, Atlantic, Caribbean, Mediterranean) Project ID 652629 (collected results from all other finished EU multi-use projects)	Caribbean: Aquaculture	Tourism, Wave energy, Desalination
	Mediterranean: Aquaculture	Tourism
MERMAID (Baltic, North Sea, Atlantic Mediterranean, Lead: DTU) Project ID 288710	Atlantic: Offshore wind and wave energy	Maritime transport,
	Mediterranean: Wave energy	Leisure , Aquaculture , Maritime transportation
	North Sea: Wind energy	Aquaculture (seaweed and shellfish), Tourism
	Baltic: Wind farm	Passive Fisheries, Aquaculture (fish and seaweed)
ORECCA (Offshore Renewable Energy Conversion platforms – Coordination Action) Project ID 241421	Offshore Renewables	Aquaculture (biomass and fish), Monitoring of the sea environment (marine mammals, fish and bird life)
TROPOS (Mediterranean, Tropic, Sub-tropic, Lead: PLOCAN) Project ID 288192	Maritime transport (offshore port and base of logistic service for energy sector)	Fisheries (service station, storage), Aquaculture (fish), Energy (solar and ocean wave), Leisure activities (floating hotel, underwater observation facility, scientific tourism, diving base, yachting services)
MARINA Platform Project ID 241402	Wind Energy	Wave Energy
National funded projects		
Project	**Use**	**Co-Use**
AquaLast (Germany – Lead: AWI; University of Applied Sciences Bremerhaven, Fraunhofer, Weswerwind, TKB) **(AWI)**	Offshore Wind Energy	Aquaculture (loading on offshore support structures, such as wind turbine foundations, caused by mussel longlines)
Biological and technical feasibility study of marine aquaculture in the Thorthonbank area, Belgium: Co-use of space with offshore wind farms (Belgium - University of Ghent, SINTEF Ocean)	Offshore Wind Energy	Aquaculture (farming of blue mussel)

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Coastal Futures (Germany – Lead: University of Kiel; AWI, GKSS) **(AWI)**	Offshore Wind Energy	Aquaculture (integrated coastal zone management for the integration of aquaculture into wind farm areas)
Flandres Queen Mussel (FIOV) (Belgium - Stichting voor Duurzame Visserijontwikkeling -SDVO, ILVO)	Offshore Wind Energy	Aquaculture (development of floating buoys with mussel ropes for spat collection)
Gulf of Mexico OOA (USA – University of Texas)	Offshore Oil Platforms	Aquaculture (multi-use of offshore fish cultivation in combination with offshore Oil & Gas)
Integrate the offshore wind technology with aquaculture – development of fish farm equipment for offshore conditions (Norway - Statoil, SINTEF Ocean and Lerøy Seafood Group)	Offshore Wind Energy	Aquaculture (fish farming of salmon)
KOREA Co-Location (South Korea – Lead: Korea Electric Power Cooperation Research Institute (KEPCO); Korean Institute of Ocean Science and Technology - KIOST)	Offshore Wind Energy	Fisheries (passive fisheries), Aquaculture (seaweed production for biomethane and bioproducts in wind farms)
Mosselkweek in Belgische windmolenparken – Mussel production within Belgium Wind Farms (Belgium – Lead: University of Ghent; ILVO, AWI, SINTEF, et al.)	Aquaculture	Wind energy, Maritime energy
MytiFit (Germany – Lead: AWI; Engel Netze, LAVES) **(AWI)**	Offshore Wind Energy	Aquaculture (mussel fitness, infestation of parasites, and selection of hard substrates for multi-use)
NutriMat (Germany – Lead: IMARE; Greim Fish Consulting, AWI, University of Applied Science Bremerhaven, WeserWind, Louis Schoppenhauer GmbH & Co. KG)	Offshore Wind Energy	Aquaculture (use of fouling organisms of offshore platforms for fish feed in land-based aquaculture)
Nysted Sea Wind Farm Mussels (Belgium – DTU)	Offshore Wind Energy	Aquaculture (investigation on the possibility to multi-use for longline mussel farming)
Ocean Forest (Norway – Leroy Seafood Group, Bellona Foundation)	Aquaculture (multi-trophic) Energy	Aquaculture (bio-mass production for energy generation)
Offshore-Aquaculture (Germany – Lead: AWI; Terramare)	Offshore Wind Energy	Aquaculture (investigations of the settlement and growth of bivalves and macroalgae in the German Bight to test its feasibility for offshore multi-use)
Offshore Site Selection	Offshore Wind Energy	Aquaculture (offshore site selection for IMTA in co-use of

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(Germany – Lead: AWI; Thünen, University of Rostock, Kutterfisch, WindMW, Deutscher Fischereiverband, Skretting)		offshore wind farms)
Open Ocean Use (OOMU) (Germany – Lead: IMARE; EWE, University of Hannover, Thünen Institute, Bard Engineering, Kutterfisch, Frosta, AWI)	Offshore Wind Energy	Aquaculture (investigation on integrating an offshore fish cage into tripile foundation)
Roter Sand Project (Germany – Lead: AWI)	Offshore Wind Energy	Aquaculture (development of system design for the use of offshore environments for the cultivation of species for aquaculture and bioextraction)
SOMOS – Safe production Of Marine plants and use of Ocean Space (The Netherlands – Lead: Wageningen University; TNO)	Offshore Renewable Energy	Aquaculture (Seaweed farming)
Stichting Noordzeeboerderij (The Netherlands – Hortimare, Schuttelaar and Partners)	Offshore Wind Energy	Aquaculture (development of a seaweed technology and mass algal production)
WINSEAFUEL (France - French National Research Agency)	Offshore Wind Energy	Aquaculture (seaweed mass production for biomethane and bioproducts in wind farms)

Source: own elaboration by SUBMARINER and AWI

If additional uses or combinations become apparent during the course of analyses in the MUSES project, , these will also be taken into consideration. Figure 2. illustrates that combinations may differ in terms of their probability and time of appearance. Some of them are very probable in the near future, some may be possible in several years' time, and others are not likely at all. However, this matrix is just provided as an illustration **serving as an inspiration for partners on how to start analysis in their Sea Basins/countries**. **One should note that not every country will include all these uses e.g. in some countries for example, fish aquaculture will not be possible at all.**

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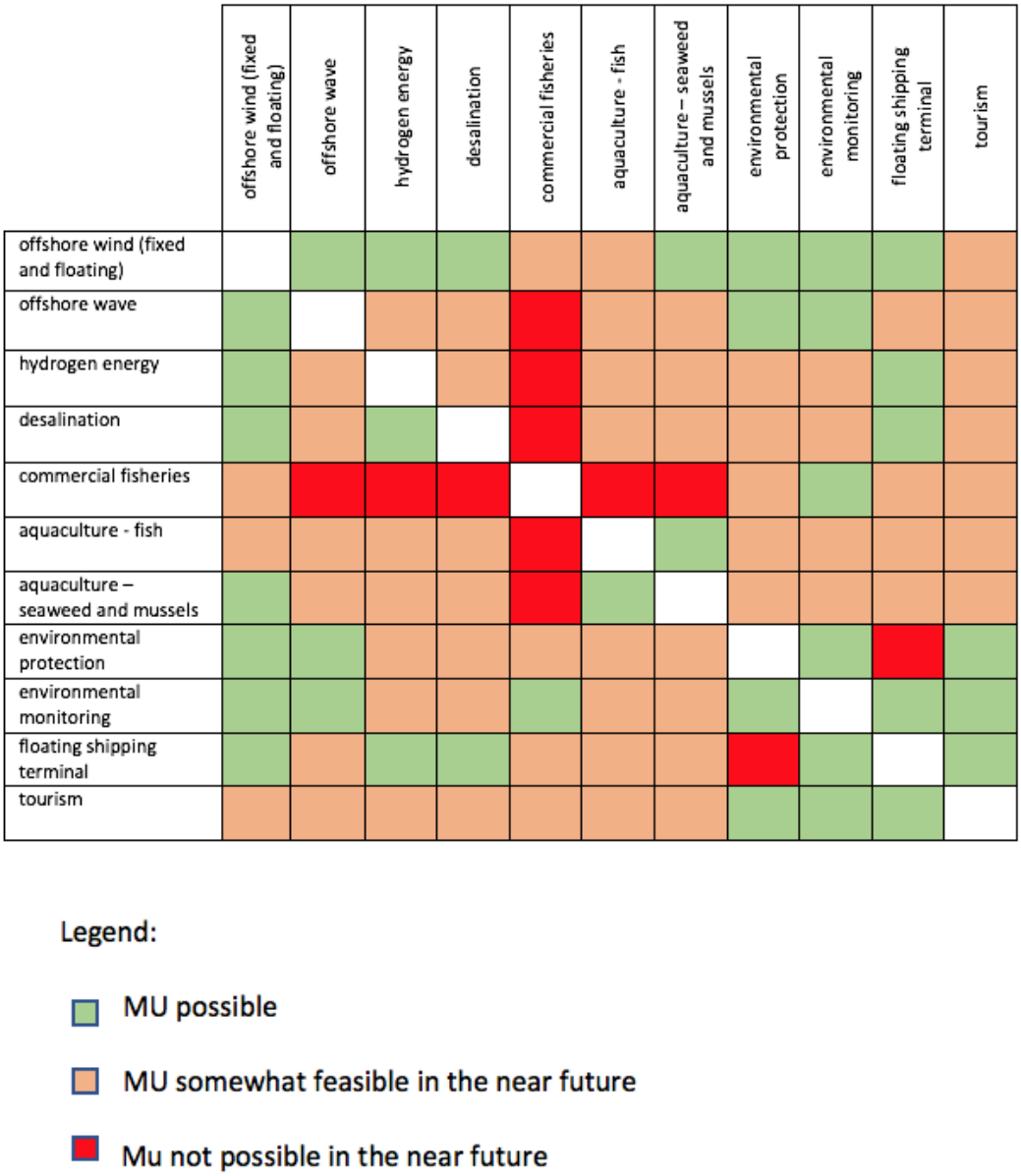

Figure 2. Multi-use possibilities considered in MUSES combining two uses.
Source: own elaboration by AWI and SUBMARINER

2.3. Project research strategy with regard to MUs

In order to achieve the project objectives, the sea basins overviews (WP2), as well as selected case studies (WP3) will be completed, with special emphasis on stakeholder involvement. This document, however, concentrates on the WP2 methodological approach. As part of WP3 a case-specific methodology will be developed to analyse case studies. The WP3 methodology will consider and adapt this analytical framework, in order to match the specific needs of the local scale and local themes under consideration. The WP3 methodology will be described in deliverable D3.1.

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To conduct the sea basin overview of MUs, the project has developed a joint methodology (analytical framework) proposed in this report (chapter 2.4) to review, structure and analyse current practices in MU across EU sea basins, taking into consideration environmental, spatial, economic and social benefit perspectives.

To analyse current challenges for MU development, it will be necessary to identify inappropriate or inadequate regulatory, operational, environmental, health and safety, social and legal aspects that constitute both real and perceived barriers.

There will be a requirement for in-depth analyses and conclusions on barriers and possibilities associated with combining marine activities which will entail the following activities:

- Identification of drivers, potentials and barriers for MU related to legal framework, administrative process and mindset of decision makers responsible for management of the sea space (sea-basin– but also national – level of analysis will cover both documents and interviews with key decision makers).
- Identification of drivers, possibilities and barriers for MU related to EU, international and (relevant) national policies (sea-basin and EU level of analysis will cover both documents and interviews with key decision makers).
- Identification of drivers, possibilities and barriers for MU from relevant previous international projects.

Research under the MUSES project will be conducted with due consideration of ethical issues. Appropriate attention will be given to MUSES deliverable 6.1 *Participation of Humans – Guidance on procedures for Informed Consent* and to deliverable 6.2 *Guidance on procedures for handling data derived from the external contribution of Stakeholders/Experts,* when planning and undertaking research.

The methodology proposed in this document will be first tested in one or two countries and then fine-tuned in order to guarantee an optimal process.

2.4. Analytical framework

The analytical framework for the analysis of MU in the Sea Basins context provides the project consortium with practical research tools necessary to examine theoretical understanding and practical experience related to MU.

Based on an overview of existing literature on MU and 'Key Research Questions' (see chapter 1.2) of the project, an **analytical framework** (Fig. 3) has been developed as presented below. This framework will guide the analysis in WP2 and also feed into WP3 and WP4, as described in chapter 3. In the context of the framework, data collection will be carried out at country-level (see step 2 below) and then results will be aggregated and analysed at Sea Basin level (see step 3 below). Countries considered in the Sea Basins analysis and the relevant responsible project partners for their analysis are shown in Maps 2-6 at chapter 6.

