SIMAtlantic

D1.2
Current and future uses and needs of the European Atlantic region

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SIMAtlantic:
Supporting implementation of maritime spatial planning in the Atlantic region

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Acronyms

AAC – Aquaculture Advisory Council

CFP - Common Fisheries Policy

EIA – Environmental Impact Assessment

EIP – European Innovation Partnership on raw materials

EMFAF – European Maritime Fisheries and Aquaculture Fund

EMFF – European Maritime and Fisheries Fund

ENTSO – E – European network of transmission system operators for electricity

ESCA – European Subsea Cables Association

EU – European Union

ICPC – International Cable Protection Committee

IOGP – International Association of Oil and Gas Producers

IMO – International Maritime Organization

IMP – Integrated Maritime Policy

IPCC – Intergovernmental Panel on Climate Change

MPA – Marine Protected Area

MRE - Marine Renewable Energy

MSFD – Marine Strategy Framework Directive

MSP – Maritime Spatial Planning

O&G – Oil and Gas

OWF – Offshore Wind Farm

PCI – Projects of Common Interest

SIMAtlantic – Supporting Implementation of maritime spatial planning in the Atlantic region

SIMCelt - Supporting Implementation of Maritime Spatial Planning in the Celtic Seas

SIMNORAT – Supporting the Implementation of Maritime Spatial Planning in the North Atlantic Region

TEN – E – Energy corridors identified by EU to support the development of energy infrastructure

TSS – Traffic Separation Schemes

UNCLOS – United Nations Convention on the Law of the Sea

UNCTAD – United Nations Conference on Trade and Development

WPC – World Petroleum Council

WTO – World Trade Organization

1 Rationale and purpose

One of the main goals MSP seeks to achieve is compatibility of activities and uses, reducing conflicts and fostering synergies in one particular area in order to achieve the most efficient use of the space by identifying the best position on the sea where a human activity can be carried out according to ecological, economic and social variables (IOC-UNESCO, 2009; European Union, 2014). Furthermore, it not only aims to deliver coexistence of particular uses at a particular time, but also the maintenance of this coexistence in the long term, even with the arrival of new maritime activities and uses, considering also emerging sectors.

These idyllic objectives normally imply the need to use the best data and information available, first, regarding current activities and the interactions among them and secondly, when talking about the long term, data on trends and future projections. The first aspects related to the present, although complex, are fairly achievable, however, when we talk about assessing the future, the issue gets more complicated and any result or outcome becomes less certain, the error range growing considerably.

Consequently, knowledge or data gaps appear many times during the process, as decision making in MSP needs to be focused on "the best available knowledge" (MSPD, EU, 2014) trying to avoid, to the maximum extent, uncertainty. But what if the best available knowledge is full of gaps and uncertainties? The real context in which this study is developed (COVID-19 pandemic) highlights the fact that the approach should be enlarged to include uncertain situations, as assumptions that were normally made, nowadays might not correspond to reality.

It is reasonable to have the willingness to work with the greatest possible certainty and with the maximum of quantified data possible. However, we should remember that MSP is not an exact science and that it is happening temporally and within a dynamic space, involving numerous actors, at different scales, of different kinds (private and public) and from different sectors. Therefore, we cannot just acknowledge and identify gaps and uncertainties; we have to deal with them. Consequently, there is a need for developing tools for decision making that work well in uncertain environments as lack of data cannot be a reason for inaction (IOC-UNESCO, 2009).

However, how do we work with something that we do not know? It is here that the design of exploratory (qualitative) scenarios to understand strategic issues (Borjeson et al, 2006 in McGowan et al 2018) plays an important role, not only in the present to test potential measures or answers to existing issues, but also to prevent future issues or to promote synergies. Exploratory scenarios consider "what can happen?" given a set of plausible futures (McGowan et al., 2018). It may not be possible to predict a certain future but we could design a potential future regarding for instance, a specific interaction between uses, analyze their implications, and thus, propose measures in the present that could prevent conflicts and maximize synergies in the future.

Considering all these aspects, the purpose of this task is to provide framework information and guidelines for the improvement of integration between activities in the project area by focusing on the prevention of potential future conflicts and promotion of possible synergies. This was proposed to be achieved by two complementary approaches:

- A background review of existing analyses and past initiatives (i.e. SIMNORAT and SIMCelt outputs) related to maritime activities and strategies at regional level. This

work has been developed in order to have a “state of art” or a “picture” regarding uses and activities in the area. The output of this subtask is structured as factsheets of maritime sectors presenting basic facts of the sector in the project area and providing sources of more information.

- A decision support tool has been developed to address interactions between activities. This method is based on permanent characteristics of the activities, but also in their surrounding changing context, being flexible enough so these characteristics can define a specific interaction scenario in the most realistic way possible.

This task did not collect new information but rather capitalized on previous studies in the area, combining and reflecting on their outputs to develop a practical product.

2 State of the art

This section provides basic facts about maritime activities in the area, their characteristics and their contexts, insights to understand main drivers of status and trends of each sector in the project area. Different sections are developed for each maritime sector:

- *Specific characteristics*: Basic facts that define the sector in the project region.
- *State of the sector:* General state of actual trend of the sector in the project region.
- *Relevance across jurisdictional zones:* Aspects of the sector that makes it relevant for MSP in the project region.
- *Interaction with other uses:* Potential interactions and aspects that define them.
- *Governance arrangements:* Governance systems in place for the sector in the project region.
- *Sector specific strategies:* Relevant strategies in the project region for the sector (if any)
- *Future perspectives:* Compilation on future perspectives concluded from previous studies and consultations
- *Further information:* Sources of more detailed information for the aspects contained in the table

FISHERIES
Specific characteristics
• Wide variety of fishing vessels, fishing techniques and large number of fish species targeted. Those different types of fisheries will be treated in common in this state of the art. • General pattern of dominant small-scale fishing in the south and deep-sea fishing more important in the north.
State of the sector
• Reduction of fishing effort and fishing fleet, due to different factors: overfishing, stock fluctuations, combat against the overexploitation of resources and to protect spawning grounds.

Relevance across jurisdictional zones
• Historically an important activity for all the countries of the SIMAtlantic study area with a long tradition of spatial claims. • Fishing activities are present throughout the study area. • Concern among fishers that they may lose access to their current fishing grounds • The redeployments of fisheries caused by the growth of new activities are carried out to areas which are already over-utilised or host sensitive environment
Interactions with other uses
• Spatial demand for the professional fishing sector is already high. With the growth of new maritime uses, the need for greater sharing of space means that there could be more potential for conflict. • Fishermen's concerns regarding the development of permanent occupation of the maritime zones for the installation of structures, such as some renewable energy at sea, aquaculture or the installation of underwater cables and structures that could prohibit the use of certain fishing gears and total exclusion. • Impacts on the marine environments from the collection of species (sometimes overfishing[1]) and the destruction of ecosystems by different types of gear.
Governance arrangements
• Several organizations representing the interests of fishing professionals at European and at national & local levels. • Exclusive competence of the European Union for conservation of marine biological resources under the Common Fisheries Policy (CFP) and shared competence with Member States for fisheries generally (except marine biological resources) and for the environment.
Sector specific strategies
• United Nations Convention on the Law of the Sea (UNCLOS) and Straddling Stocks Agreement. • Common Fisheries Policy (CFP) and associated Regulations (including area-based management measures). • European Maritime, Fisheries and Aquaculture Fund (EMFAF) • Atlantic Strategy. *The Commission intends to propose an appropriate framework as soon as the CFP reform is finalised.*
Future perspectives (if clearly identified)
• Several elements could lead to a modification of the fishing zone for part of the fishing activities: the increase of restrictive measures to preserve important fish

[1] OurFish (2017) & STECF (2017) in https://www.msp-platform.eu/sector-information/fishing

habitat as part of management policies[2] (such as the CFP); a growing need for space sharing due to the rise of other activities; agreements between countries (such as Brexit agreement); climate change is expected to lead to more extreme weather conditions as well as rapid warming of waters and acidification.

- The reduction in the number of fleets, the implementation of sustainable fisheries management and the accelerated use of selective fishing is expected to have positive effect on European fish stocks in the medium term. It could lead to an increase in the gross value added (GVA) of the fishing sector and the possible extension into areas not utilised to date for fisheries.

Further information

- SIMNORAT D8: Spatial demands and future trends for maritime sectors and marine conservation
- SIMNORAT D1: Initial Assessment Developing an Overview
- SIMCelt D3c: Overview Report on the Current State and Potential Future Spatial Requirements of Key Maritime Activities
- https://www.msp-platform.eu/sector-information/fishing
- https://oap.ospar.org

SHIPPING

Specific characteristics

- The sector depends more on fluctuations in economic markets.[3]
- Mature sector of Europe's maritime economy, contributing to high levels of gross value added (GVA) and employment in Member States.[4]
- Marine traffic routes are defined by international law (i.e. International Maritime Organization - IMO). In addition, the European Union introduced the concept of Motorways of the Sea in the White Paper on Transport in 2001[5].