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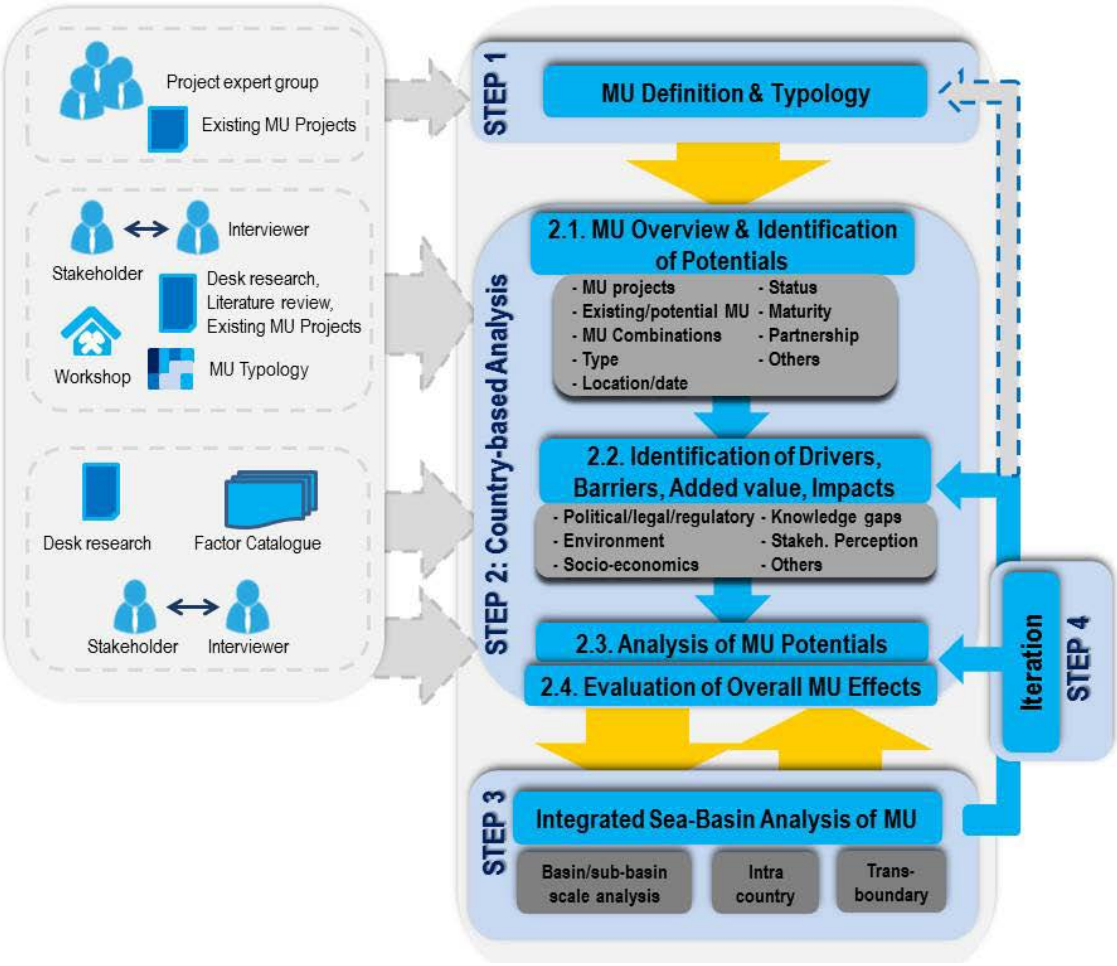

Figure 3. Graphical flow chart of the operational methodology and methods used for data collection and analysis.
Source: own elaboration by ISMAR

The aim of the analytical framework is to provide a practical procedure for data collection and analysis within WP2. Desk analysis and stakeholder engagement activities will be combined through the different steps. For each step and sub-step a template sheet has been designed to guide MUSES data collection along the analytical process (chapter 4). The process will be, in the large part, stakeholder oriented: stakeholder knowledge, experience and perception will constitute the most relevant part of the analysis. Operative details on how the analytical procedure will be applied in practice (with reference to steps 2.2, 2.3 and 2.4) are given in chapter 3.1. The entire process has been detailed in order to guarantee homogeneity of approach and comparability of results. Nevertheless we are conscious that new, relevant elements can emerge during the implementation phase: these will be taken into consideration, if necessary, by appropriately adapting the methodology.

Stakeholder identification and engagement within the Analytical Framework procedure will be carried out according to the principles and methods described in chapter 3.1. When collecting stakeholders input on scoring and identification of drivers, barriers etc, it will be important to take

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into consideration the classification of each stakeholder to help establish where barriers or drivers for MU are coming from (see chapter 4).

The analytical framework and its operative details consider the following definitions:

- DRIVERS = factors promoting MU
  They are defined as those factors supporting / facilitating / strengthening MU development.
- BARRIERS = factors hindering MU
  They are defined as those factors preventing /negatively affecting MU.
- ADDED VALUES = positive effects/impacts of establishing or strengthening MU
  They are defined as the pros or the benefits or the positive effects of implementing / strengthening MU.
- IMPACTS (NEGATIVE IMPACTS) = negative effects/impacts of establishing or strengthening MU. They are defined as the cons or the negative effects of implementing / strengthening MU).
- MU POTENTIAL is defined as the degree of opportunity the study area has to develop or strengthen MU.
- MU EFFECT is defined as the overall result or balance of pros and cons of developing MU in the study area.

The analytical framework uses a top-down approach, as it prioritizes on the overview of MU potentials at country level and then performs a more detailed characterization of MU in terms of drivers/barriers/added values/impacts and the MU potentials, MU overall effects and the integration of MU overviews (country fiches) on sea-basin, intra-country and trans-boundary level. The analytical framework considers four steps, defined as follows:

STEP 1: MU Definition & Typology

This work has already been completed by the MUSES project partners and the results are presented in the chapter 2 of this document. However in the course of the research new typologies might be identified and analysed.
Methods: Expert group, review of existing MU projects.
Outputs: MU Definition + MU Typology

STEP 2: COUNTRY BASED ANALYSIS

The objective of this step is to develop a country-based MU analysis. The final output will be a collection of country fiches[1], summarising findings related to each country in a common, structured way. Results from several country fiches will then be aggregated at Sea Basin level (see step 3).

Step 2.1: MU overview & identification of potentials (country-based)

[1] Country fiches are products generated by performing country overviews.

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This step refers to the MU potentials identification at country level, considering existing/potential MU, MU combinations, type of MU based on the typology provided in step 1 and the collection of basic information for the further characterization of the MU type (location, date, legal basis, maturity, MU combinations, MU cooperation, advantages, possible extensions, etc). MU typology, combination and cooperation modes will be considered when preparing the country fiches (see chapter 4). The starting point will be the selection of feasible and the most probable types of MUs and MU combinations for each country. Feasibility will be judged by expert knowledge in terms of likelihood, time horizon of possible appearance and spatial prevalence/scope.
Moreover, in this initial phase an overview of all projects listed in chapter 1.5 will be prepared by the WP2 leader (general projects) and Sea basin leaders (sea basin projects) to identify already examined barriers, drivers, potential, added value and impacts to inform MU identification and potential.
In this step we will examine how and to what extent the idea of MUs has been framed so far in key policy documents at national and sea-basin level, and what is the perception of key decision makers responsible for the development and management of the sea space on the idea of MUs. The overview of strategies, forums and policy processes identified under the WP4 Action Plan will be used. Stakeholder views about MU will be collected; possible stakeholder roles in MU development will be investigated, their opinions on what kind of strategy may have to be developed to strengthen any benefits or lessen any barriers/risks will be compiled. This will be initially addressed by steps 2.2-2.4.

Methods: Desk research, literature review, existing projects overview, workshop, semi-structured stakeholder interviews, MU typology. In particular, selected key national decision makers influencing way of thinking at the sea basin level will be also interviewed, as well as chair persons and/or heads of Secretariats of key international organizations.
Outputs: MU overview, MU combinations and MU type characterization at country level.

Step 2.2: Identification of MU drivers, barriers, added value, impacts (country-based)

Drivers/barriers/added value/impacts to MU will be identified in this step. They will be categorized by considering key issues for MU development, such as policies, administrative/legal aspects, environmental and socio-economic constrains, technical capacity, and knowledge gaps (technology, environmental impacts, health and security issues etc.).
Methods: Mainly desk research complemented with stakeholder consultation. Consultation methods will be defined for each specific country, based on the context (interviews, seminar with selected experts, etc.). Detailed methodology for drivers/barriers/added value/impacts identification is given in paragraph 3.1.
Output: Catalogue of drivers/barriers/added value/impacts.. Structured information on stakeholder perception on perceived and real barriers.

Step 2.3: Analysis of MU potentials (country-based)

This step analyses the drivers and barriers for MU development identified in step 2.2 by applying a scoring system. Drivers and barriers will be scored by stakeholders according to their knowledge. The relative balance between drivers and barriers will identify the potentials for MU development in the study area. During this phase stakeholders will be also asked to complement the catalogue of listed drivers/barriers based on their experience.
Methods: Stakeholder engagement. Stakeholder consultation methods will be defined for each country, based on the specific context (interviews, seminar with selected experts, etc.). Detailed methodology for drivers/barriers scoring and MU potential evaluation is given in paragraph 3.1.

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Outputs: MU potentials look-up table.

Step 2.4: Evaluation of overall MU effects (country-based)

This step analyses the added value (positive effects) and the impacts (negative effects) related to MU development and identified in step 2.2 by applying a scoring system. Added values and impacts will be scored by stakeholders according to their knowledge. The relative balance between added value and impacts will identify the overall MU effect in the study area. During this phase stakeholders will be also asked to complement the catalogue of listed added values/impacts based on their experience.
Methods: Stakeholder engagement. Stakeholder consultation methods will be defined for each country, based on the specific context (interviews, seminar with selected experts, etc.). Detailed methodology for added values/impacts scoring and MU effect evaluation is given in paragraph 3.1.
Outputs: MU effects look-up table.

Outputs of STEP2 as a whole: Country fiches

STEP 3: INTEGRATED SEA BASIN ANALYSIS OF MU
The country fiches generated in step 2 will be synthesized at basin/sub-basin scale to address opportunities and challenges for future development. Additional effort will also be made to identify trans-boundary issues of MU potentials (stemming mainly from interviews of stakeholders in step 2).
Results of step 2 will be integrated using a threefold scalable approach:

- Scale 1 – Basin/sub-basin scale: Sum of country fiches within a basin or sub-basin.
- Scale 2 – Intra country scale: Within single country fiche.
- Scale 3 – Trans-boundary scale: two or more country fiches.

Methods: Aggregation of step 2 results.
Output: Basin/sub-basin, intra country and trans-boundary analysis.

STEP 4: ITERATIVE ANALYSIS

Results obtained from the stakeholder/experts scores (steps 2.3 and 2.4) and from the scaled MU analysis (step 3) in terms of MU potentials and effects will be iterated in order to identify knowledge gaps, identify new elements or improve existing ones and compare results within basin/sea-basin and trans-boundary scale. Moreover, results obtained from the overall process can then be reiterated back into the initial stages of the AF at step 1, for refining MU Definition and Typology.
Methods: Stakeholder re-engagement, factor catalogue.
Output: Updated factor score table (steps 2.2-2.4) and scaled MU analysis (step 3)

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3. Methodology in detail – scope of application

3.1. Methodology for evaluating MU drivers/ barriers and added value/impacts

The methodology will be applied to WP2 "Overview of MU" and WP3 "Case Studies":

- **under WP2** it will be used to evaluate drivers/barriers and added value/impacts of MU in the context of the **Country-based Analysis** (STEP 2 of the Analytical Framework provided in paragraph 2.4) for **the 5 EU Sea Basins**
- **under WP3** it will be used for the same scope, in relation to the analysis of **7 case-studies** at a local level . The methodology will be applied both to case-studies where MU is already developed (to analyse strengthening potential) and to case studies where MU is not developed yet.

Within WP2, this methodology defines the details for implementing steps 2.2, 2.3 and 2.4 of the Analytical Framework above.

Application of the methodology is aimed at providing two evaluation elements:

- **an overview of the potential to develop or strengthen MU**
  As defined in chapter 2 MU potential is interpreted as the degree of opportunity the study area (Country/Sea Basin or Case Study) has to develop or strengthen MU.
  Results from step 2.1 "Country-based MU overview & identification of potentials" will give input to this analysis, providing a MU overview at **a** country level. Here, a comparative evaluation of **drivers** and **barriers** is carried out, resulting in a detailed analysis of **MU potential**.
- **an evaluation of the effect of MU development / strengthening**
  As defined in chapter 2, the effect of MU is interpreted as the overall results of pros and cons of developing MU in the study area (Country/Sea Basin or Case Study). The overall **effect of MU** is evaluated by comparing **added values** with **impacts**.

Four **themes** are identified for the analysis:

- DRIVERS = factors promoting MU
- BARRIERS = factors hindering MU
- ADDED VALUES = positive effects of establishing or strengthening MU
- IMPACTS = negative effects of establishing or strengthening MU

The methodology is illustrated in the diagram given in figure 4. It consists of a phase of **desk analysis**, followed by a **stakeholder engagement** phase. These two phases will be carried out both in WP2 and WP3, as foreseen by MUSES project proposal (Annex 1 – Part A of the Grant Agreement). The methodology is adapted from the framework applied by Kyriazi et al. (2016).