State of the sector

- Despite in some specific cases (ferry passenger transport in UK, Ireland and France) the sector, in general (including cruises), has shown a general trend of growth and it is expected that this trend will continue in the near future.
- Additional and new ferry routes have commenced between Ireland and mainland Europe this year (2021) as a result of the UK's departure from the EU.

Relevance across jurisdictional zones

- Shipping takes place throughout the SIMAtlantic maritime area.

[2] Fishermen interviews in SIMNORAT D8: Spatial demands and future trends for maritime sectors and marine conservation
[3] Frémont & al. 2013
[4] Ecorys, 2014 in SIMCelt 2017
[5] Available at: https://ec.europa.eu/transport/themes/strategies/2001_white_paper_en

- Highest densities of ship traffic are found in the English Channel and at the entrance to the Mediterranean Sea.
- Several traffic separation schemes (TSS) are in place in the project area.

Interaction with other uses

- There is increasing competition and spatial demand for shipping and wind farms. The main concerns here relate to safety of navigation, the prevention of accidents and pollution.

Governance arrangements

- European Community Shipowners' Associations (ECSA)
- International Maritime Organization (IMO).
- Cruise Lines International Association (CLIA).

Strategies, initiatives and legal arrangements

- European Commission: Integrated Maritime Policy and Sustainable Blue Economy.
- Short Sea Shipping.
- Motorways of the Sea.
- Atlantic Strategy and Action Plan.
- Each member state in the SIMAtlantic study develops its own public policies in support of the development of ports and maritime transport.

Future perspectives (if clearly identified)

- The use of larger vessels and the effects of rerouting could affect the demand for space in the commercial transport sector, which is currently experiencing strong global growth in traffic and thus freight volume.
- Current transport policies advocating greater development of maritime transport in intra-European transport are opportunities for the development of short sea shipping, which also affects marine space.
- Climate change makes weather routing important, and the space needs to be available.
- Increased deployments of marine renewable energy devices may result in increased competition for port access and space, adding to pressures on coastal locations and space for shipping/transport.

Further information

- SIMNNORAT D8: Spatial demands and future trends for maritime sectors and marine conservation
- SIMNORAT D1: Initial assessment: developing an overview
- SIMCelt D3c: Overview Report on the Current State and Potential Future Spatial Requirements of Key Maritime Activities
- Ecorys, 2011 in SIMCelt (2017).

• SIMCelt D1: Initial Assessment Developing an Overview	• https://oap.ospar.org • https://www.msp-platform.eu/sites/default/files/sector/pdf/mspforbluegrowth_sectorfiche_shippingports.pdf

MARINE AGGREGATES

Specific characteristics

- The marine aggregates sector considers the exploration, exploitation and extraction of marine sediment from the seabed, mainly sand and gravel, for potential use in construction, beach nourishment/coastal protection or filling purposes. Agricultural soil improvement is a less common way.

State of the sector

It depends on the country, however, there are some commonalities:

- The restrictive regulatory framework for obtaining exploitation rights for marine aggregates is presented as an obstacle to the development of the activity.
- In any case, there are not enough defined arguments to state that the activity is growing or in decline, so we can assume a stagnant situation.

Relevance across jurisdictional zones

- Extraction of aggregates occurs off the North-West and South-West of England[6]. There is currently no commercial extraction of marine aggregates in Ireland, Scotland and Northern Ireland. France extracts marine aggregates for construction. On the other hand, in Spain extraction of aggregates for construction is specifically forbidden and the activity is only allowed for beach nourishment and in port related dredging, and in that case is subject to an Environmental Impact Assessment (EIA).
- Different reasons (e.g. beach nourishment and port maintenance) make this use a necessary activity in every country that has spatial implications and relevance in the context of MSP.
- For the sake of cost of marine aggregates, it is likely that any increase in the number of applications for authorizations for new extraction sites will be limited to nearshore areas.

Interaction with other uses

- During extraction, all other uses are to be spatially avoided so that focus remains on a safe exploration[7].
- During dredging activity, conflicts exist with regard to access to fishing grounds and deployment of fixed fixing gear.

[6] ICES, 2012
[7] Comment from British Marine Aggregates Producers Association in https://www.msp-platform.eu/sites/default/files/sector/pdf/mspforbluegrowth_sectorfiche_marineaggregates.pdf

- Marine mining potentially causes environmental damage to biological diversity and ecosystems and can conflict with designated sites under the EU Birds and Habitats Directives and other Marine Protected Areas.

Strategies, initiatives and legal arrangements

- The Atlantic strategy aims to develop the sustainable exploitation of the natural resources of the Atlantic seabed.
- EU industrial strategy: In March 2020, the Commission adopted an EU industrial strategy to address the twin challenges of the green and the digital transformation.
- European Innovation Partnership on raw materials (EIP)[o]
- ERA-MIN (Network on the industrial handling of raw materials for European industries) & ERA-MIN2
- The Raw Materials Initiative.

Future perspectives

- Increasing demand for construction materials, maintenance of port activities. In addition, availability of aggregates resources becomes constrained on land.
- Coastal defence: Because of climate change impacts and rising sea levels, demand for sediments is likely to increase in the next few years where most beach and coastal areas are experiencing increases in erosion.
- However, regulatory obstacles to obtaining new exploitation rights and the negative interactions with other activities are issues that may reduce the potential growth of the activity.
- The increasing scarcity of supply of raw and non-living materials, tends to push some countries (i.e., UK and France) out into deeper waters further offshore to look for new supply zones.

Further information

- SIMNORAT D8: Spatial demands and future trends for maritime sectors and marine conservation
- SIMNORAT D1: Initial assessment: developing an overview
- SIMCelt D1: Initial Assessment Developing an Overview
- SIMCelt D3c: Overview Report on the Current State and Potential Future Spatial Requirements of Key Maritime Activities
- https://oap.ospar.org
- https://www.msp-platform.eu/sites/default/files/sector/pdf/mspforbluegrowth_sectorfiche_marineaggregates.pdf

MARINE RENEWABLE ENERGY

Specific characteristics

- This sector is represented mainly by offshore wind energy industrial developments as other kinds of offshore renewable energies in the region are in testing and

research phases. Although southern countries in the project area have great potential, there is a clear difference with the more developed sector in the north.

- Bathymetry and swell criteria remain constraints for the development of the sector in the near future.
- Fixed platforms and cables present until decommissioning.

State of the sector

- Recent years have seen a significant increase in the amount of renewable energy development in the SIMAtlantic project area, mostly in the northern area for offshore wind energy.
- Energy from the conversion of tidal and wave resources is also being developed but at a pre-development stage.
- In relation to offshore wind, floating technologies are also being developed and deployed and are expected to increase in the coming years.

Relevance across jurisdictional zones

- The harnessing of offshore renewable energies is crucial to achieving international, European and national commitments in line with energy transition and in the fight against climate change. Marine renewable energies, in particular offshore wind, could be an important contributor to this.
- Offshore wind farm development has been most intense in the waters of North West England and the Irish Sea. Offshore wind is currently the predominant technology deployed in the Celtic Seas. Projects in French and Irish waters are in the planning stage.
- In the South project area, despite of a high potential, marine renewable sector is still at its infancy and its development is taking place at a slower pace than expected. Spain has a great potential for offshore wind potential but at the time of writing, no commercial offshore wind farms (OWF) have been developed, though this situation is expected to change due to the current MSP process and the new Law of Climate Change and Ecological Transition that was just approved.

Interaction with other uses

- It seems that there can be strong public objections to certain offshore energy developments (and probably the tourism and recreational sectors) with wind farms are more difficult to develop closer to shore[8] where there are impacts on the aesthetic environment/seascape.
- Wind farms, as permanent installations, might conflict with activities such as fisheries and maritime transport.

[8] Interview with Maritime Industry/Energy representative in France in SIMNORAT D8: Spatial demands and future trends for maritime sectors and marine conservation

Governance arrangements

- There are roughly two types of processes currently used in the development of offshore wind farms. The government “call for tender process” and the “open door process”. The former is usually led by a competent authority whereas the latter tends to be developer led on a case-by-case basis. In practice, each country has its own policy and procedures, differing slightly from these general processes. The choice of approach not only influences what kind of zones (search zones, tender zones) are developed in an MSP, but also how the energy transport from OWF to land is arranged.