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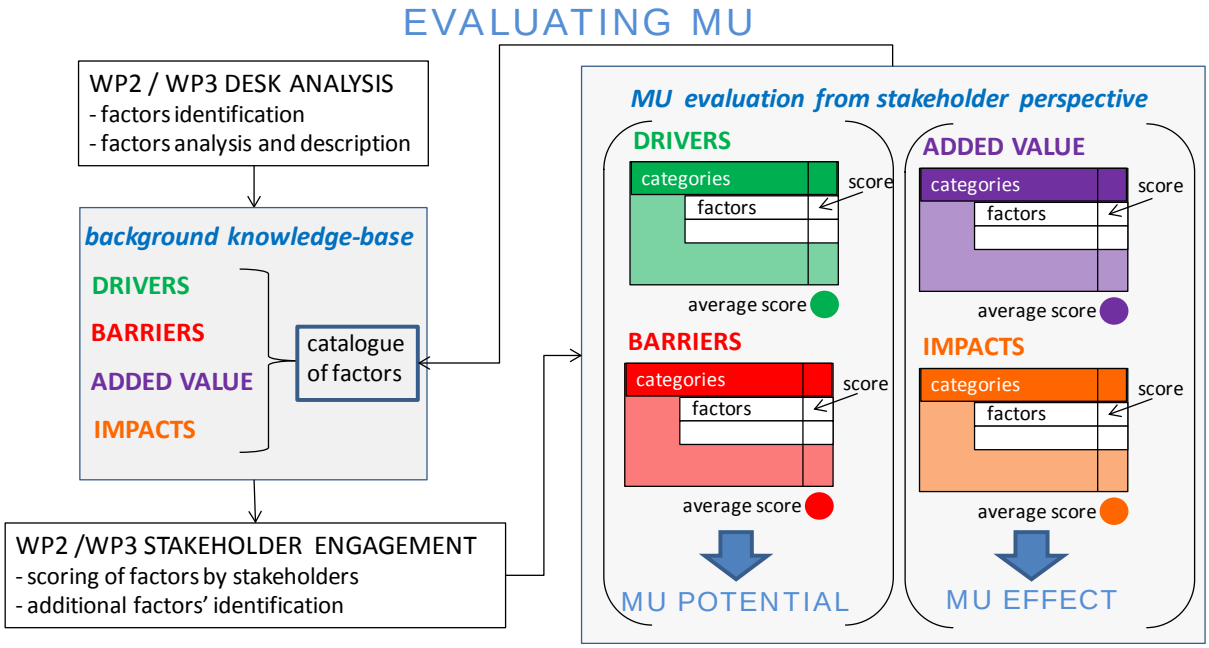

Figure 4. Diagram of the methodology for evaluating MU in Sea Basins and Case-Studies.
Source: own elaboration by THETIS

I. **Desk analysis**

MU related documents and literature will be screened: policies, strategies, laws, regulations, administrative procedures, plans, strategic environmental assessment (SEA), environmental impact assessments (EIAs), studies, projects, etc. A number of **relevant factors** will be identified with reference to the four themes. These factors will be analysed and described by the investigator, providing motivation for their selection and a qualitative evaluation of their importance as drivers / barriers / added values / impacts of MU in the study area (Country/Sea Basin or Case Study). The catalogue of factors and their related descriptions will provide a background knowledge-base for interacting with the stakeholders. This phase of analysis is also key for identifying factors that act as real barriers, i.e. barriers that are actually occurring, normally in a written form, and might not result from stakeholders' perceptions (see MUSES definition of real barriers in chapter 3.2). In addition, this background knowledge-base is relevant to critically evaluate, *ex post*, the results on stakeholder knowledge / perception and, eventually, to fill gaps in stakeholder consultation results where no answers are provided or there are unclear responses provided by stakeholders.

II. **Stakeholder engagement**

The factors identified during the desk phase will be evaluated and scored by stakeholders during interviews, workshops or any of the other consultation methods implemented in WP2 and WP3. Stakeholder scores will provide a picture of perceived drivers/barriers/added value/impacts of MU. In addition, experts and stakeholders will be asked to identify additional factors (drivers/barriers/added value/impacts) according to their knowledge/experience.

III. **Categories of factors**

As a result of desk analysis and responses from the stakeholders we expect to record differences in factors (drivers, barriers, added value, impacts) in different Countries/Sea Basins. We aim to achieve comparability, within the four themes (drivers, barriers, added value, impacts) by clustering these

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themes in **categories**. A preliminary list of categories is provided below. Additional categories may be identified in the desk phase and/or the stakeholder consultation phase.

CATEGORIES FOR DRIVERS = factors promoting MU

- Category D.1 – policy drivers (e.g. marine renewable policy)
  - Factor D.1.1 ....
  - Factor D.1.2 ....
  - Factor D.1.n ...
- Category D.2 – relation with other uses (e.g. other use(s) present already in the area)
  - Factor D.2.1 ....
  - Factor D.2.2 ....
  - Factor D.2.n ...
- Category D.3 – economic drivers (e.g. availability of funds promoting MU)
  - Factor D.3.1 ....
  - Factor D.3.2 ....
  - Factor D.3.n ...
- Category D.4 – societal drivers (e.g. social or political promotion of MU)
  - Factor D.4.1 ....
  - Factor D.4.2 ....
  - Factor D.4.n ...
- other categories to be identified

CATEGORIES FOR BARRIERS = factors hindering MU:

- Category B.1 – legal barriers (e.g. lack of legislation to undertake MU)
  - Factor B.1.1 ....
  - Factor B.1.2 ....
  - Factor B.1.n ...
- Category B.2 – administrative barriers (e.g. specific administrative obstacles in allowing MU)
  - Factor B.2.1 ....
  - Factor B.2.2 ....
  - Factor B.2.n ...
- Category B.3 – barriers related to economic availability / risk (e.g. lack of full understanding of economic benefits of MUs – i.e. no investors)
  - Factor B.3.1 ....
  - Factor B.3.2 ....
  - Factor B.3.n ...
- Category B.4 – barriers related to technical capacity (e.g. specific technical problems affecting combination of some uses)
  - Factor B.4.1 ....
  - Factor B.4.2 ....
  - Factor B.4.n ...

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- Category B.5 – barriers related to social factors (e.g. social acceptance of MU)
  - Factor B.5.1 ....
  - Factor B.5.2 ....
  - Factor B.5.n ...
- Category B.6 – barriers related to environmental factors (e.g. achievement of natural conservation targets)
  - Factor B.6.1 ....
  - Factor B.6.2 ....
  - Factor B.6.n ...
- other categories to be identified

CATEGORIES FOR ADDED VALUES = positive effects of establishing or strengthening MU:

- Category V.1 – economic added value (e.g. reduction of overall costs)
  - Factor V.1.1 ....
  - Factor V.1.2 ....
  - Factor V.1.n ...
- Category V.2 – societal added value (e.g. conservation of traditional sea uses)
  - Factor V.2.1 ....
  - Factor V.2.2 ....
  - Factor V.2.n ...
- Category V.3 – environmental added value (e.g. reduction of overall environmental impact)
  - Factor V.3.1 ....
  - Factor V.3.2 ....
  - Factor V.3.n ...
- Category V.4 – better insurance policies and risk management (e.g. share risk management and related costs among different operators)
  - Factor V.4.1 ....
  - Factor V.4.2 ....
  - Factor V.4.n ...
- other categories to be identified

CATEGORIES FOR IMPACTS = negative effects of establishing or strengthening MU:

- Category I.1 – economic impacts (e.g. increased competition with other sectors not included in MU)
  - Factor I.1.1 ....
  - Factor I.1.2 ....
  - Factor I.1.n ...
- Category I.2 – societal impacts (e.g. increased societal non-acceptance of maritime activities)
  - Factor I.2.1 ....
  - Factor I.2.2 ....
  - Factor I.2.n ...

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- Category I.3 – environmental impacts (e.g. increased cumulative impacts on marine benthic ecosystem)
    - Factor I.3.1 ....
    - Factor I.3.2 ....
    - Factor I.3.n ...

3.1.2. Scoring system and evaluation method

Identified factors (drivers, barriers, added value, impacts) will be scored by the stakeholders. Results of scoring will be aggregated into synthetic indexes. The process is described in the following paragraphs.

Analysis of MU potential

In order to evaluate MU potential the following steps will be undertaken:

- scoring of drivers by stakeholders
- calculation of the average drivers score (average scores by categories can be also computed to complement the analysis)
- scoring of barriers by stakeholder
- calculation of the average barriers score (average scores by categories can also be computed to complement the analysis)
- MU potential estimation (see below for the description on this point).

Scoring of drivers (factors supporting / facilitating MU development / strengthening): to factors supporting MU a positive sign is attributed and the following scoring scale is applied:

- high priority — score = +3
- medium priority — score = +2
- low priority — score = +1
- not relevant = the factor is present, but it has no influence on MU potentials or MU effects — score = 0
- absent = the factor is not present — score = 0

  I do not know = there is no knowledge on the factor — no score is given

Scoring of barriers (factors preventing /negatively affecting MU): to factors negatively affecting MU a negative sign is attributed and the following scoring scale is applied:

- high obstacle — score = -3
- medium obstacle — score = -2
- low obstacle — score = -1
- not relevant = the factor is present, but it has no influence on MU potentials or MU effects — score = 0
- absent = the factor is not present — score = 0

  I do not know = there is no knowledge on the factor — no score is given

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MU potential will be evaluated by averaging the average drivers' score and the average barriers' score. MU potential can assume values in the interval [-1.5, 1.5][2] where -1.5 reflects totally negative MU potential and 1.5 totally positive MU potential. The list of negatively and positively scored factors should be attached to this analysis as well. The case of MU potential = 0 can occur where there is a balance between factors promoting MU development and factors hindering it. The development / strengthening of MU will therefore depend upon which of them will prevail. The knowledge of positive and negative factors is very useful to address actions aimed at facilitating MU development.

Evaluation of overall MU effect

In order to evaluate MU effect the following steps will be undertaken:

- scoring of added values
- calculation of average added values score (average scores by categories can be also computed to complement the analysis)
- scoring of impacts
- calculation of average impacts score (average scores by categories can be also computed to complement the analysis)
- MU overall effect estimation (see below for the description on this point).

Scoring of added values (positive effects of implementing / strengthening MU): to factors representing benefits of developing or reinforcing MU a positive sign is attributed and the following scoring scale is applied:

- high added value — score = +3
- medium added value — score = +2
- low added value — score = +1
- not relevant = the factor is present, but it has no influence on MU potentials or MU effects — score = 0
- absent = the factor is not present — score = 0

  I do not know = there is no knowledge on the factor — no score is given

Scoring of impacts (negative effects of implementing / strengthening MU): to factors representing negative effects of developing or expanding MU a negative sign is attributed and the following scoring scale is applied:

- high impact — score = -3
- medium impact — score = -2
- low impact — score = -1
- not relevant = the factor is present, but it has no influence on MU potentials or MU effects — score = 0
- absent = the factor is not present — score = 0

[2] The negative extreme -1.5, is calculated by applying a score of -3 to all barriers (B) and a score of 0 to all drivers (D), calculating their averages (respectively average of B = -3 and average of D = 0) and finally calculating the average of these averages which is -1,5. The reversed process is applied for the positive extreme +1,5 where all drivers got 3 and all barriers 0 and the average of the sum of their averages is +1.5. Kyriazi et al. (2016).

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I do not know = there is no knowledge on the factor no score is given

The **overall MU effect** will be evaluated by averaging the average added value's score and the average impacts' score. MU effect can assume values the interval [-1.5, 1.5][3] where -1.5 reflects a totally negative effect of MU in the area and 1.5 a totally positive effect. The case of MU effect = 0 can occur where there is a balance between pros and cons of MU development. The knowledge of positive and negative factors is very useful to address actions aimed at maximising added value of MU.

3.2. Definition of perceived versus real barriers

In the course of analysing MUs future development key attention will be attached to examination of barriers hindering this process. The MUSES project will focus on barriers exclusive to MU, and therefore will not deal with single-activity barriers that already restrict developments in their own right, irrespective of the reason within the sea area (e.g. fish aquaculture being prohibited in the Baltic Sea). Barriers are divided into the real and perceived ones. The same distinction in barriers will be used in both WP2 and WP3. Differentiation between real and perceived barriers will be essential for the action planning process. Namely, barriers identified as perceived may be resolved in the short-term, while real barriers will need to have to be dealt with over a longer timeline. During the process of identification of barriers and drivers, the source will be identified, in simple terms – whom is the barrier coming from (institutions/actors). It is expected that most categories of barriers will have already been identified within the Analytical Framework research process. However, new categories may be added if their importance becomes apparent at the research implementation phase. Furthermore, the sphere of influence (Fig. 5) as explained in BaltSeaPlan Vision 2030 is a good approach to understand in what environment a certain barrier occurs in relation to its source, and differentiate between barriers that can be:
a) solved through active control and decision making (barriers that occur in the sphere 1),
b) influenced (barriers that occur in sphere 2), and
c) neither controlled, nor influenced (barriers that occur in sphere 3).

[3] The negative extreme -1.5, is calculated by applying a score of -3 to all impacts (I) and a score of 0 to all added values (A), calculating their averages (respectively average of I = -3 and average of A = 0) and finally calculating the average of these averages which is -1.5. The reversed process is applied for the positive extreme +1.5 where all added value got 3 and all impacts 0 and the average of the sum of their averages is +1.5 (Kyriazi et al. 2016).

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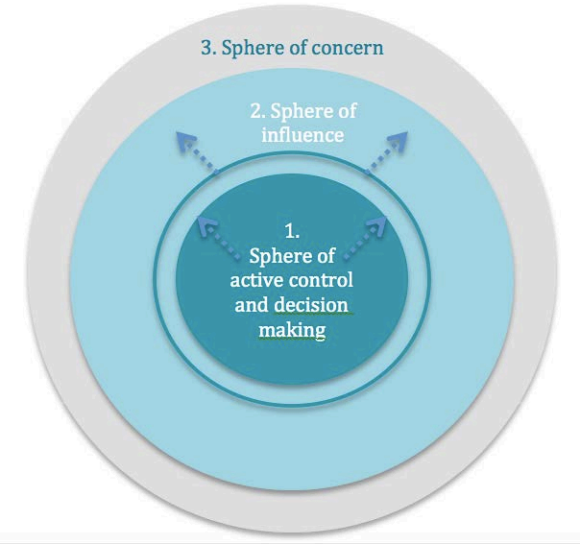

Figure 5. Sphere of Influence
Source: own elaboration by SUBMARINER

Real and perceived barriers will also require a differentiated approach comprising timely and informative engagement with the relevant stakeholders.

The scale at which a barrier occurs will also be indicated e.g. EU, sea basin, national, regional, etc. It is important to note that not every MU combination is relevant to every Sea Basin, nor the same barrier is relevant to each combination. Hence, it is crucial early in the process to identify which combinations will be analysed in which sea basins, and to what combination of MU are identified barriers related.