Strategies, initiatives and legal arrangements

- Paris Agreement (2016)
- Renewable Energy Directive 2009/28/EC; EU – Energy Road map 2050
- Atlantic Strategy and Atlantic Action Plan
- European Integrated Maritime Policy and Sustainable Blue Economy Agenda.
- The European Green Deal
- An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future (COM(2020) 741 final)

Future perspectives (if clearly identified)

- Offshore wind farm construction is largely driven by international commitments for carbon reduction, such as the Paris agreement. EU law and policy developments are also an important stimulus. A significant expansion of the production of offshore wind energy is therefore expected over the next decades, with an increasing number of offshore wind farms being built and planned.
- Technological advances (such as floating technologies) enable deeper water installations allowing OWFs to be sited further offshore and in previously inaccessible locations.
- Commercialisation of wave energy conversion technology could result in major spatial implications in areas where wave resource is present.
- In some countries there are difficulties relating to public acceptance of large-scale offshore wind developments. It is therefore important that stakeholders are engaged and participate early in the planning process.

Further information

- SIMNORAT D8: Spatial demands and future trends for maritime sectors and marine conservation
- SIMNORAT D1: Initial assessment: developing an overview
- SIMCelt D1: Initial Assessment Developing an Overview
- SIMCelt D3c: Overview Report on the Current State and Potential Future Spatial Requirements of Key Maritime Activities
- SIMCelt D2c: Offshore Wind Briefing Note
- https://oap.ospar.org

• https://www.msp-platform.eu/sites/default/files/sector/pdf/mspforbluegrowth_sectorfiche_tidalwave.pdf	• https://www.msp-platform.eu/sites/default/files/sector/pdf/mspforbluegrowth_sectorfiche_offshorewind.pdf

OIL & GAS

Specific characteristics

- Fixed platforms and pipelines present until decommissioning and may not be fully removed from the seabed.
- The attractiveness of the sector is influenced by a number of geo-political factors particularly crude oil price.
- The competition with other energy sources affects the oil and gas sector, in particular the development of renewable marine energies in a context of increasing emphasis on emission reductions

State of the sector

- Mature and declining activity.
- Accompanied by the decarbonization policies of the Member States: e.g. exploration and exploitation of hydrocarbons prohibited by law in France[9] , Spain[10] and a similar bill underway in Ireland.[11]

Relevance across jurisdictional zones

- The activity is more present in the Celtic seas even if it remains modest. Most of these sites are located in the North Sea, with small-scale production in the eastern Irish Sea and in Shetland (Scotland) and south of Ireland (Cork).
- The oil and gas sector is locked in physically to the specific location where geological processes lead to those materials to be extracted. Thus, the spatial aspect is of the greatest importance for these sectors, as the spatial availability of the resource cannot be altered. At the same time, a re-allocation of the activity would therefore not be possible.

[9] French law N° 2017-1839 du 30 décembre 2017 mettant fin à la recherche ainsi qu'à l'exploitation des hydrocarbures et portant diverses dispositions relatives à l'énergie et à l'environnement available at: https://www.legifrance.gouv.fr/loda/id/JORFTEXT000036339396/

[10] Spanish Law 7/2021, de 20 de mayo, de cambio climático y transición energética, available at: https://boe.es/buscar/act.php?id=BOE-A-2021-8447

[11] Irish government press release available at: https://www.gov.ie/en/press-release/ee960-government-to-introduce-legislation-to-ban-new-oil-and-natural-gas-exploration-and-extraction/

Interaction with other uses

- Some potential for multi-use e.g., sharing platforms with Marine Renewable Energies (OWF).
- Safety zones around the sites excluding any other activity such as fishing.
- Potential significant ecological consequences even if oil spills are of increasingly low risk. Also, potential disturbance of marine mammals during seismic uses in exploration phases.
- Additional environmental impacts from full decommissioning.

Governance arrangements

A large number of international organizations directly or indirectly influence the sector such as:

- World Petroleum Council (WPC)
- International Association of Oil and Gas Producers (IOGP)
- International Maritime Organization (IMO)
- United Nations Conference on Trade and Development (UNCTAD)
- World Trade Organization (WTO)
- Intergovernmental Panel on Climate Change (IPCC)

- At the national level, sectors have been organized into federations integrating most companies developing exploration and production activities.

Strategies, initiatives and legal arrangements

- OSPAR recommendation 2003/5 which promotes the use of environmental management mechanisms by the Offshore oil & gas industry.
- National Governments strategies which have control over the area which companies install exploitation sites.
- The European Green Deal
- MERMAID (Innovative Multipurpose offshore platforms: planning, design & operation)

Future perspectives (if clearly identified)

- Demand for oil and gas is linked to the economic cycle. New environmental policies such as the Paris Agreement are calling for a reduction in European CO_2 levels, compelling countries to turn to renewable energy resources such as offshore wind or tidal energy.
- With the combination of climate change policies and legislation, the Marine Strategy Framework Directive (MSFD) and the projected increase in MPAs, it is likely that oil and gas production will become less attractive due to new constraints.

Further information

- SIMNORAT D8: Spatial demands and future trends for maritime sectors and marine conservation
- SIMCelt D3c: Overview Report on the Current State and Potential Future

• SIMNORAT D1: Initial assessment: developing an overview • SIMCelt D1: Initial Assessment Developing an Overview	Spatial Requirements of Key Maritime Activities • https://oap.ospar.org • https://www.msp-platform.eu/sites/default/files/sector/pdf/mspforbluegrowth_sectorfiche_oilgas.pdf

AQUACULTURE

Specific characteristics

- The presence of aquaculture activity varies widely across the SIMAtlantic project area. Most finfish aquaculture occurs in Scotland and Ireland, whereas aquaculture for shellfish is more widespread and is found mainly on the French and Spanish coasts.
- Within the project area, the main aquaculture species include Atlantic Salmon, which is the main product of Scottish aquaculture, and mussels in Ireland, Wales, Spain and France.[12]

State of the sector

- The aquaculture sector in Europe has been described as 'stagnating', due to its lack of growth compared to the aquaculture sector globally. Therefore, it became a priority sector for the European Union's Blue Growth agenda as well as for the new approach for sustainable blue economy, with concerted efforts to stimulate development and sustainability.[13][14]
- In Portugal, the number of active establishments located at sea is still low and seems to show significant growth potential.

Relevance across jurisdictional waters

- The predominant marine farming methods in the SIMAtlantic seas include, in large part, the farming of Atlantic salmon in enclosures and crustaceans, including the cultivation of shellfish in coastal / marine aquaculture facilities. (i.e., on trestles, ropes, "bouchot" poles or in netting) or grown on the seabed.
- Depending on the operating methods, the installation of aquaculture sites, notably bivalves, is constrained by physical factors (geomorphology of the coasts, bathymetry) and by the good ecological status of the water and water quality.
- These constraints are exacerbated by the development of new activities on the coast (in particular land-based activities such as yachting or certain MRE). The sector is therefore concerned with the challenges of preserving existing sites as much as with the search for new sites.[15]

[12] ABPmer, 2016
[13] Ertör and Ortega-Cerdà, 2015
[14] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021DC0240&from=EN
[15] Interview with French aquaculture stakeholders in SIMNorat D8: Spatial demands and future trends

Interaction with other uses
• Pressures associated with aquaculture include: physical damage to the seabed, pollution/chemical changes to the water column (mainly for finfish aquaculture[16]), disease and parasites, escapes (interaction with wild stocks), carrying capacity / nutrient cycling. • Conflicts relating to access of space mostly occur with beach tourism, shipping, oil and gas and marine aggregates and mining sectors. Synergies can be developed with tourism, renewable energy production and environmental protection[17]
Governance arrangements
• Aquaculture Advisory Council (AAC) composed of representatives from industry and other stakeholders to provide recommendations and advice to Member States and other European Institutions. • National and local associations of professionals.
Strategies, initiatives and legal arrangements
• Aquaculture was a development axis for Blue Growth within the European Union and keeps its importance in the new approach to Sustainable Blue Economy. It is therefore supported by several international, national and local policies and strategies. • Common Fisheries Policy (CFP), Reforms of the CFP and the European Maritime and Fisheries Fund (EMFF), now European Maritime Fisheries and Aquaculture Fund (EMFAF) have introduced a framework to accompany a marked increase in aquaculture production across the EU[18]. • Strategic Guidelines for the sustainable development of EU aquaculture. • The European Green Deal • Atlantic strategy • National sectoral strategies
Future perspectives (if clearly identified)
• Simplifying administrative procedures for aquaculture development: Under reforms to the Common Fisheries Policy, it is recommended that all European Member States produce Multiannual National Plans based around the themes of simplifying administrative procedures for aquaculture development. • Growing demand for aquaculture products**:** Aquaculture production must increase within Europe in order to satisfy the increasing demand for seafood, coupled with reduced catches, decrease the dependence from importation, boost economic development and job creation, and reduce pressure on fish stocks[19].

[16] STECF 2015
[17] https://www.msp-platform.eu/sites/default/files/sector/pdf/mspforbluegrowth_sectorfiche_aquaculture.pdf
[18] European Commission, 2013a
[19] Douvere and Ehler, 2009; Ertör and Ortega-Cerdà, 2015; FAO, 2012

- As a result, the sector is likely to increase its spatial requirements in the coming years, including moving to more offshore areas. Offshore expansion could be facilitated by synergies with other offshore maritime sectors, in a multi-use context.