After being identified and valuated using the methodology which is described under **Error! Reference source not found.**, barriers will be classified as real or perceived by using the following definitions:

Perceived barriers – defined as the barriers that are related to stakeholder's mindset. Namely, perceived barriers to development of MU result from stakeholder's perception or understanding of a certain document, process, risk, situation or actor (including persons or entities).
Examples of perceived barriers include but are not limited to:

- Interpretation of directives, laws, regulations, guidelines, and standards;
- Stereotyping potential partners/sectors as ideologically driven, incompetent or old fashioned;
- Tradition e.g. traditional fishing or aquaculture practices and equipment are aimed to be preserved and do not allow for combination with other sectors. Hence, there is a lack of tradition for cooperation between the different sectors involved.
- Controversies e.g. controversies about aquaculture impact on the environment have arisen in Venice and Po Delta coastal lagoons when clam producers imported a Philippine species that have rapidly spread around the lagoons. On the other hand, actual risk of a noticeable increase in the nutrient concentration due to new species is very low.

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- Lack of knowledge due to immaturity of the concept – multi use concept might be perceived as exclusive/limited to the offshore wind farms and aquaculture only;
- Fear of undermining existing policy or breaching the law and;
- Lack of trust and/or transparency.

Real barriers – defined as barriers that do actually occur, normally in a written form, and are not supposition or a result of stakeholders' perceptions.
Examples include but are not limited to:

- Environmental and safety restrictions required by law or compulsory standard requirements,
- Insurance issues/policies e.g. resulting in high insurance costs,
- High costs of infrastructure or combined operations,
- Other more attractive investment opportunities for investors,
- Lack of incentives i.e. financial (offshore wind investment tax credit), planning (e.g. plans or strategies providing good practices and promoting IMTA) and regulatory incentives (e.g. streamlined application processing in case of more efficient space use),
- Barriers related to technical and economic feasibility e.g. insufficient level of technology readiness (TRL) and,
- Barriers related to politics, including set political targets and agendas.

3.3. Links to WP 3 methodology

Methodology for case studies analysis will take up the essential elements from this general methodological framework, in order to allow a coherent downscaling of the overall analysis to the case study level. A separate document will be generated by WP3 (deliverable D3.1 – "Case study methodology") where the downscaling of analysis to be followed by case study will be detailed.
Case-study fiches will be prepared, capturing the essential elements of the country fiches that will be used for WP2 and are described in chapter 4. The following common denominators between case-study fiches and country fiches will be considered:

- existing MU practices (from projects and applications[4] in the case-study area)
- reference to MU in policy, legal, regulatory frameworks, strategies, plans
- environmental and socio-economic impact of real / planned / potential MU in the case-study area
- potentials, added value, drivers and barriers to MU.

A specifically tailored approach will be adopted for those case-studies where MUs are not implemented yet and the analysis will mainly discuss potential and readiness for MU development.

The same methods will be applied in WP2 and WP3: desk analysis (screening of projects, law, plans and other official documents) and stakeholder involvement. Concerning the latter, interviews will be used in WP2 while each case study under WP3 will develop its own stakeholder engagement method, which will be detailed in the WP3 deliverable D3.2 (Stakeholder engagement).

[4] This means not only licensable activities, but also pilot projects and immature experiences of marine developments.

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The same distinction for barriers used in WP2 will be adopted in WP3 (i.e. Real *vs.* Perceived, identification of where the barrier is), as described in chapter 3.2.

Each case study will be implemented according to a site-specific analytical approach, with reference to the three focus areas:

i. Addressing co-existence,
ii. Boosting Blue Growth potential, and
iii. Improving environmental compatibility.

These focus areas are relevant for WP3 analysis and will be identified under deliverable D3.1. Nevertheless case studies shall provide some minimum common elements (answers to Key Evaluation Questions for each of the focus areas) to be exploited by comparative analysis (Task 3.3). Answers to Key Evaluation Questions will be formulated under WP3 activities and are not relevant for WP2 Analytical Framework. Common elements within case-studies will deal with:

- current characteristics and trends of use of the sea in the area, with focus on MU and coexistence
- historic and existing connections / conflicts / synergies among sectors
- potential to develop / enlarge(in space) / enhance(in terms of e.g. jobs or revenues) MU / coexistence
- current and future barriers[5] to MU / coexistence (Real vs. Perceived barriers, identification of where the barrier is e.g. legal, administrative, financial)
- advantages / benefits of MU / coexistence (e.g. environmental, economic, societal

3.4. Links to WP4

WP4 Action Plan will bring together the results from WP2 (Overview of MUs in European Sea Basins) and WP3 (Case Studies), and develop recommendations for future development of MU in European Seas. This work package addresses stakeholder engagement, in-depth analyses of outcomes from WP2 and WP3, sea basin syntheses of the barriers that need to be overcome to realize sea basin potential and an Action Plan providing recommendations and actions for developing MU in European Seas. All those aspects are taken into consideration in the WP2 methodology

Stakeholder Profiles – WP4 - Deliverable 4.1

The stakeholder arena in WP4 will be similar to those participating in WP2, therefore, close cooperation will be maintained on this aspect between the two WPs given the importance of the stakeholder process for the project. Stakeholder views arising from WP2 (basin scale) and WP3 (sub-national/local scale) activities will be used for comprehensive analysis of relevant stakeholders taken from different sectors, with different roles in the MU process and from different geographic scales (national, sea basin and EU wide) covering all EU sea basins (according to the methodology presented in 3.5).

[5] For example Brexit and access to finances might be a future barrier for some users

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Analyses and Sea Basin Syntheses - WP4 - Deliverable 4.2

Findings from WP2 and WP3 will be analysed to provide a clear overview of MU of oceans in European sea basins which identifies the real and perceived barriers to MU from a number of perspectives (i.e. legal, environmental, economic, stakeholder mindset and EU policy) and at a number of scales (national, macro-regional (where appropriate), sea basin and European).

Analysis and Sea Basin Syntheses will:

- Clearly show the potentiality of ocean space: which MU applications have real potential, in which context in terms of focus areas, and where. Outputs from Task 2.3 Sea Basin Comparison will form basis for mapping the potentiality of MU, and identify potential sectors and sea areas suitable for promotion of MU required for WP4.
- After real and perceived barriers have been identified in WP2 and WP3, analysis in WP 4.2. will draw attention to barriers that can be overcome, and indicate mechanisms through which this could be achieved (identify scale of the problem, i.e. national, regional, sea basin).
- Highlight where benefits could be realised, drawing attention to possible incentives that could facilitate this and how to communicate these to relevant stakeholders.
- Present draft models for integration of MUs, innovation potential and concrete actions which are needed for their implementation with priority lines.
- Clearly identify relevant sea basin stakeholders and incorporate transparent integration of stakeholder feedback and comments; ground-truth findings with relevant stakeholders.

Action Plan formulation – WP4 - Deliverable 4.3

As the final output of the project, the Action Plan will be developed, fed by the outputs of all previous tasks. The Action Plan will clearly identify who should apply an “action”, at which level, indicate possible time-frames for action delivery as well as funding needs and opportunities.

3.5. Stakeholder analysis and engagement strategy

3.5.1. Stakeholder Analysis

Stakeholder analysis methodology has been developed for the purpose of this project with an aim to provide understanding of the extent to which stakeholders are affected by, interested in, or could influence/drive the change towards MU. Analysis is set to provide insights on who the stakeholders are behind the identified drivers and barriers. As a result, this method which is based on the Force Field analysis (FAO, 2013a) will allow the identification of the barriers that should be addressed by the action plan, as well as stakeholders responsible for implementation of proposed actions. Force Field Analysis is a method for listing, discussing, and evaluating the various forces for and against a proposed change (Iowa State University, 2017). Force Field Analysis helps systematic analysis of all of the forces impacting the change (in this project Multi-Use) and weighing the opportunities and

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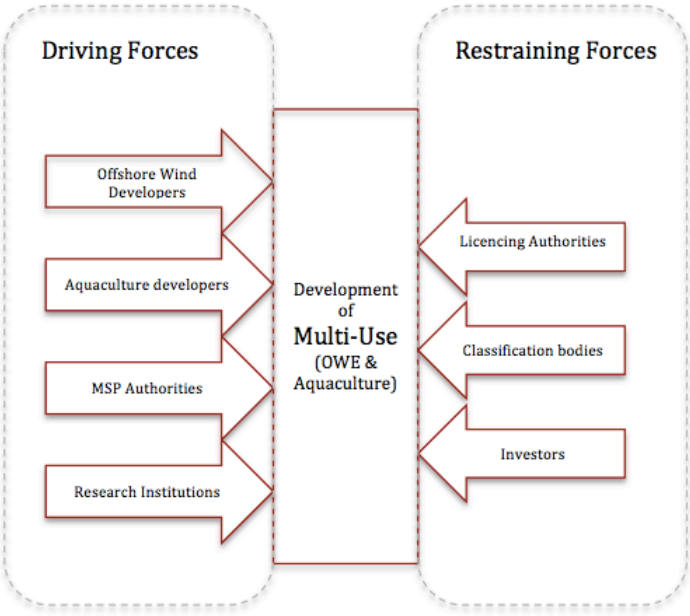
barriers. As visualised in figure 6, Force Field Analysis is based on the premises that change takes place when an imbalance occurs between the sum of the forces against change (Restraining Forces) and the sum of the forces for change (Driving Forces). An imbalance may occur through a change of magnitude or a change in direction in any one of the forces, or through the addition of a new force[6]. Therefore, the main questions that will be analysed through Force Field method are:

- Does the driving force stand a chance against the restraining force? How can this be changed? Is faster progress feasible?
- Questions about up-scaling driving forces and weakening restraining forces, and how to influence different stakeholders

Knowing who stands behind opportunities and barriers, is necessary for development of strategies to reduce the impact of the opposing forces and strengthen the supporting forces. Force Field Analysis will be used to develop an action plan to implement a change. Specifically it will:

1. Determine if a proposed change can get needed support;
2. Identify obstacles to successful solutions, and;
3. Suggest actions to reduce the strength of the obstacles.

As advised by FAO (2013b) CPF Toolkit, conducting stakeholder analysis is important for improving the robustness and quality of action planning and the probability of delivering desired benefits. Hence, it is vital to identify all of the key organizations and individuals that will be involved in the MUSES project. Analysis is also expected to provide the Overview of Stakeholder Profiles, a deliverable that is due in month 12, under Deliverable 4.1, Stakeholder Profiles.



[6] One should keep in mind that whenever a force changes, other forces might also be influenced (eg. First movers, tipping points…)

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Figure 6. Simplified Force Field Analysis diagram for the OWE and aquaculture Multi-Use development

Source: own elaboration SUBMARINER

As a first step, preliminary stakeholder analysis will be developed through desktop research. Definition of stakeholders used for the purpose of this project is derived from the European Commission - EuropeAid Cooperation Office (2004) and describes stakeholders as individuals or institutions that may – directly or indirectly, positively or negatively – affect or be affected by a project or programme, in this case, development of MU from concept to practice.

The stakeholder analysis matrix (as adopted from European Commission - EuropeAid Cooperation Office (2004) will be used as a tool for collecting information during the first phase of the analysis (Tab.2).

Table. 2. The stakeholder analysis matrix

Stakeholder and basic characteristic	Overall interests	How affected by the change?	How could influence (drive) the change?

Source: own elaboration by SUBMARINER

Stakeholder Analysis will be an iterative process that evolves throughout the stages of the project, rather than a one-off isolated analytical step. Stakeholder analysis will be conducted in parallel with barrier/driver identification and evaluation. The findings that come out of the desktop phase of stakeholder analysis will be verified and revised through various methods including interviews and workshops.

For the next step of the analysis Venn Diagrams will be created in order to analyse and illustrate the nature of relationships between key stakeholder groups. Development of Venn Diagrams will be based on the guidelines provided by the European Commission - EuropeAid Cooperation Office (2004). Venn Diagrams will be developed for each type of the MU considered by the project.

An example of a Venn Diagram that analyses a relationship between stakeholders for the MU of aquaculture and offshore wind, is shown in figure 6. The size of the circle is used to indicate the relative power/influence of each group/organization, while the spatial separation is used to indicate the relative strength or weakness of the working relationship/interaction between different groups/organizations. The arrows are used to indicate if certain stakeholders have been acting as a bridge connecting other stakeholders.

3.5.2. Stakeholder Engagement

Stakeholder analysis will serve to inform the stakeholder engagement process. However, the findings that come out of the desktop phase of stakeholder analysis will be verified and revised through various engagement methods including interviews and workshops jointly used for receiving input for analysis in WP2.

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Stakeholder engagement encompasses a range of activities and interactions over the life of the MUSES project. The combination of methods used for engaging stakeholders will be substantially different between WP2 and WP3, given the difference among relevant stakeholder groups identified, and specific objectives set for each WP. For the purpose of actively involving stakeholders and obtaining their input for the analysis in WP2, WP3, as well as the action planning process in WP4, methods for stakeholder engagement will consider: workshops, conferences, interviews, questionnaires, and teleconferences. As part of the specific study methodology, rationale regarding the choice of methods for collecting and analysing information (e.g. structured vs. semi structured interview or world café vs conventional presentations) will be provided.

In WP2, stakeholders will be considered a sampling frame[7] for the analysis and their engagement will, alongside desk research, provide necessary input for analysing MU in European sea basins. The principles outlined below will be followed when engaging with stakeholders in WP2:

1) Right timing for engagement – avoid contacting stakeholders or scheduling involvement activities during the holiday season or non-working hours;
2) In line with the stakeholder analysis, ensure appropriate distribution of stakeholder groups engaged (appropriate distribution of stakeholders backgrounds/expertise);
3) Use appropriate means of engagement for each stakeholder group according to study methodology, and;
4) Consider stakeholders geographical distribution and logistics (e.g. in some cases given the wide geographical distribution teleconference might be better option than in-person conference, or telephone interviews vs in person interviews)

Aside from specific stakeholder groups, engaged to provide input for the sea basin, case study analyses, and action planning process, the project will also ensure overall engagement of society-at-large. Methods of engaging society-at-large, developed in close collaboration with WP5, will concentrate on increasing collective consciousness about MU, through the project web-site, newsletters, social media, handouts, etc. Furthermore, with an intention to increase knowledge and expertise of those working in Blue Growth field, the project will also encourage formation of discussion groups (e.g. linkedin discussion group on specific MU topic), and targeted newsletters.

[7] Sampling frame is a complete list of all the members of the population that we wish to study

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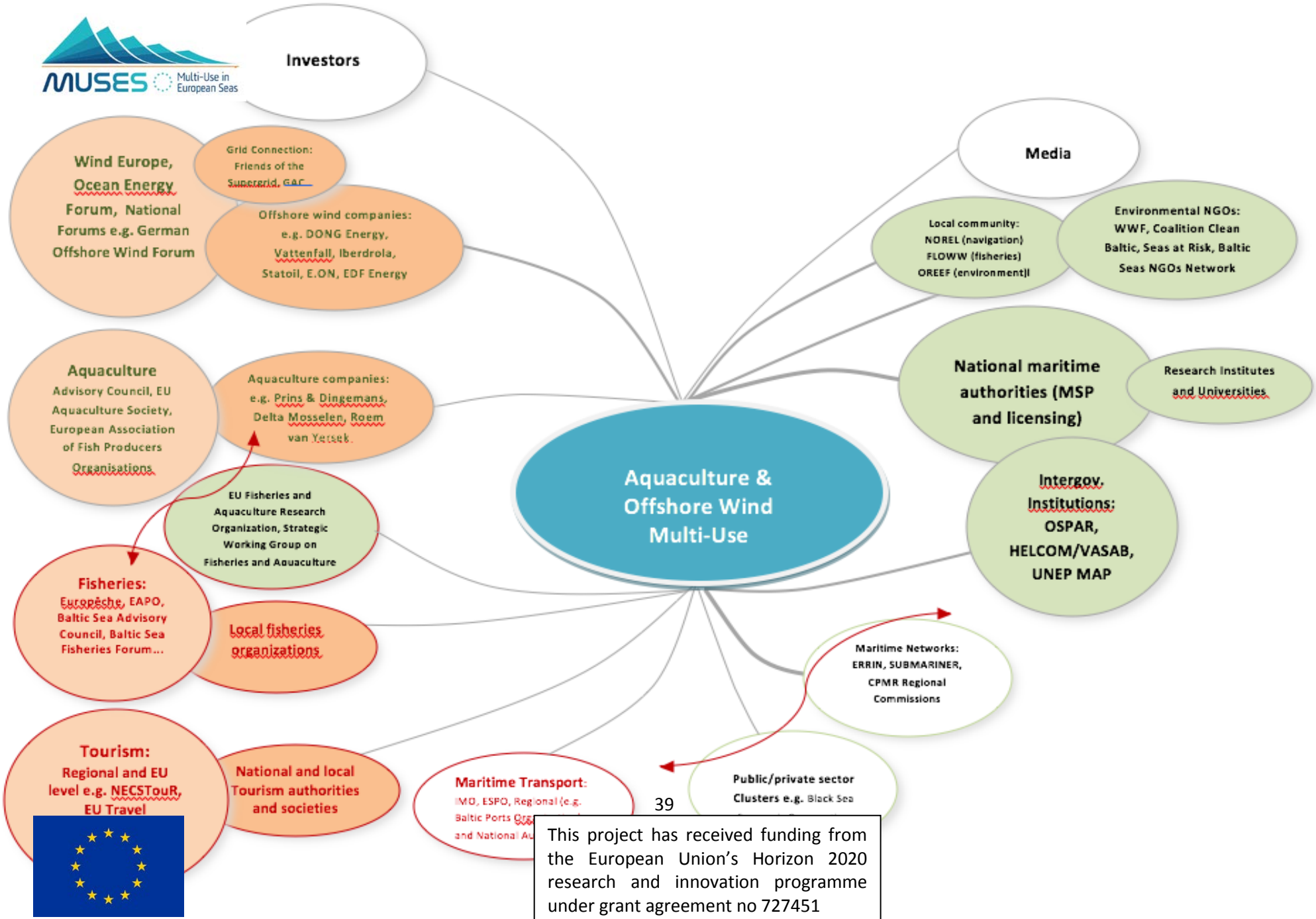

Figure 7. Example Venn Diagram illustrating the nature of relationships between key stakeholder groups in Aquaculture and Offshore Wind Farm industries.

Source: own elaboration by SUBMARINER

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4. Templates

4.1. General assumptions

Although the ultimate aim is to identify relevant sea basins and sub-sea-basins elements for MUs development, the starting point will be on country/subregional level of analysis.

4.2. Template for country-based analysis

The aim of the template is to guide MUSES partners during desk research, stakeholder interviews and stakeholder analysis for the production of country fiches and sea-basin analysis. The template follows the stepwise approach of the Analytical Framework. The design of the template was kept open in order to be applicable for desk research, stakeholder interviews and combined analysis. A specific template sheet was designed for each step and intermediate step of the AF (Table. 3) and to provide input information for stakeholder analysis matrix (Table. 4).

Table 3. AF steps and intermediate steps with respective sheets and outputs.

AF STEP	AF Intermediate step	SHEET
Step 2	Step 2.1. MU Overview and Identification of MU Potentials	1, 2
	Step 2.2. Identification of drivers, barriers, added values and impacts.	3, 4, 5, 6
	Step 2.3. Analysis of MU Potentials	7, 8, 9, 9.1, 10
	Step 2.4. Evaluation of Overall MU Effects	11, 12
Step 3	Step 3. Integrated Sea basin Analysis of MU	No templates but guiding questions instead

Source: own elaboration by ISMAR

Moreover the template feeds into the stakeholder analysis matrix defined in paragraph 3.5 (Tab. 2).

Table 4. Sheets of the template providing input data for the stakeholder analysis matrix and consequently the action planning process in WP4.

Stakeholder analysis matrix	SHEET
Interview general information	7, 8
Overall interest	9.1, 10.1, 11.1, 12.1
How could influence (drive) change	

Source: own elaboration by ISMAR

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COUNTRY FICHES DATA COLLECTION AND ANALYSIS

STEP 2. Country-based MU Analysis
Step 2.1. MU Overview and Identification of MU Potentials

Method: Literature review including:

- past and ongoing MU related projects outputs (sheet 1),
- peer reviewed literature,
- grey literature including relevant industry reports, industry web pages, news articles, etc.

Literature review will be all encompassing with no cut offs in order to capture the most up-to-date information.

SHEET 1	
2.1.1. Overview of existing/potential MU projects/sites	
Describe existing/potential MU projects/sites	…
Project aim	…
Project name	…
Partners involved	…
contact/info details	…
Type of resources shared (as defined under 2.1)	a)biological b)human resources c)physical d)geographical e) other_____
Order of development (as defined under 2.1):	a)joint b)staggered
Location	Proposal: Use the unified EEA reference Grid (1 km2, shapefile). The grid provides a unique CELL ID (e.g. 1kmE3900N1300), that can be used as spatial identifier of the MU or for areas of MU potential. Lon/lat **EEA reference grid:** The grid is based on the recommendation at the 1st European Workshop on Reference Grids in 2003 and later INSPIRE geographical grid systems. For Europe and each country three vector polygon grid shape files, 1, 10 and 100 km, are available. The grids cover at least country borders and, where applicable, marine Exclusive Economic Zones v2.0, www.vliz.be/vmdcdata/marbound. Note that the extent of the grid into the marine area does not reflect the extent of the territorial waters. Reference: http://www.eea.europa.eu/data-and-maps/data/eea-reference-grids-2.
	Provide the location of the existing MU:
	Provide the location of the existing use and the potential combined use (s):
MU commencement (date)	
Legal basis of MU – administrative obligation/private contract/research project	Administrative/obligation ☐ Private contract ☐ Research project ☐

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level of maturity of MU	Planned	☐	Design phase	☐
	Full implementation	☐	Commercial use	☐
	Provide date/ time period of maturity level:			
Technology Readiness Levels (TRL) (*if applicable*)	**TRL1.** basic principles observed	☐	**TRL6.** technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)	☐
	TRL2. technology concept formulated	☐	**TRL7.** system prototype demonstration in operational environment	☐
	TRL3. experimental proof of concept	☐	**TRL8.** system complete and qualified	☐
	TRL4. technology validated in lab	☐	**TRL9.** actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)	☐
	TRL5. technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)	☐		
Is MU cooperation subsidized	International	☐	EU level	☐
	National	☐	Regional	☐
Advantages from MU	*What are the advantages from MU?* *1.* _____ *2.* _____ *3.*_____ *4.*_____ *5.* _____			
Possibility of extension	*What are the possibilities of extension of MU?* *Where?* _____ *What?* _____ *Who?* _____ *What are the conditions for extension?* _____			
Key private actors for MU development	*Who are the key actors involved?* _____ _____ _____			

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	_____ _____ _____ _____ _____
Others ?	
Reference documentation & notes • … • … • …	

SHEET 2			
2.1.2. Define MU combinations *Instruction: Define the MU by selecting USE 1 combined with USE 2 as described in AF chapter2.2.*			
USE 1		**USE 2**	
Offshore wind (fixed & floating)		Offshore wind (fixed & floating)	
Offshore wave		Offshore wave	
Tidal energy		Tidal energy	
Hydrogen generation		Hydrogen generation	
Desalination		Desalination	
Commercial Fishery		Commercial Fishery	
Environmental Protection		Environmental Protection	
Environmental Monitoring		Environmental Monitoring	
Floating Shipping terminal		Floating Shipping terminal	
Tourism		Tourism	
Aquaculture fish		Aquaculture fish	
Aquaculture seaweed and mussels		Aquaculture seaweed and mussels	
Cultural Heritage		Cultural Heritage	
Oil&Gas		Oil&Gas	
Other: _____		Other:_____	
IF 3 or more use combinations, please specify: • … • … • …			
Reference documentation & notes • … • … • …			

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Step 2.2.: Identification of drivers, barriers, added values and impacts.

Method: Mainly desk research complemented with stakeholder consultation through workshops. Complementary consultation methods will be defined for each specific country, based on the context.

This part will identify the categories for driver/barriers/added value/impact, their detailed description, the definition of factors determining them and will provide basic information for the classification of perceived versus real barriers as described in paragraph 4.2. This section is the back bone for the scoring of MU potentials and MU overall effects. As an example, these sheets provide basic categories common to all sea-basins, which will be further complemented through desk research and where required stakeholder consultation.

Sheet 1 and 2 will provide the scope conditions for the desk research on identification of drivers, barriers, added value and impacts. Particular attention will be given to the MU combinations (as defined under 2.1.2), the type of resources shared, the order of development and the location (as defined under 2.1.1).

Key information concerned is:

- Type of MU combination in line with figure 2 and table 1;
- Type of resources shared (as defined under chapter 2.2, see also step 2.1.2);
- Order of development (as defined under chapter 2.2);
- Location (if applicable – location of existing uses (e.g. offshore wind) that could potentially be combined with upcoming one, or the potential location where two uses could develop jointly one day);

SHEET 3			
	2.2.1. DRIVERS: Identification and description of categories & factors		
Category definition	**Description**	**Factor definition**	**At what scale factor occurs/is relevant? (internat.,EU, seabasin, National..)**
D.1. **Policy drivers**	…	Factor D.1.1… Factor D.1.2… Factor D.1.3… Etc	
D.2.**Relation with other uses**	…	Factor D.2.1… Factor D.2.2… Factor D.2.3… Etc…	
D.3. **Economic**	…	Factor D.3.1… Factor D.2.2…	

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drivers		Factor D.2.3… Etc…	
D.4. **Societal drivers**	…	Factor D.4.1… Factor D.4.2… Factor D.4.3… Etc	
D.5…	…	Factor D.5.1… Factor D.5.2… Factor D.5.3… Etc	
Etc…	…	Etc…	
	References • …		

SHEET 4			
	2.2.2. BARRIERS: Identification and description of categories & factors		
Category definition	**Description**	**Factor definition**	**At what scale factor occurs/is relevant? (internat.,EU, seabasin, National..)**
B.1. **Legal barriers**	…	Factor B.1.1… Factor B.1.2… Factor B.1.3… Etc…	
B.2. **Administrative barriers**	…	Factor B.2.1… Factor B.2.2… Factor B.2.3… Etc…	
B.3. **Barriers related with economic availability / risk**	…	Factor B.3.1… Factor B.2.2… Factor B.2.3… Etc…	
B.4. **Barriers**	…	Factor B.4.1…	

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related with technical capacity		Factor B.4.2… Factor B.4.3… Etc…	
B.5. **Barriers related with social factors**	…	Factor B.5.1… Factor B.5.2… Factor B.5.3… Etc…	
B.6. **Barriers related with environmental factors**	…	Etc…	
	References • …		

SHEET 5			
	2.2.3. ADDED VALUE (positive effects): Identification and description of categories & factors		
Category definition	**Description**	**Factor definition**	**At what scale factor occurs/is relevant? (internat.,EU, seabasin, National..)**
V.1…	…	Factor V.1.1… Factor V.1.2… Factor V.1.3… Etc…	
V.2…	…	Factor V.2.1… Factor V.2.2… Factor V.2.3… Etc…	
V.3…	…	Factor B.3.1… Factor B.2.2… Factor B.2.3… Etc…	

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V.4…	…	Factor V.4.1… Factor V.4.2… Factor V.4.3… Etc…	
V.5…	…	Factor V.5.1… Factor V.5.2… Factor V.5.3… Etc…	
Etc…	…	Etc…	
	References • …		

SHEET 6			
	2.2.4. IMPACT (negative effects): Identification and description of categories & factors		
Category definition	**Description**	**Factor definition**	**At what scale factor occurs/is relevant? (internat.,EU, seabasin, National..)**
I.1…	…	Factor I.1.1… Factor I.1.2… Factor I.1.3… Etc…	
I.2…	…	Factor I.2.1… Factor I.2.2… Factor I.2.3… Etc…	
I.3…	…	Factor I.3.1… Factor I.2.2… Factor I.2.3…	

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		Etc…	
I.4…	…	Factor I.4.1… Factor I.4.2… Factor I.4.3… Etc…	
I.5…	…	Factor I.5.1… Factor I.5.2… Factor I.5.3… Etc…	
Etc…	…	Etc…	
	References • …		

Step 2.3. Analysis of MU Potentials

Method: Stakeholder engagement. Stakeholder consultation methods will be defined for each country, based on the specific context (interviews, seminar with selected experts, etc.). Stakeholders will be asked to score the factors but also to add additional categories and/or factors that have not been previously identified through desk research. Actors with the ability to influence MU factors will be identified during this phase. Sheet 9.1 is given as an example associated with Sheet 9. However, the same template for stakeholder analysis through interviews should be followed for each of the sheets (9 drivers, 10 barriers, 11 added value and 12 impacts).