Further information

- SIMNORAT D8: Spatial demands and future trends for maritime sectors and marine conservation
- SIMNORAT D1: Initial assessment: developing an overview
- SIMCelt D1: Initial Assessment Developing an Overview
- SIMCelt D3c: Overview Report on the Current State and Potential Future Spatial Requirements of Key Maritime Activities
- SIMCelt D2a: Aquaculture Briefing Note
- https://oap.ospar.org
- https://www.msp-platform.eu/sites/default/files/sector/pdf/mspforbluegrowth_sectorfiche_aquaculture.pdf

YACHTING & MARITIME TOURISM

Specific characteristics

- The analysis of the spatial demands for recreational and water sports is complex. Indeed, this element is mainly based on multiple practices carried out by individual boaters to which are added many federations and professional practitioners.
- The concept of navigation basins is complex and takes different forms depending on the practices and regions.
- In addition, the data of the sports federations, which regroup the licensees and the occasional practitioners (within the framework of the federations), bring only a partial light on the analysis of the practice of the nautical activities.

State of the sector

- A mature and growing activity.
- Current trends in the industry in the Member States are leading to an increase in the number of vessels on the coastlines and increase in the number of users of the various practices and the development of many new practices in recent decades.

Relevance across jurisdictional zones

- The sector is often associated with the onshore tourism sector (number of overnight stays or financial contributions for a territory) without making the link between this tourist activity and the spatial involvement at sea.
- In most practices, the maritime and coastal tourism sector is a spatially limited activity. The practice of the light leisure activities remains limited to areas closest to the shore and only few boaters leave the territorial sea where all the navigation basins are registered[20].

[20] Sonnic, 2008

- In numbers of cases maritime activities are area based e.g., surf spot, snorkelling and scuba diving sites.
- The spatial demands of the representatives of the various nautical and recreational practices are expressed, for the most part, in the form of the defence of the freedom of navigation. The sea is presented as a space of freedom to preserve.

Interaction with other uses

- A concentration of activities in the coastal strip which may lead to local conflicts: tourism, sailing and nautical activities, small-scale fisheries, aquaculture and recreational fishing and an emerging issue with renewable marine energy projects.
- Coastal tourism may lead to negative land-sea interactions and water quality issues, increase waste generation and energy and water consumption, exacerbate the exploitation of biological and other resources and ultimately lead to more pollution and a serious deterioration of marine and coastal ecosystems.
- Conversely, even when coastal tourism does not share the same space with other activities, the environmental impacts of other sectors can affect coastal tourism.

Governance arrangements

- Number of different institutions from public authorities to stakeholder representatives: user associations, sports federations, tourism development representatives.

Strategies, initiatives and legal arrangements

- National and local tourism development strategies
- Blue Growth agenda (coastal tourism).

Future perspectives (if clearly identified)

- Forecasts indicate a significant increase in recreational boating associated with the growth of coastal tourism where tourism associated with nautical activities is expected to increase significantly over the next few years. The demand for additional infrastructure and services / activities is therefore likely to increase.
- Practices should turn more and more towards the use without possession of vessels with the development of leasing. These changes are reflected in particular in a reduction in the demand for moorings, which could lead to the gradual release of berths currently occupied by “stationary boats”, some ports are already anticipating these changes.
- These new forms of practice, moving towards a sort of “Uberization” of marine recreational uses, will increase the need to promote good practices towards new groups of users who are less aware of the interactions between uses and environmental issues.
- The technical evolutions (power of the engines, GPS, safety equipment) are susceptible to enlarge the area of navigation by ensuring a better security to the boaters.

Further information	
• SIMNORAT D8: Spatial demands and future trends for maritime sectors and marine conservation • SIMNORAT D1: Initial assessment: developing an overview • SIMCelt D1: Initial Assessment Developing an Overview	• SIMCelt D3c: Overview Report on the Current State and Potential Future Spatial Requirements of Key Maritime Activities • https://oap.ospar.org • https://www.msp-platform.eu/sites/default/files/sector/pdf/mspforbluegrowth_sectorfiche_tourism.pdf

CABLES AND PIPELINES

Specific characteristics

- The activity includes the laying and maintenance of submarine cables immersed at depth, and generally buried, intended to carry communications or electrical power.
- In the study area, the bulk of submarine cables consist principally of telecommunication cables
- The submarine cable markets are international and the cable laying and maintenance service activity is provided by a small number of operators worldwide.
- About 99% of international telecommunication cables are owned by non-governmental entities [21]. The energy interconnection projects are led by the State, which is the competent authority to approve the route of the underwater cables.

State of the sector

- The connection needs for global telecommunication are increasing and the cable business continues to grow. It is difficult to identify a spatial demand for this activity as the development of submarine telecommunication cables is conditioned by the needs and decisions of non-governmental entities.[22]
- The importance of submarine power cables has been on the increase in recent times due to the advent of offshore renewable energy.
- Subsea cable development projects for communications are underway, some of them funded as Projects of Common Interest (PCI). This is the case of the "Ellalink" (link the American continent to Europe)[23]. Electrical interconnectors between countries are also planned such as Spain and France interconnection crossing Bay of Biscay[24], the “FAB” project (France – Alderney – Britain)[25], the Celtic Interconnector Project (Ireland – France to the European electricity grid)[26], the North

[21] ICPC. 2016
[22] De Cacqueray, 2011
[23] https://ella.link/
[24] https://www.inelfe.eu/en/projects/bay-biscay
[25] https://www.fablink.net/
[26] https://www.rte-france.com/en/projects/celtic-interconnector-interconnexion-between-france-ireland

Sea SuperGrid (UK – Ireland) and the ISLES study (Scotland, Ireland and Northern Ireland).

Relevance across jurisdictional zones

- Telecommunication and electrical power cable are dispersed throughout all sea basins.
- Activity happens throughout the year.
- Pipelines and cables are either locked in physically to a specific location between the field of collection and the point of delivery or seek to take the direct route between two connection points. Re-allocation prior to their laying onto the seabed is possible, but difficult and costly due to longer distances, need for more material as well as labour costs.
- The needs of the industry are affiliated with those of the other sectors such as the wind energy sector.

Interaction with other uses

- The development of submarine cables combined with existing activities and the development of new activities will lead to increasing interrelations with other users of the seabed, negative interrelation could appear especially with extractive uses (i.e., marine aggregates, oil and gas extraction, fishing, etc.).[27]
- As for offshore wind energy and nearshore wave and tidal devices cables, the International Cable Protection Committee (ICPC) recommends that existing cables in shallower waters are given a default 500m exclusion zone on either side.
- Similarly, energy cables might require space for their laying, bundling, energy transformation (at the transformer substation platform), interconnection (at grid interconnector sites) and cross connection (at cables crossing areas).

Governance arrangements

At the international level, federations exist to represent the stakes of the sector.

- International Cable Protection Committee (ICPC).
- European Subsea Cables Association (ESCA)
- European network of transmission system operators for electricity (ENTSO-E) made up of grid operators across EU Member States
- EuropaCable – the representative body for wire and cable manufacturers.

Strategies, initiatives and legal arrangements

- Under the United Nations Convention on the Law of the Sea (UNCLOS), the freedom to lay cables includes operations associated with that freedom, such as investigations and cable repairs and can vary according to which maritime jurisdictional zone in which the cable is to be located.[28]

[27] United Nations Environment Programme; International Cable Protection Committee (UNEP/ICPC) 2009.
[28] United Nations Environment Programme; International Cable Protection Committee (UNEP/ICPC) 2009.

- Trans-European Energy Networks (TEN-E), Energy corridors identified by EU to support the development of energy infrastructure.
- The planning of the submarine telecommunication cables activity seems very limited. The installation is done as without a real integrated national strategic planning, nor spatial[29]. Old cables are rarely removed, and their locations are gradually lost. The activity and installation of submarine cables can however be taken into account in national energy policies.

Future perspectives (if clearly identified)

- The support of States for the installation of telecommunication cables should grow in view of the important challenges represented by its means of communication
- In the next few years, development of submarine electrical cabling would mainly be driven by offshore wind energy development. In this sense, the initiative of the European Super Grid needs to be highlighted.
- Technological advances in cables are expected to allow longer, deeper and higher capacity cables to be laid.