SHEET 7				
General interviewee (stakeholder) information				
Name Surname				
Organization				
Title/Position				
Contact	Tel:_____		Email:	
Sea basin	Atlantic	☐	North & Baltic Sea	☐
	Baltic Sea	☐	North Sea	☐
	Black Sea	☐	North Sea & Atlantic	☐
	Med Sea	☐	ALL Sea-basins	☐
Scale	International	☐	National	☐
	EU level	☐	Regional	☐
	Basin	☐	Local	☐
	Sub-basin	☐	MUSES Case Study: _____	
Country	Belgium	☐	Lithuania	☐
	Bulgaria	☐	Malta	☐
	Croatia	☐	Netherlands	☐
	Cyprus	☐	Northern Ireland	☐
	Denmark	☐	Norway	☐

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	England	☐	Poland	☐
	Estonia	☐	Portugal (Azores)	☐
	Finland	☐	Portugal (Mainland)	☐
	France	☐	Rumania	☐
	Germany (Baltic Sea)	☐	Scotland	☐
	Germany (North Sea)	☐	Slovenia	☐
	Greece	☐	Spain	☐
	Ireland	☐	Sweden	☐
	Italy	☐	Wales	☐
	Latvia	☐	Other country: _____	
Sector	Aggregates	☐	Offshore Wind Energy	☐
	Government	☐	Oil & Gas	☐
	Commercial fisheries	☐	Recreational Fisheries	☐
	Defence	☐	Shipping	☐
	Environmental	☐	Statutory bodies	☐
	Aquaculture fish	☐	Submarine Cables	☐
	Aquaculture seaweed and mussels	☐	Tourism & Recreation	☐
	Marine Renew. Energy-Tidal	☐	Other	☐
	Marine Renew. Energy Wave	☐		
Type	Academic/Research Institute	☐	Planner - Marine	☐
	Advisor	☐	Planner – Terrestrial	☐
	Classification body	☐	Policy maker	☐
	Consultants	☐	Private Company	☐
	Decision maker	☐	Regulator	☐
	Investor	☐	Sectorial Group/Forum/Network	☐
	Lobby group	☐	Statutory body	☐
	Media	☐	Statutory consultee	☐
Other?				

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SHEET 8		
Data collection method		
Method of engagement/modes of data collection	Questionnaire	☐
	In person Interview	☐
	Phone/Skype Interview	☐

SHEET 9		
2.3.1. Category Drivers (D) *Instructions: Compile the scores according to stakeholder judgment using definitions in AF paragraph 3.1.1. & 3.1.2 (a). If required extend categories and factor list according to step 2.2. (section 2.2.1.).* *Scoring instructions:* • *high priority score = +3* • *medium priority score = +2* • *low priority score = +1* • *absent = 0 (*the factor is not present*)* • *not relevant = 0(*the factor is present, but it has no influence on MU potentials or MU effects*)* • *I do not know = NK (*there is no knowledge on the factor*)*		
Category D.1 - policy drivers (e.g. marine renewable policy)	**Factor list**	**Score**
	Factor D.1.1_____	
	Factor D.1.2_____	
	Factor D.1.n_____	
Category D.2 - relation with other uses (e.g. other use(s) present already in the area)	**Factor list**	**Score**
	Factor D.2.1_____	
	Factor D.2.2_____	
	Factor D.2.n_____	
Category D.3 - economic drivers (e.g. availability of funds promoting MU)	**Factor list**	**Score**
	Factor D.3.1_____	

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	Factor D.3.2_____	
	Factor D.3.n_____	
Category D.4 - societal drivers (e.g. social or political promotion of MU)	**Factor list**	**Score**
	Factor D.4.1_____	
	Factor D.4.2_____	
	Factor D.4.n_____	
Others	**Factor list**	**Score**
	Factor D.n.1_____	
	Factor D.n.2_____	
	Factor D.n.n_____	
Reference documentation & notes • **…** • **…** • **…**		

SHEET 9.1
Stakeholder Analysis
D.1. policy drivers
Who are the actors behind each of the driving factors? Factor D.1.1… Factor D.1.2… Factor D.1.3…
What is the relation between the actor and the factor (sphere of influence)? Specify for each factor: Actor has the power to : • control and make decisions • influence • no power or other? Please specify _____
D.2. relation with other uses
Who are the actors behind each of the driving factors? Factor D.2.1… Factor D.2.2… Factor D.2.3…
What is the relation between the actor and the factor (sphere of influence)? Specify for each

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factor: Actor has the power to : • control and make decisions • influence no power or other? Please specify _____
D.3. economic drivers
Who are the actors behind each of the driving factors? Factor D.3.1… Factor D.3.2… Factor D.3.3…
What is the relation between the actor and the factor (sphere of influence)? Specify for each factor: Actor has the power to : • control and make decisions • influence no power or other? Please specify _____
D.4. societal drivers …
Reference documentation & notes • … • … • …

SHEET 10		
2.3.2. Category Barriers (B) *Instructions: Compile the scores according to stakeholder judgment using definitions in AF paragraph 3.1.1. & 3.1.2 (a). If required extend categories and factor list according to step 2.2. (section 2.2.2.).* *Scoring instructions:* • *high obstacle score = -3* • *medium obstacle score = -2* • *low priority score = -1* • *absent = 0 (*the factor is not present*)* • *not relevant = 0 (*the factor is present, but it has no influence on MU potentials or MU effects*)* • *I do not know = NK (*there is no knowledge on the factor*)*		
Category B.1 – legal barriers (e.g. marine renewable policy)	**Factor list**	**Score**
	Factor B.1.1_____	
	Factor B.1.2_____	
	Factor B.1.n_____	
Category B.2 – administrative barriers (e.g. specific administrative	**Factor list**	**Score**

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obstacles in allowing MU)	Factor B.2.1_____ Factor B.2.2_____ Factor B.2.n_____	
Category B.3 – barriers related with economic availability / risk (e.g. lack of full understanding of economic benefits of MUs – i.e. no investors)	**Factor list** Factor B.3.1_____ Factor B.3.2_____ Factor B.3.n_____	**Score**
Category B.4 – barriers related with technical capacity (e.g. specific technical problems affecting combination of some uses)	**Factor list** Factor B.4.1_____ Factor B.4.2_____ Factor B.4.n_____	**Score**
Category B.5 – barriers related with social factors (e.g. social acceptance of MU)	**Factor list** Factor B.5.1_____ Factor B.5.2_____ Factor B.5.n_____	**Score**
Category B.6 - barriers related with environmental factors (e.g. achievement of natural conservation targets)	**Factor list** Factor B.6.1_____ Factor B.6.2_____ Factor B.6.n_____	**Score**
Others	**Factor list** Factor B.n.1_____ Factor B.n.2_____ Factor B.n.n_____	**Score**
Reference documentation & notes • **…** • **…** • **…**		

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2.4. Evaluation of Overall MU Effects

SHEET 11

2.3.3. Category Added Values (V)

Instructions: Compile the scores according to stakeholder judgment using definitions in AF paragraph 3.1.1. & 3.1.2 (b). If required extend categories and factor list according to step 2.2. (section 2.2.3.).

Scoring instruction:

- *high added value = +3*
- *medium added value = +2*
- *low added value = +1*
- *absent = 0 (*the factor is not present*)*
- *not relevant = 0 (*the factor is present, but it has no influence on MU potentials or MU effects*)*
- *I do not know = NK (*there is no knowledge on the factor*)*

Category V.1 - economic added value (e.g. reduction of overall costs)	**Factor list**	**Score**
	Factor V.1.1_____	
	Factor V.1.2_____	
	Factor V.1.n_____	
Category V.2 - societal added value (e.g. conservation of traditional sea uses)	**Factor list**	**Score**
	Factor V.2.1_____	
	Factor V.2.2_____	
	Factor V.2.n_____	
Category V.3 - environmental added value (e.g. reduction of overall environmental impact)	**Factor list**	**Score**
	Factor V.3.1_____	
	Factor V.3.2_____	
	Factor V.3.n_____	
Category V.4 - better insurance and risk management (e.g. share risk management among different operators)	**Factor list**	**Score**
	Factor V.4.1_____	
	Factor V.4.2_____	
	Factor V.4.n_____	
Others	**Factor list**	**Score**
	Factor V.n.1_____	
	Factor V.n.2_____	
	Factor V.n.n_____	

Reference documentation & notes

- **…**
- **…**
- **…**

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SHEET 12

2.3.4. Category Impacts (I)

Instructions: Compile the scores according to stakeholder judgment using definitions in AF paragraph 3.1.1. & 3.1.2 (b). If required extend categories and factor list according to step 2.2. (section 2.2.4.).

Scoring instruction:

- *high impact = -3*
- *medium impact = -2*
- *low impact = -1*
- *absent = 0 (*the factor is not present*)*
- *not relevant = 0 (*the factor is present, but it has no influence on MU potentials or MU effects*)*
- *I do not know = NK (*there is no knowledge on the factor*)*

Category I.1 - economic impacts (e.g. increased competition with other sectors not included in MU)	**Factor list**	**Score**
	Factor I.1.1_____	
	Factor I.1.2_____	
	Factor I.1.n_____	
Category I.2 - societal impacts (e.g. increased societal non-acceptance of maritime activities)	**Factor list**	**Score**
	Factor I.2.1_____	
	Factor I.2.2_____	
	Factor I.2.n_____	
Category I.3 - environmental impacts (e.g. increased cumulative impacts on marine benthic ecosystem)	**Factor list**	**Score**
	Factor I.3.1_____	
	Factor I.3.2_____	
	Factor I.3.n_____	
Others	**Factor list**	**Score**
	Factor I.n.1_____	
	Factor I.n.2_____	
	Factor I.n.n_____	

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4.3. Transboundary areas

Any 'transboundary' issues that are raised by stakeholders during consideration of the research questions under paragraph 4.2 above, will be explored by the MUSES team.

There will be specific discussion with the stakeholder on how transboundary issues (legal, administrative, etc.) influence MU potentials.

Transboundary issues of relevance for MU development that require specific MU analysis will be identified by each sea-basin team. This will be done at the beginning of the analysis in parallel with starting country level screening. Decisions whether to conduct an overview of the transboundary areas and which areas should be analysed will be taken by the sea basin leaders.

The template provided below will be used for screening the MU transnational projects (only if relevant).

Step 2.1 (a): Transboundary areas overview

SHEET T1				
2.1.3. Overview of existing/potential MU projects/sites				
Describe existing/potential MU projects/sites	…			
Project aim	…			
Project name	…			
Partners involved	…			
contact/info details	…			
Location	Proposal: Use the unified EEA reference Grid (1 km2, shapefile). The grid provides a unique CELL ID (e.g. 1kmE3900N1300), that can be used as spatial identifier of the MU or for areas of MU potential. Lon/lat **EEA reference grid:** The grid is based on the recommendation at the 1st European Workshop on Reference Grids in 2003 and later INSPIRE geographical grid systems. For Europe and each country three vector polygon grid shape files, 1, 10 and 100 km, are available. The grids cover at least country borders and, where applicable, marine Exclusive Economic Zones v2.0, www.vliz.be/vmdcdata/marbound. Note that the extent of the grid into the marine area does not reflect the extent of the territorial waters. Reference: http://www.eea.europa.eu/data-and-maps/data/eea-reference-grids-2.			
MU commencement (date)				
Legal basis of MU – administrative obligation/private contract/research project	Administrative/obligation Research project	☐ ☐	Private contract	☐
Level of maturity of MU	Planned Full implementation *Provide date/ time period of maturity level*:	☐ ☐	Design phase Commercial use	☐ ☐
Is MU cooperation subsidized	International National	☐ ☐	EU level Regional	☐ ☐

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Sea basin	Atlantic	☐	North & Baltic Sea	☐
	Baltic Sea	☐	North Sea	☐
	Black Sea	☐	North Sea & Atlantic	☐
	Med Sea	☐	ALL Sea-basins	☐
Country	Belgium	☐	Lithuania	☐
	Bulgaria	☐	Malta	☐
	Croatia	☐	Netherlands	☐
	Cyprus	☐	Northern Ireland	☐
	Denmark	☐	Norway	☐
	England	☐	Poland	☐
	Estonia	☐	Portugal (Azores)	☐
	Finland	☐	Portugal (Mainland)	☐
	France	☐	Rumania	☐
	Germany (Baltic Sea)	☐	Scotland	☐
	Germany (North Sea)	☐	Slovenia	☐
	Greece	☐	Spain	☐
	Ireland	☐	Sweden	☐
	Italy	☐	Wales	☐
	Latvia	☐	Other country: _____	☐
Advantages from MU	*What are the advantages from MU?* *1.* _____ *2.* _____ *3.*_____ *4.*_____ *5.* _____			
Possibility of extension	*What are the possibilities of extension of MU?* *Where?* _____ *What?* _____ *Who?* _____ *What are the conditions for extension?* _____			
Key private actors for MU development	*What are the key actors involved?* _____ _____ _____ _____ _____ _____ _____ _____			
Others ?				
Reference documentation & notes				

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- …
- …
- …

Step 2.1. (b): Identification of MU Potentials

SHEET T2		
Type, location, added value		
a)	Type of MUs combinations	Based on typology AF 2.2
b)	Advantages from MU	specify
c)	Key projects outputs relevant for MU development	specify

Step 2.2.: Analysis of MU Potentials and effect: catalogue of factors (drivers, barriers, added values, impacts).

SHEET T3		
Political, legal and regulatory framework		
a)	Key political/legal/regulatory drivers of MU development	(specify)
b)	Key political/legal/regulatory barriers of MU development	(specify in line with AF 2.3)
c)	Key solutions proposed to address the drivers and barriers	(specify)

SHEET T4		
Environmental aspects		
a)	Environmental conditions/nature components vulnerable to intensification of sea use / new sea use	
b)	MU types with expected positive environmental impact	
c)	MU types with expected neutral environmental impact	
d)	MU types with expected negative environmental impact	

SHEET T5		
Socio-economic aspects		
a)	Social groups / aspects vulnerable to intensification of sea use / new sea use	
b)	MU types with expected positive socio-economic impact	
c)	MU types with expected neutral socio-economic impact	
d)	MU types with expected negative socio-economic impact	

SHEET T6		
Knowledge gaps/ key research questions		
a)	Environmental impacts	
b)	Technology	
c)	Health and Security	
d)	Others	

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4.4. Sea basin level

The national and transboundary analysis conducted by Sea Basin leaders in WP2 will allow the identification of key sea basin-level elements requiring joint actions in the WP 4 action plan. Analysis under WP2 will identify some "hot elements" for each of the sea-basin (sub-basin), including:

- the most feasible MUs and MU combinations for a given sea basin
- the three most relevant MUs drivers to be boosted,
- the three most relevant MU barriers to be overcome ,
- the three most relevant types of MU added value,
- the three most relevant MU impacts,
- the three most relevant knowledge gaps,
- the three most relevant good practices of interest for other sea basins.
- topics related to MUs that cannot be solved at national level and require transnational co-operation.

It is expected that for the issues listed above the following information will be provided:

1. Environmental aspects of feasible MUs concept in a given sea basin
    a. environmental conditions/nature components vulnerable to intensification of sea use / new sea use
    b. MU types with expected positive environmental impact
    c. MU types with expected neutral environmental impact
    d. MU types with expected negative environmental impact
2. Socio-economic aspects of feasible MUs concept in a given sea basin
    a. social groups / aspects vulnerable to intensification of sea use / new sea use
    b. MU types with expected positive socio-economic impact
    c. MU types with expected neutral socio-economic impact
    d. MU types with expected negative socio-economic impact
3. Knowledge gaps / key research questions
    a. Environmental impacts
    b. Technology
    c. Others
4. MU Potential and added value of feasible MUs concept in a given sea basin as identified in line with methodology described under chapter 3.1
5. MU drivers and barriers of feasible MUs concept in a given sea basin
    (who and what *e.g. who is the barrier and what creates the barriers*) as identified in line with methodology described under chapter 3.1

Commonalities at an EU scale will also be highlighted in order to feed policy development at Community level. This cross-cutting analysis might in principle be carried out at 1) national level, 2) sub-regional level, 3) regional sea level, 4) EU level.

Below there is a list of questions that should be answered in the sea basin reports concerning countries.

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1. Existing MU practices
    a. existence of operational MU examples (y/n)
    b. type of MU (sectoral selection list)
    c. MU commencement (date)
    d. legal basis of MU – administrative obligation/private contract/research project (selection list)
    e. level of maturity of MU - commercial or pilot/demonstration (selection list)
    f. is MU cooperation subsidized - country/EU level (selection list)
    g. ownership status of MU partners – private / public (selection list)
    h. advantages from MU (specify)
    i. possibility of extension (specify)
    j. exact location (coordinates)
    k. MU partners (specify)
    l. contact/info details (project name, website, etc.)
    m. other info

2. Feasible MU concepts in each country in a given sea basin based on expert knowledge, literature and results of the previous projects
    a. The most probable and feasible MUs that exist and can appear in 5 years and in several sites
    b. The less probable and feasible MUs that might either require a long time to become a reality or/and might appear in one or two sites only

3. MU concept in political, legal and regulatory framework by sea basin countries
    a. presence of MU at sea basin policy level - obligatory/recommended/not present/ hindered/forbidden (selection list) + (sectoral selection list)
    b. presence of MU at national policy level - obligatory/recommended/not present/ hindered/forbidden (selection list) + (sectoral selection list)
    c. presence of MU at national legislation level - obligatory/recommended/not present/ hindered/forbidden (selection list) + (sectoral selection list)
    d. presence of MU at MSP level explicit reference of MU in National Marine Plans- obligatory/recommended/not present/ hindered/forbidden (selection list) + (sectoral selection list)
    e. presence of MU at individual administrative decision level - obligatory/recommended/not present/hindered/forbidden (selection list) + (sectoral selection list)
    f. presence of economic incentives for MU (selection list) + (sectoral selection list)
    g. key political/legal/regulatory drivers of MU development (specify)
    h. key political/legal/regulatory barriers of MU development (specify)

4. Public outreach and stakeholders opinion on MU
    a. presence of MU in public discussion - required/discussed/not known/not interesting/rejected (selection list) + (sectoral selection list)
    b. presence of sectoral conflicts on the co-location basis – y/n + (sectoral selection list)
    c. expected future conflicts on the co-location basis – y/n + (sectoral selection list)
    d. key actors and their attitude (selection list) + (sectoral selection list)
    e. possible needs for MU to increase benefits (specify) + (sectoral selection list)

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f. possible needs for MU to reduce losses (specify) + (sectoral selection list)
g. possible needs for MU to mitigate conflicts (specify) + (sectoral selection list)
h. drivers necessary to stimulate MU (specify)
i. barriers preventing MU development (specify)
j. solutions for MU (suggested development directions)
k. benefits/advantages from MU

All these issues should be analysed within the relevant WP procedural steps introduced in chapter 2 and 3 of the AF. The templates provided above will be used.

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5. Guidelines for Geographical/Spatial Data Representation

5.1. Introduction

MUSES project partners need to deal with geographical data, especially to address map-making efforts. Collecting and mapping data related to existing and potential Multi-Uses, as well as other important spatial features in the scope of the project, require a harmonisation of the spatial data management and the mapping process.

The European Commission directs that the efforts from data harmonisation, interoperability and access should produce direct benefits reducing operational costs of data acquisition and deliver better information base for policy development and implementation (European Commission, 2010).

The European Union recognizes that "problems regarding the availability, quality, organisation, accessibility and sharing of spatial information are common to a large number of policy and information themes and are experienced across the various levels of public authority" (Directive 2007/2/EC). To establish rules for data components, metadata, interoperability of spatial data sets and services, network services, data sharing, coordination and complimentary measures, and other provisions, the European Parliament and the Council of the European Union laid down the Directive 2007/2/EC for establishing an Infrastructure for Spatial Information in the European Community (INSPIRE). The INSPIRE Directive will serve as a reference for this document.

5.2. Objectives

During the project, mainly in work packages 2, 3 and 4, there will be the need to produce and present maps in support of various tasks. The existence of agreed and shared guidelines in the production of those maps will ensure that all partners will be working under common guidelines and facilitate the visual consistency of the maps to be presented to stakeholders.

Although systematic data collection is not considered in the project and taking account the different needs for data according to geographical space and scale, a basic set of criteria to assure visual consistency of maps for MUSES purposes and their interoperability for future uses is needed.

5.3. General recommendations

- All the geographical data in the framework of the MUSES project should adhere to rules and guidelines set up by the INSPIRE Directive (Directive 2007/2/EC).
- Define/allocate a person responsible for spatial data management and map production in each partner organisation. This will allow all sea basins and case studies to work in parallel and networking for normalization of results (see Tab. 5).
- Define explicit spatial objectives for each Sea Basin and case study data collection actions. This will assist preparation of the strategy and the approach to the spatial data issues in the plan.
- Address individual sectoral data needs and difficulty in mapping dynamic biological data. Modelling, proxy parameters, and trade-offs with other kinds of data could be alternatives for these issues. Keep track of all these actions.
- Ensure maintenance of the data ownerships to the stakeholders and hence establish the trust between the parties, complying and interacting with specific data policies and licenses in accordance with WP6 on Ethics.

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- Identification of the required data and the degree of necessity of the information streamlining of data collection and assessments. Share this within MUSES Team, it can help to scale needs and actions.
- If necessary, define metadata standards and a common technical standards but always ensure that they are in accordance with INSPIRE requirements.
- The same standard of maps production throughout the project should be maintained.

Table 5. MUSES individuals representitives for spatial data management and map production

Organisation	Person in charge
Marine Scotland (MS)	Andronikos Kafas
University of Dundee (UNIVDUN)	Vincent Onyango
Thetis (THET)	Angiola Fanelli
Institute of Marine Science (ISMAR)	Alessandro Sarretta
Submariner Network (SUBM)	Served by MIG
Alfred Wegener Institute (AWI)	Served by MIG
Hellenic Centre for Marine Research (HCMR)	Stefanos Kavadas
Ecorys (ECO)	Aneta Kovacheva
Maritime Institute Gdansk (MIG)	Joanna Pardus
Fundação Gaspar Frutuoso (FGF)	Mario Cana

5.4. Specific recommendations

- ***Metadata***

Metadata consists of properties and documentation; it is the information that describes the content, quality, condition, origin, and other characteristics of data or other pieces of information.

Some GIS software produces metadata automatically. In ArcGIS, for example, it is possible to export the "INSPIRE Metadata Directive", among others. However, only fields corresponding to geographical information (such as coordinate system, extension, etc.) will be automatically filled. Remaining fields must be manually completed using an editor which in case of ArcGIS is available in ArcCatalog. In many open source software, such as QGIS, plug-ins to edit metadata are also available.

RECOMMENDATION:

For MUSES-generated data we recommend the use of English language.

Metadata shall include the following information according to the INSPIRE Directive:

a) the conformity of spatial data sets with the implementing rules provided for in Article 7(1) [referred to interoperability of data];

b) conditions applying to access to, and use of, spatial datasets and services and, where applicable, the corresponding fee;

c) the quality and validity of spatial data sets;

d) the public authorities responsible for the establishment, management, maintenance and distribution of spatial datasets and services;

e) limitations on public access (if any) and the reasons for such limitations.

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In order to facilitate the provision of discovery services, metadata should also include:

a) keywords

b) classification of spatial data and services

c) geographical location.

On the INSPIRE webpage (http://inspire-geoportal.ec.europa.eu/), a metadata editor with all fields is available. There are some mandatory fields which need to be fulfilled (some of them are automatically fulfilled by GIS software like ArcGIS):

- Metadata language
- Metadata date
- Metadata point of contact
- Responsible party
- Conditions applying to access and use
- Limitations on public access
- Resource title
- Spatial Data Theme
- Topic category
- Resource abstract
- Unique resource identifier
- Resource locator
- Keyword
- Geographic bounding box
- Coordinate Reference System

We also suggest fulfilling these optional metadata fields:

- Lineage
- Resource language
- Temporal reference
- Spatial resolution

- ***Spatial Reference***

Spatial reference usually refers to the coordinate system, tolerance, and resolution used to store a spatial dataset.

RECOMMENDATION:

Datum: WGS 84

Coordinate systems for:

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European scale: WGS_1984_WorldMercator (EPSG:3395) or ETRS_1989_LAEA (Lambert_Azimuthal_Equal_Area) (EPSG: 3035)

Regional/Sea basin scale: UTM with appropriate zone or the same for all sea basins (EPSG 3395)

Case study scale: UTM with appropriate zone or WGS_1984_WorldMercator (EPSG 3395)

- ***Data Exchange Formats***

Data exchange may be needed between partners and should be facilitated via a common means of sharing files.

Exchange of spatial data within partners of MUSES project should be done with one of the following formats:

RECOMMENDATION:

Vector data as shape files (SHP) with projection files

Raster data as ESRI GRID, binary, ASCII format or Geotiff

Images as TIFF (uncompressed), JPEG, PNG or other "standard" image format.

Within possible, the images should be georeferenced by ESRI worldfiles.

All data should be in accordance with previous selected spatial reference.

If any other form or adapted form is used, that should be clearly described on metadata.

- ***Sea Basins/Case study boundaries***

Official boundaries for sea basin and/or case studies should be used.

RECOMMENDATION:

- For Regional/Sea basin boundaries: use boundaries from the Marine Strategy Framework Directive (Map 1).

Note: North Sea is considered as a sub-region in the Directive while the other 4 sea basins are considered regions.