Further information

- SIMNORAT D8: Spatial demands and future trends for maritime sectors and marine conservation
- SIMNORAT D1: Initial assessment: developing an overview
- SIMCelt D1: Initial Assessment Developing an Overview
- SIMCelt D3c: Overview Report on the Current State and Potential Future Spatial Requirements of Key Maritime Activities
- SIMCelt D2b: Cables and Pipelines Briefing Note
- https://oap.ospar.org
- https://www.msp-platform.eu/sites/default/files/sector/pdf/mspforbluegrowth_sectorfiche_tourism.pdf

SCIENTIFIC RESEARCH

Specific characteristics

- Most of the scientific disciplines and fields of research constitute the marine sciences. Physicists, biologists, chemists, geoscientists, economists, lawyers or geographers apply their knowledge to the sea.
- This is to increase knowledge on ocean state, trends and functioning, and also to support knowledge on marine resources availability, both biotic and abiotic and increase understanding of the impacts of human activities.
- Distinction between research requiring permanent or long-term occupation of sea space, such as installation of research platforms or areas for testing new

[29] De Cacqueray, 2011

technologies and the research that can be done without reserving space, such as monitoring campaigns, surveys, scientific trawling.

State of the sector

- Oceanography is viewed as one of the fastest growing sciences today.[30]. This is in line with the increasing need of sea space for maritime activities, determined by a growing Blue Economy. In fact, the new European approach to sustainable blue economy, identifies "ocean knowledge" as a prerequisite for a sustainable transformation of the blue economy[31].

Relevance across jurisdictional zones

- Space at sea is needed for field testing of new technologies in fields like e.g., renewable energies, aquaculture. Such research can be very space consuming.
- Permission for Marine Scientific Research (as defined by UNCLOS) is required in different marine jurisdictional zones: within the territorial sea, the coastal State, being a full sovereign, has complete control over marine scientific research activities - all research activities within the territorial sea require the coastal State's express consent. In the EEZ and Continental Shelf the coastal State has both jurisdiction over Marine Scientific Research and the right to regulate, authorise, and conduct research activities.
- Some research can be done without reserving space, such as monitoring campaigns, surveys, scientific trawling. It still has to be considered when planning marine space, since access to monitoring areas should be allowed without conflicting with other activities taking place in the same area.

Interaction with other uses

- Scientific research and monitoring have been considered as possible co-uses with offshore platforms dedicated to O&G extraction or wind energy production.
- Research requiring permanent or long-term occupation of marine space, such as the installation of research platforms or areas to test new technologies, most often observe the same restrictive measures as the corresponding industrial activities towards other sectors.

Governance arrangements

State authorities in the territorial sea and also in the EEZ and continental shelf subject to conditions contained in UNCLOS.

- This can also vary according to whether the research is fundamental or applied.
- Provisions from UNCLOS are available for marine scientific research[32]. Research is a freedom in the high seas (Art. 87), and all states may conduct scientific activities

[30] Charles 2016.
[31] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021DC0240&from=EN

[32] https://www.msp-platform.eu/faq/scientific-research#1

there (included land-locked states), but exclusively for peaceful purposes and for the benefit of mankind as a whole.

Strategies, initiatives and legal arrangements

- The Integrated Maritime Policy (IMP) of the EU considers “Marine Data and knowledge” as one of its cross-cutting policies.
- United Nations Decade of Ocean Science
- Research and innovation are considered essential for the new EU’s approach to sustainable blue economy.

Future perspectives (if clearly identified)

- As one of the cross-cutting policies of the IMP, together with the EU Sustainable Blue Economy strategy, it seems logical to think that research related to growing sectors will increase too.
- Legal requirements for ecosystem based approach under MSFD, MSP and CFP will necessitate greater understanding of how ecosystems function; in turn, this will enhance the need for data and information.

Further information

https://www.msp-platform.eu/faq/scientific-research

https://ec.europa.eu/maritimeaffairs/policy/marine_knowledge_2020

2.1 Potential interactions

The simplest way of identifying interactions (and normally the first step when analyzing uses interactions) is to develop a matrix (IOC - UNESCO, 2009). In the framework of the Transboundary Planning European Atlantic Project (TPEA) a matrix of interactions between marine and coastal uses and activities in the project area was developed (Figure 1).

		NC/MPA	Fishing & Aquaculture		Energy resources		Tourism & Coastal management		Ports & Navigation	
		Nature conservation features	Fisheries	Aquaculture	Gas explotation	Wind farms	Tourism	Coastal uses	Ports	Maritime transport
Nature conservation features	Bentic habitats		*		*					
	Birds									
Maritime transport				*		*				
Fisheries	Bottom trawling	*								
	Gillnet fishery			*						
	Coastal fishery									
Aquaculture					*		*		*	*
Marine Biotechnology										
Laying pipelines and cables										
Exploitation of non-living natural marine resources	Gas explotation	*		*						
	Sand/gravel extraction & mining	*								
Dumpling										
Military activities					*					
Carbon Capture Storage										
Tourism	Bathing sites									
	Nautical activities		*	*						
	Surf and regatta areas		*	*						
	Recreational fishing		*							
Wind farms				*			*		*	*
Ports and places of refuge				*		*	*			
Marine Scientific Research										
Wrecks and other historic features										
Coastal uses	Seawater abstraction									
	Water rejection									
	Coastal protection									

Conflicting sea uses

Sea uses compatible under certain conditions

Compatible sea uses

* Spatial solutions are possible to reduce or avoid the conflict

Figure 1. TPEA conflict matrix. Source: TPEA project, 2014.

This type of matrix is a useful tool to identify theoretical potential interactions, however in real life some of these conflicts might not occur or might be occasional. For some of them, the solution may be found through management interventions while others may have spatial implications. Sometimes there might be a need for specific governance arrangements and/or agreements between different stakeholders and/or levels of administrations. In fact, the solution might be out of the scope of MSP, and this needs to be identified too.

This is why this kind of analysis needs to be complemented with a context-based in-depth analysis, as interactions are normally context and management based and cannot be defined by a simple spatial overlapping. This is the rationale behind the methodology proposed in this task, to try to characterize a specific interaction in a specific context, finally trying to propose targeted recommendations to reverse the interaction if it was negative or to maximize it if it was positive.

In order to do this, we should break down these interactions in understandable “building blocks” to be able to imagine the specific scenario and then, according to this, be able to propose a targeted recommendation. A proposed methodology to systematically conduct this process is explained in detail through the next sections.

3 Approaching activities' interaction by building scenarios: a proposed method to strategic thinking

As explained in the *rationale and purpose* section, this task did not produce new information but rather capitalized on previous studies in the area, combining and reflecting on their outputs to develop a ready-to-use method to support strategic thinking. The main outputs consulted for the development of the methodology were:

- SIMNORAT D8 – Spatial demands and future trends for maritime sectors. The area of study was the national jurisdictional waters of France, Spain and Portugal in the Atlantic region.
- SIMCelt D3c – Spatial Demands and Scenarios for Maritime Sectors and Marine Conservation. It comprised waters under the national jurisdiction of France, Ireland and UK.

Both documents helped provide information to develop the underlying assumptions of the proposed model and the range of values given to characteristics. Specifically, the work from SIMCelt also supported the design of the framework for the development of micro-scenarios.

In summary, the task developed a methodology to characterize uses and their potential future interactions in a specific context, in order to identify for them the best approach in the MSP framework for their better integration, by developing targeted recommendations. To do so, the aim of the methodology is to simplify a complex interaction by splitting it into small "building blocks" used to construct exploratory scenarios in order to ask *'what if… this new activity is located in this specific area where there is already another activity taking place?'*

The development of these type of micro-scenarios might make it easier to understand the drivers that influence an interaction thus assist in defining potential future conflicts, alerting planners and managers to the hot spots of the specific interaction that need to be tackled. The design of the methodology is based on methods to construct scenarios reviewed by SIMCelt Spatial Demands and Scenarios for Maritime Sectors and Marine Conservation task. A relevant selection can be consulted in Annex I.

The final developed method is based on the premise that uses and activities can be characterized and categorized based on different variables described in the next sections. The rationale is supported by the fact that it is important to understand the implication of each use in its space and time but also the implications that a specific space/context (and the rules that prevail in it) have in the use and how this influences its performance, and therefore, its interaction with other uses.

This method can be used mainly in two situations regarding the assessment of interactions between activities:

a) When there is already a spatial assessment carried out and the spatial interaction is confirmed. To propose correction measures if the interaction is negative and to foster synergies if this is positive.
b) When there is no such a study carried out (i.e., because of lack of data). To assess if the spatial study should be carried out, and in any case, to design the best way to approach the interaction if there is no spatial data available and to propose correction measures and foster synergies.

Important note: Annex 2 contents a worked example that might help to elucidate how the methodology can be applied. It should be highlighted that the case study performed is not real and that it was designed solely to test the working logistics of the methodology. Results should be only considered as examples of the kind of outputs that the methodology could provide. **The methodology provides the framework for addressing a specific potential interaction between two activities. The outcome itself will depend to a great extent on who is conducting the analysis and what is its objective. The methodology will thus, be the starting point to frame further measures that might or might not fall into the framework of MSP.**

3.1 Uses characterization

Any use has specific characteristics that normally depend on its nature and are constant along time and space (i.e., they are not likely to change from one country/region to another). Furthermore, each use or activity might work in a different way depending on its context (i.e., provided by specificities of the country, region, the season).

These factors might as well influence any interaction that this use may have with another use. Analogous to the concept of *material considerations* applied in UK planning, these factors should be taken into account in decision making for allocation of new marine activities[33]. This is the reason why it is important to describe the nature of each activity but also its context in order to build the specific scenario for which we will need to take decisions.

In summary, the proposed method is based on the assumption that a specific use can be characterized by two types of variables:

- Internal characteristics: They depend on the very nature of the activity and the way it works. They are likely to be the constant for the particular activity regardless the region, governance and legislative framework.
- External conditioning factors: These characteristics are context-based. They hardly depend on the country/region and the governance and legislative frameworks established. In this category, we include the variable “dependency”. Although dependencies might be based on the nature of the use, their value and importance will be defined by aspects related to the context.

The next figure symbolizes the model used for the characterization of a specific use or activity:

[33] https://www.planningportal.co.uk/faqs/faq/4/what_are_material_considerations#:~:text=A%20material%20consideration%20is%20a,Loss%20of%20light%20or%20overshadowing

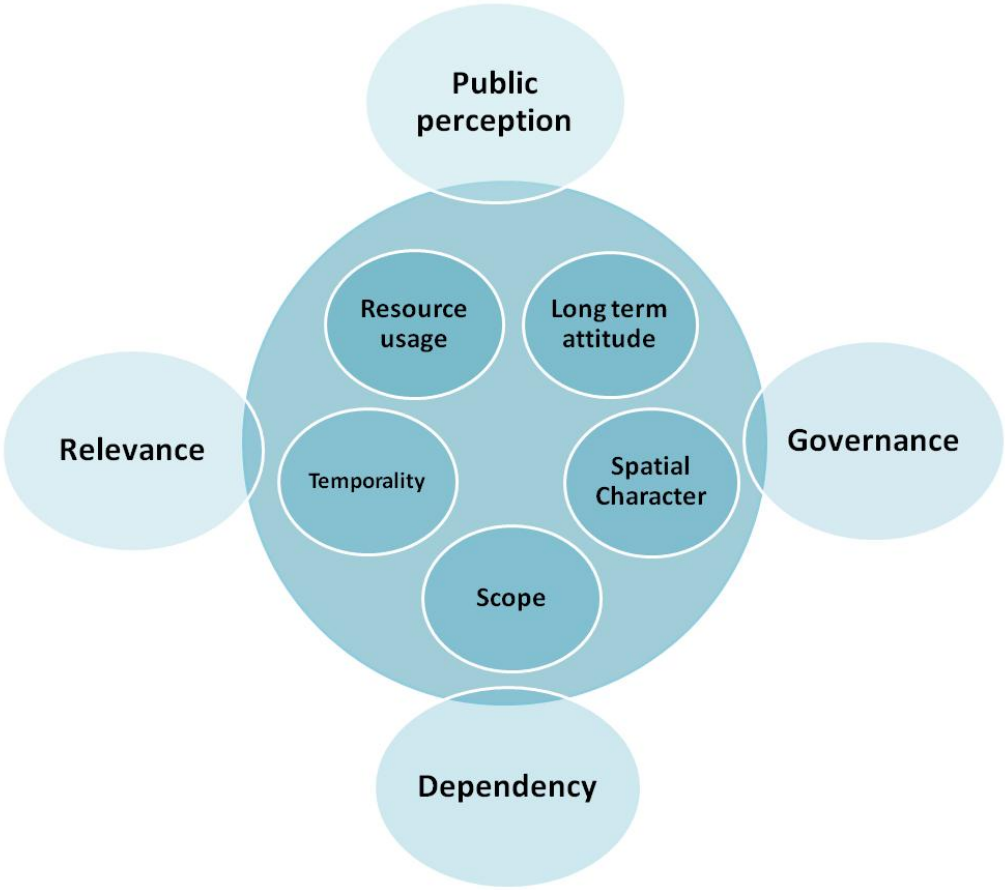

Figure 2. Conceptual model for characterizing uses. Source: Own elaboration.

3.1.1 Internal characteristics

This section describes characteristics of the use that are normally intrinsic to the activity. These are normally the same indistinctly on the region, as they respond to the technical and management aspects of the use. Different values for one or another characteristic might influence its performance and, thus, its interaction with another use.

Different potential values are identified for the various variables according to their nature and the aspect that is expected to have more influence in the characterization of the use and the subsequent interaction.

Table 1. Internal characteristics and values

Internal characteristics	Description	Possible values
Long term attitude	Some activities benefit from long-term detailed planning to assure resources, for others this detailed planning is not so obvious due to the nature of the resources they exploit (i.e., fisheries) so they normally express the demand of preserving the maximum possible space. On the other hand, the organization of some	• Proactive (strategic planning) • Conservative (defensive)

	activities makes impossible to have detailed forecasts and they simply react to the different circumstances as they appear. Finally, it should be kept in mind that sectors that traditionally plan their long-term activity, would probably benefit from a multisectoral integrated planning as MSP, because it provides certainty for their industries.	• Reactive ("wait-and-see")
Scope	Some uses according to their nature, have their scope of action at national level, others act at regional, local or international levels (i.e., aquaculture vs maritime transport). This internal variable, in turn, will influence which external variables act upon the activity as the context will depend on their scope of action.	• Local • Regional • National • International
Resource usage	Different uses and activities might have different kind of relationships with the resources they use. This, in turn, might condition any potential interaction with other activity.	• Exploitation • Extraction • Research
Spatial character	Uses can be classified according to how it occupies the space: permanently in a specific point or area, or dispersed and in movement along the space. In fact, this character has led some countries to categorize activities in those that have a title of private occupation and need space reservation, and the "common uses"[34] that act in all space but in areas where they are specifically prohibited.	• Spatially explicit • Spatially diffuse /Ubiquitous nature
Temporality	It is important to address time when talking about interactions between activities because some activities are not permanent in time, but occasional or seasonal, and this might influence the interaction and its potential resolution. This variable is very linked to the "spatial character" variable. Spatially diffuse activities are normally temporal while permanent activities are normally spatially explicit. However, they are considered separately as their weight influencing the potential interaction with another use might be different.	• Permanent • Time bounded

[34] https://www.psoem.pt/como-funciona-o-psoem/

3.1.2 External characteristics

This section describes variables defining the context, the external conditioning factors. These characteristics of the use are normally variable from one country to another. They do not normally depend on the activity itself but more likely on different governance, policies and cultural backgrounds. However, they might influence the development of the activity and its interaction with others.

Different values are identified for the various variables according to their nature and the aspect that is expected to have more influence in the characterization of the use and the subsequent potential interaction.

Table 2. External characteristics and values

External conditioning factors	Description	Possible values
Public perception	Some uses are more easily accepted by society than others because of their nature, but this can also be influenced by institutional policies or strategies and local cultural backgrounds. This, in turn, may conditions the way in which a potential interaction with other activity could be addressed. By "public" here we refer to the *general/broad* public.	• Attractive • Tolerable • Unattractive •
Relevance	Not all uses have the same relevance regarding economy, representativeness, visibility and/or influence. There may be different reasons: for instance, a particular sector may be part of an international/national strategy (i.e., Blue Growth) or it is traditionally represented in administrative institutions while others are not. Also, in some cases the societal link is much strongly relevant so this might be considered as balancing factor that may influence the resolution of a potential interaction with another use.	• Strategically relevant. • Economically relevant. • Culturally, socially and/or historically relevant.
Governance	The governance structure for the use may work at a particular scale or even between two scales at the same time. This needs to be taken into account when characterizing an interaction between activities to design the appropriate scale for the approach.	• Local • Regional • National • European • International • Mixed
Dependency	There are uses which present relevant dependencies to other aspects. It is important to	• Dependent on other uses

	identify these dependencies when assessing an interaction, as it may highlight specific key drivers that need to be addressed. Moreover, it is important to assess the adaptation capacity that each use has to changes in other uses trends, markets fluctuations or changes in the environmental status. Any sector is dependent on the aspects mentioned in "values" section; however, it is important to identify which dependency will be more relevant when addressing an interaction.	• Dependent on markets fluctuations • Dependent on the environment • Currently dependent on technological developments

3.1.3 Characterizing the interaction by building micro-scenarios

Once each use is characterized giving values to the presented variables, these values will be addressed by pairs in order to identify key drivers of interactions (see Figure 3). The rationale of this is to analyze how the specific characteristics of both uses interact with each other and in turn, influence the interaction between the two uses.

The matrix format is just to show how the methodology works. In practice, this part of the assessment can be carried out in different ways depending on how many people are involved in the analysis. For instance, in a work team, the work could be distributed assigning the assessment of one specific variable to each person separately, and then when discussing results, common points will arise, highlighting the hot spots of the interaction.