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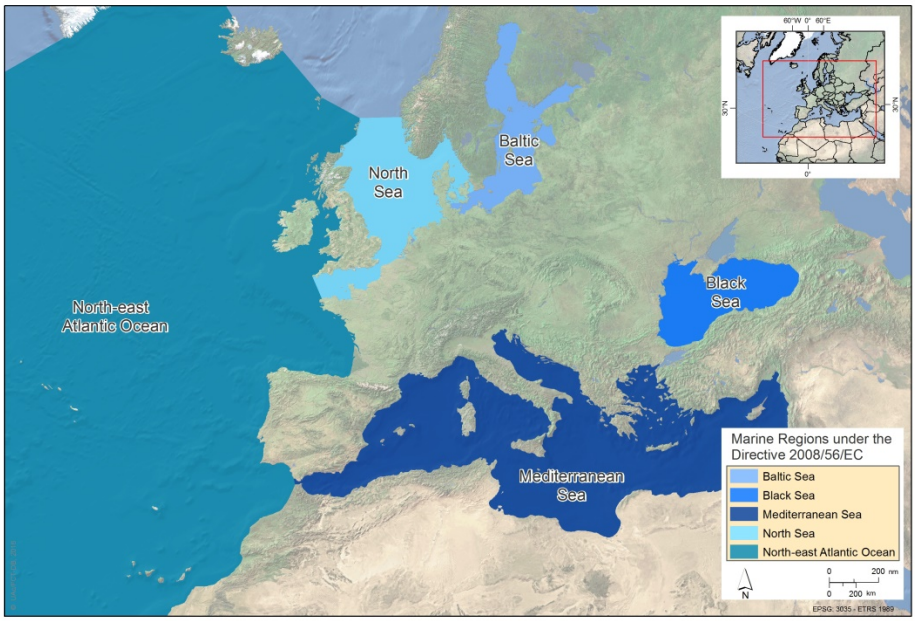

Map 1 *– Region boundaries of the Marine Strategy Framework Directive.*

Source: own elaboration by FGF

- ***Data sources***

RECOMMENDATION:

A common list or database of spatial data sources will be created. This list can be classified by geographical scope or coverage (European seas and each sea basin respectively). It can also be used to clarify the data sources used for all partners. This list will be stored in the SharePoint and be available for every partner to update during the course of the project.

An initial list with some data sources is provided (Tab. 6). This list can be stored with some relevant information like the website or dataset scale.

Table. 6. Example of data sources list.

Source	Website	Data	Scale	Source for:
Continental Shelf Programme GRID Arendal	http://continentalshelf.org/onestopdatashop/6350.aspx	ECS claims	World	
European Atlas of the Seas	http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas/	Tourism, Energy…	European Union	
European Marine Observation and	http://www.emodnet.eu/	Bathymetry, Geology, Habitats…	European Union	Bathimetry (in specific cases, e.g.

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Data Network (EMODnet)				Atlantic)
Marine Regions	http://marineregions.org/downloads.php	EEZ, FAO areas…	World	
Ocean Data Viewer UNEP WCMC	http://data.unep-wcmc.org/	Protected Areas, MEOW	World	
General Bathymetric Chart of the Oceans (GEBCO)	http://www.gebco.net/data_and_products/gridded_bathymetry_data/	Bathymetry	World	
Helsinki Commission (HELCOM)	http://www.helcom.fi/baltic-sea-trends/data-maps/	Biodiversity, human activities	Baltic	
OSPAR's Data & Information Management System	http://odims.ospar.org/	Energy, pollution…	Atlantic & North Sea & Arctic	

- ***Base Maps***

The scale of spatial data depends largely on the subject of the planning and planning area. A carefully conceived strategy which determines the minimum sufficient resolution is the key to success. In simple terms, there will be no fixed scales for the sea basins (GIS maps are flexible and can be zoomed according to needs and even size of print-out).

RECOMMENDATION:

- European scale should be fixed to all partners

We recommend 1:25.000.000

- Regional/Sea basin should provide an overview without much detail; a graphical and numerical scale must be evident to the reader

- Case studies must show much more specific details and, if applicable, split case study areas into more detailed scales; a graphical and numerical scale must be evident to the reader

- ***Naming spatial data sets***

To facilitate data sharing among partners or the future publication of data sets, common guidelines should be adopted by all partners and throughout the project.

RECOMMENDATION:

Use a simple coding starting by sea basin and/or case study, when applicable, and representative names by thematic areas.

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- ***Data sets (to be finished)***

Needs for new data collection exercises will be identified during the several phases of the project. However, in case of several data sets which will be common for all basin and case-studies (i.e. bathymetry), decisions can be taken about which data source is used.

RECOMMENDATION
Administrative boundaries - Government regulations - Bathymetry - Shoreline morphology - Soils, geology and coastal processes - Substrates (geology) - Geochemistry - Climatic factors - Water quality - Air quality - Physical oceanography - Chemical oceanography - Marine meteorology - Biology, biodiversity, flora and fauna - Hazards - Nature conservation - Population and human health - Structures - Human activities - Material assets - Cultural heritage - Others?

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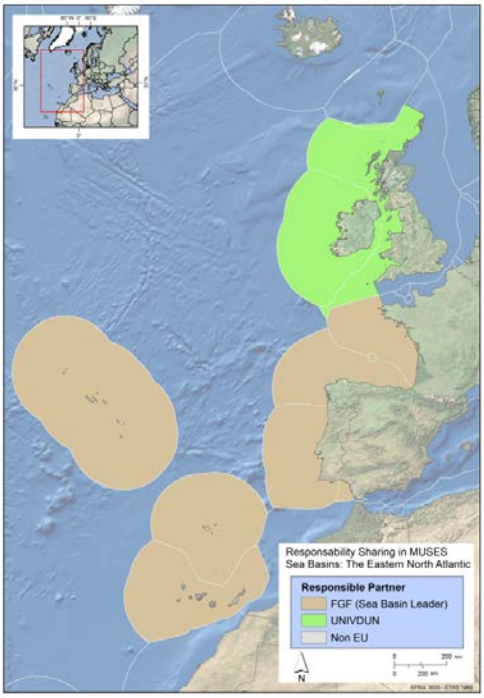
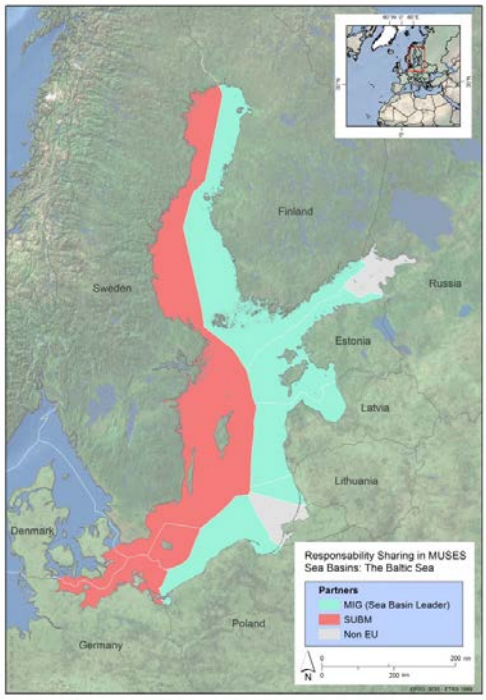
- ***Sharing Responsibility for partners***

Maps are provided to have a geographical approximation of the responsibility of MUSES partners over the 5 Sea Basins of the project. A set of 5 maps, one per sea basin, which includes the Sea Basin leaders, serves as a reference for partners on this issue.





Map 2 and 3 *– Screening countries by the MUSES partners in the Baltic Sea and Atlantic basins.*
Source: own elaboration by FGF

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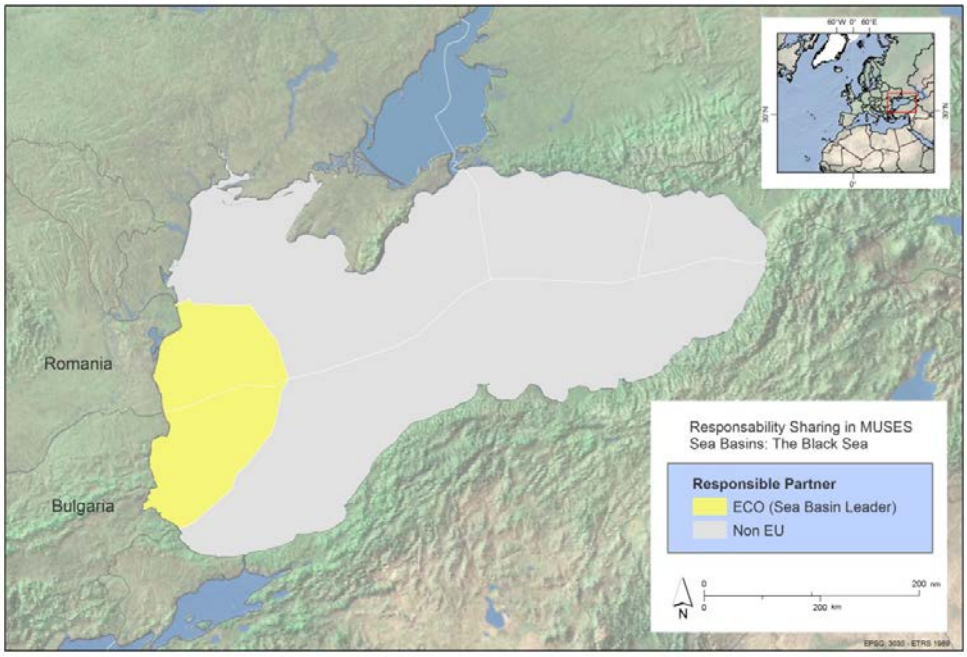
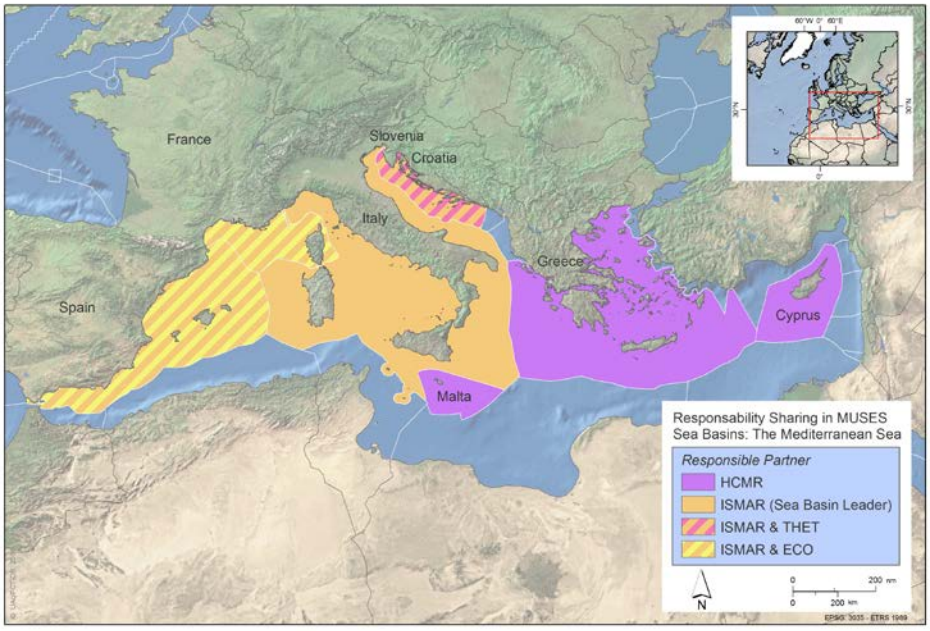


Map 4 *– Screening countries by the MUSES partners in the Black Sea basin.*
Source: own elaboration by FGF



Map 5 *– Screening countries by the MUSES partners in the Mediterranean Sea basin.*

Source: own elaboration by FGF

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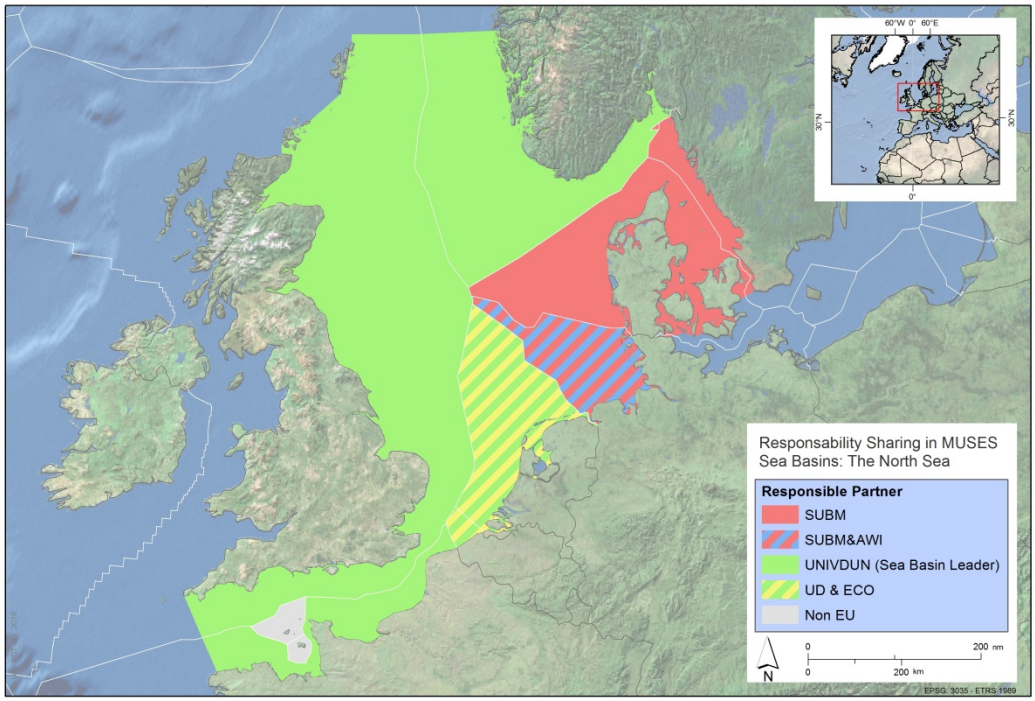

Map 6 *– Screening countries by the MUSES partners in the North Sea basin.*

Source: own elaboration by FGF

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