Aside from the fact that the objective was different, the UK National Ecosystem Assessment (NEA) put in place a similar approach with slight differences in structure and outputs (see Annex I for more information on scenarios methodologies).

In the present methodology, only one scenario will be developed for each matrix, linking all cells based on the understanding of how external conditioning factors and internal characteristics of each use might interact and influence each other and, in turn, how they will define the interaction and its development.

Not all the cells of the matrix need to be filled up. Some pairs of characteristics might not have any relevant interaction; sometimes various cells will provide the same or similar outputs; this could be interpreted to weight this particular factor of the interaction.

It is advisable not to have too much information in the matrix. It might be useful to focus in 2-3 key considerations (i.e., type of conflict: space or resources; scales mismatch) and to explain the weightings attached to these within the decision. In fact, this will depend a lot on the type of interaction and the context, being potentially different from case to case.

			USE 1								
			INTERNAL CHARACTERISTICS					EXTERNAL CONDITIONING FACTORS			
			Long-term attitude	Scope	Resources usage	Spatial Character	Temporality	Public perception	Relevance	Governance	Dependency
USE 2	INTERNAL CHARACTERISTICS	Long -term attitude									
		Scope									
		Resources usage									
		Spatial Character									
		Temporality									
	EXTERNAL CONDITIONING FACTORS	Public perception									
		Relevance									
		Governance									
		Dependency									

Figure 3. Interaction matrix. Source: Own elaboration.

3.1.4 Targeted approach

Hotspots derived from the previous analysis will work as “building blocks” to construct scenarios. These building blocks, in turn, can be classified into different categories; however, these categories might be defined case by case, in the way that best fits to define the specific context. In this section we propose three categories that might be appropriate for any case:

Table 3. Potential types of building blocks

BUILDING BLOCKS		TARGETED APPROACH
Descriptors	They are characteristics of the scenario determined by the interaction of particular characteristics of both uses. They are used to describe the interaction scenario defining the type of conflict, main impacts (positive or negative) and who "suffer" them.	The targeted approach will be built upon specific recommendations designed according to the descriptors, to tackled risks and to capitalize in opportunities It might include measures like: • *Design of workshops or specific mechanisms for collaboration (i.e. working groups)* • *Conduct consultations (to stakeholders and/or experts).* • *Design and conduct specific studies.*
Risks	They refer to the aspects of the interaction that are more difficult to manage if the interaction is positive, or, if the interaction is negative, these will be the hot spots that need to be addressed more carefully in order to conduct the interaction to a good end.	
Opportunities	They are aspects specific to the interaction or the framework (MSP) that can be used as facilitators for the integration.	

While analysing building blocks and developing specific recommendations a reflection should be made based on the next set of questions:

- Were there other processes addressing this interaction prior to the present analysis? What were their results? This information should feed transversally into the whole analysis.
- Has the MSP authority the power/competence to apply the recommendation in the specific case?
    - If yes, what are the specific actions that need to be taken? What kind of interventions are possible?
    - If not, can MSP be a framework/platform to facilitate the development of the appropriate actions?

Once micro-scenarios are described in a strategic way, it is easier to propose specific measures to address the main "hot spots" of the interaction. It is suggested that these recommendations are concrete enough to be implemented. For instance, if the recommendation is to create a multidisciplinary working group, set the objectives of this working group and who should be in it, who is going to moderate it, etc. If the

recommendation comprises further study, set the objectives of this study and who should do it (i.e., external personnel), etc.

The outcome of the methodology will be a report containing these detailed recommendations and should be accompanied of a “summary sheet” designed in an attractive and user-friendly manner to engage senior officials and decision makers competent or part of the interaction’s resolution.

4 SWOT analysis of the method

A SWOT analysis has been conducted in order to assess strengths, weaknesses, opportunities and threats of the proposed method. This assessment has been conducted by authors and complemented by external revisions from project partners, including competent authorities in MSP of the countries involved in the project.

4.1 Strengths

- It provides a systematic approach to define and characterize uses in specific time and space, thus allowing identifying factors influencing their development.
- The matrix allows seeing where the conflict lies but would also allow considering the weight attached to the various considerations of the decision.
- The method is adaptive as it works through scenarios it is applicable in different contexts. A scenario is built based on specific characteristics of the uses concerned and taking into account the specific characteristics of the area that most influence the performance of the use.
- It is also adaptive in the term of the quantity of information that needs. It works with generic and scarce information but also with detailed information, thus, making outputs more detailed as more detailed data is used as input.
- It helps identifying the kind of action needed (resource mobilization, policy driven interventions, specific measures) and who and/or at what level of governance should be conducted.

4.2 Weaknesses

- The method proposed is based on qualitative judgement, thus, the viability of results will depend quite highly on who conducted the analysis and what information they opted to use. This method targets MSP practitioners however, the importance each one attaches to the various internal and external characteristics might be different, thus conditioning the final result.
- Analysis might only be valid for a specific scenario as it is designed specifically case by case by building the scenario with the characteristics of the case. However, internal characteristics of a specific use might be reused with slight adaptations.
- The method is only applicable to interactions between pairs of activities, if there is a third component to assess, the method as it is cannot handle the three at the same time.

4.3 Opportunities

- The method could be used as a resource to examine marine policy issues and their weighting as well as specific MSP decisions (i.e., interactions).
- The method is structured in such a way that allows MSP practitioners to organise and think about use interactions in a strategic way analysing specific factors affecting these interactions to better understand their drivers.
- The process of inputting the position in relation to each characteristic may be useful in highlighting where gaps in knowledge exist and assist in identifying areas of additional focus for the user in (or prior to) decision making judgement.
- The methodology framework provides a good way to take into account aspects of the interaction that are not considered in a simple spatial analysis, for instance, the link between the activity in the sea and the communities on land, as well as, the role of the environment in the development of a particular activity. Therefore, the method could complement typical spatial analysis of overlapping, by adding other dimensions like socio-economic and governance domains. It could go beyond the only identification, to the characterization and the application of measures to a specific interaction.
- The methodology could be usefully applied to transboundary and future zoning of activities and uses within MSP. Also, the summary sheet with targeted recommendations is potentially a very useful tool to engage decision makers on complex issues in a digestible and user-friendly way while also providing clear recommendations for action.

4.4 Threats

- As it is an adaptive model based in the context, changes in the external conditioning factors of any of the uses may change the results of the analysis.
- When developing recommendations by evaluating the scenario, it needs to be taken into account that some (or all) identified actions may follow out of MSP competences.
- Application of this method might be time consuming, however it may depend on how much input data is available and, consequently how detailed the analysis will be, as well as, how many people will be involved.
- Ecosystem components are only considered in the assessment by the services they provide to uses. For instance, when there is a use that presents “Dependency to the environment” and the other use in the interaction might cause prejudice to the environment.

5 Final observations

“Coexistence”, “compatibility” or “collocation” are words repeatedly used in MSP good practices guides, recommendations etc., however, it is becoming clear that the way in which these objectives can be achieved differ substantially from one case to another, as there is not “one size fits all” approach. For instance, co-location, defined as the use of the same structure for two particular uses, is suggested theoretically to solve some conflicts of uses but for the moment these considerations remain marginal and there are still too few concrete examples of positive interactions on a large scale to conclude on their relevance, as

highlighted by projects like SIMNORAT[35]. In fact, there is a need to identify what is required for co-location to be attractive to industries. Does it need to be incentivized through subsidies or just be imposed by authorities? Can MSP really impose this on developers?

On the other hand, the utopian stage in which none of the uses of an interaction loses anything and they both win is not realistic. There will be always concessions and likely they will not affect both parties to the same extent since most of these activities are primarily affected by other cyclical factors or specific characteristics that may constrain their adaptation. The aim of integrated planning would be then, to try to make these "negative" concessions as few as possible and maximise the benefits, as balanced as possible between the two activities and, above all, maximizing the social and environmental benefits of this integration. It seems reasonable to think that the way to approach this issue will depend to a great extent in the area, the characteristics of the uses, their governance and legislative frameworks and their socio-economic and strategic relevance.

Another factor to take into account would be international arrangements for specific topics as it can be the *Green Deal* at the European level, or the OSPAR Convention, for the protection of the marine environment of the North-East Atlantic, at the regional level. If many other management actions exist, they are most often sectoral, whether at the sub-national or international level. These aspects are the reason why this deliverable is structured in two parts, the first one aiming to identify all these factors affecting activities and uses in the project area, and the second one presenting a methodology to be used case by case by the Competent Authorities, taking into account these considerations.

This methodology does not include "environmental conservation" itself as a use, however, this aspect is taken into account transversally, inherent in the definition of characteristics themselves (i.e. dependency on the environment) and also considering that interactions between activities and the environment are and shall be addressed compulsorily through other processes (Environmental Impact Assessments in any case, and management plans when considering MPAs). Furthermore, the methodology assumes that there is an intention to evaluate the possibility of establishing a new use in an area where there is already another one, in the framework of a MSP process; this should imply that environmental objectives have been already taken into account and had been balanced with socio-economic objectives.

The proposed method tries to help addressing all these issues not by giving a straight answer but by providing a framework to be applied case by case while leading to a holistic thinking about how interactions can be addressed.

From the testing of the method some conclusions referring to the kind of interactions that can potentially occur have been extracted. For instance, conflicts can be related to different aspects such as: space or resources, and/or conflicts related to indirect effects (i.e., one activity causing an impact in the environment on which the other activity depends). However, many of the interactions are a mix of these aspects but with different intensities and scales associated to them. The case-by-case treatment of these problems therefore takes on its full meaning given the diversity of activities, their organization and the interweaving of management scales inherited from cultural heritages, specific characteristics, political will or

[35] Spatial demands and future trends for maritime sectors | European MSP Platform (msp-platform.eu)

other external socio-economic factors. These are some of the aspects that can be defined and tackled applying the proposed method.

During the revision by partners, it was pointed out that the methodology *"could also be useful as part of an overall decision-making process. Not only as a tool to stimulate and organise thinking and information, but as an evidence trail of how this thinking and information was used to come to a decision and the weighting that was used to arrive at that point."*

Therefore, it makes sense to think that a region like the project's that applies this kind of approach could also benefit from transparency and accountability regarding decision making, not only for local stakeholders but also at the transboundary levels.

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Annex I – Scenario development examples

Methodology /project	**Inspirational elements for the proposed methodology**
UK National Ecosystem Assessment (NEA)	• NEA scenarios involved the creation of a matrix that listed direct and indirect drivers of change against different trends. Different storylines then were constructed by linking cells horizontally in the matrix, each strand forming a distinct scenario based on understandings of how drivers might be associated or casually connected (Haines-Young et al, 2011:1206 in McGowan et al, 2018).
Dessine-Moi un système Mer –terre, funded through the French Ministry of the Environment (2013-2014)	• "Mental maps" and free association of ideas to indicate different representations of the project area
Cooperation in Fisheries, Aquaculture and Seafood Processing (COFASP) Project	• Defining the system including the problem, boundaries, and horizon of the system and subsystems. This can include identifying elements outside the system that actors have no control over. • Creation of micro scenarios for each subsystem by assembling drivers and hypotheses. This process involves taking a hypothesis for each driver in a sub-system and linking them together in a logical and plausible storyline. • Identification of uncertainties, challenges and opportunities.
CEFAS – Alternative Futures for Marine Ecosystems (AFMEC)	• Under this approach, the two driving forces considered the most likely to instigate change were determined to be societal values (from individual to community) and distribution of power (autonomy to interdependence).

Annex II – Virtual test – Wind energy vs fisheries in the Galician coast

In order to check and test the logistics of the method proposed, a test was developed considering a virtual (not real) scenario in which a wind farm is to be deployed in the Galician coast and a potential conflict with fisheries is identified. Following the method proposed:

1. Characterizing uses

Wind farms and fisheries have been characterized following the characteristics (internal and external) and the values proposed (Tables 1 and 2). Additional information is provided in order to understand the value given for each characteristic and the implications in the potential interaction.

Fisheries, Galicia (Spain):

			Values	**Additional information**
Fisheries, Galicia (Spain)	**INTERNAL CHARACTERISTICS**	**Long-term attitude**	Conservative	Fisheries can be considered as a "common use". They want to keep their historically right of exploitation by claiming the use of the whole area available, always respecting restrictions and measures imposed by policies in the matter.
		Scope	Local	Fishing up to 30 nm from the coast is the one that could enter into conflict with wind farms deployment.
		Resources usage	Extraction	Extraction of fishing resources. Resources might be impacted at the phase of construction of wind farms they might redistribute in other areas. The extraction of these resources might be impossible where the wind farm is installed.
		Spatial Character	Diffuse	Exploiting a mobile resource, the activity ‘spatial implications have a diffuse character in contrast to an activity fixed in a specific point or area. In this sense, the spatial overlapping with another activity may occurs in some areas, while in others might not.

		Temporality	Time bounded	As it happens with its spatial character, this activity does not happen permanently along time but in some time slots. This means that any interaction that may occur with another activity, will not be permanent, but it will only happen when this activity is in place (in a given time) and in spatial overlapping with the other (in a given space)
	EXTERNAL CHARACTERISTICS	**Public perception**	Tolerable	Fisheries are a historically traditional use in the area. It makes sense to think that people is familiarised with it and understands its value, which implies that they accept the use.
		Relevance	Culturally, socially and/or historically relevant	Societal link of the sector is relevant as it supports economically local households directly and indirectly through the value chain. For coastal communities, fisheries are highly connected by its associations (e.g. Cofradías de pescadores)
		Governance	Mixed	In this context, this activity is managed at different levels: EU level, National level and at regional level in a lesser extent, as they are external waters.
		Dependency	Dependent on the environment	This activity depends a lot on regulations (EU level, quotas) and on the environment. Keeping in mind the kind of interaction analysed, the dependence on the environment is highlighted as the most relevant.

Table 1. Characteristics of “fisheries” use

			Values	Additional information
Wind energy, Galicia (Spain)	INTERNAL CHARACTERISTICS	**Long-term attitude**	Proactive	Wind energy development requires of several studies regarding resource availability and technical issues (i.e. depth), furthermore, this activity requires of specific licenses to operate in a particular area, so this sector normally have to plan ahead for the development of the activity. In addition, wind projects should need an approval of EIA.
		Scope	Local	It should be considered two stages of wind farm projects: 1. during construction and 2. during operation.
		Resources usage	Exploitation	
		Spatial Character	Spatially explicit	Wind farms occupy specific delimited areas and their spatial influence can be represented by the installations and their buffer zones where navigation may be limited or prohibited. Many countries have established zones for the installation of wind farms.
		Temporality	Permanent	In the framework of the study, these installations are considered permanent. They might not be working continuously, in fact the effect produced by their functioning might be punctual, but the effect that has more relevance on the activity of fisheries is more related to the occupation of the space rather than about their functioning.
	EXTERNAL CHARACTERISTICS	**Public perception**	Tolerable	Renewable energy itself is found as an attractive sector because of the obvious benefits in comparison with other energy resources, however, the interaction of wind farms with the landscape and its effects on seabirds makes no possible to consider this activity as "attractive". Related to the tourism sector, in some coastal areas, it is not good considered because of this landscape impact.
		Relevance	Strategically relevant	This activity is both, economically and strategically relevant, as it is considered in national and European policies and strategies and it is going to be promoted by public institutions.
		Governance	National	Site identification and licenses are issued by the national administration.

		Dependency	Dependent on technological development	The deployment of this kind of infrastructure in a particular area is sometimes conditioned by the technology available, also, interactions with other activities and the environment might be influenced by the technology used in its installation and functioning.

Table 2. Characteristics of “wind farm” use

2. Characterizing the interaction. Building micro-scenarios.

In the next table, characteristics of both uses are confronted to try to analyze what they imply in the interaction, highlight the main drivers and thus, be able to identify and propose the best way to approach the situation that they build (Table 3).

In the case that this scenario becomes real, the use most affected will be the exitent, fisheries .			Fisheries, Galicia (Spain)								
			INTERNAL CHARACTERISTICS					EXTERNAL CHARACTERISTICS			
			Long-term attitude	Scope	Resources usage	Spatial Character	Temporality	Public perception	Relevance	Governance	Dependency
			Conservative	Local	Extraction	Diffuse	Time bounded	Tolerable	Culturally, socially and/or historically relevant	Mixed	Dependent on the environment
Wind energy, Galicia (Spain)	INTERNAL CHARACTERISTICS	Long -term attitude	Proactive	The fact of one activity being proactive and the other one being conservative will help to identify the conflict, and the specificities before it occurs (**area**, kind of conflict). Fishing grounds are known before the locations' analysis of future wind farms .On the other hand, it could help to identify possible synergies to establish areas of "no conflict"			When one activity has a diffuse character, the other one being proactive it is an advantage as it can help to identify the potential conflict in **space** beforehand	As one activity is **not permanent**, we should consider that the conflict will not be permanent, although it will be for the diffuse activity when its resources are **spatially overlapping** the wind farm				
		Scope	Local		In this case both activities work in the local environment and their conflict will be local. It will be a conflict for the **space**. In other hand, it is important to know that during the operational stage of the wind fam, fish could be affected by noise, and there is the possibility that fishes could look for new areas to live (spawning, breeding, reproduction, etc.), these changes could affect fishing sector, and space conflict with wind energy.	Wind farms might affect not only the extraction of the resource (because of the **impossibility** of **accessing** the space) but also the **availability** of the resource itself that could redistribute in other areas.			The fact that we are in a **local** environment can make that fisheries that was considered just "tolerable" might be more supported by the general public in the face of a **new activity** conflicting with it	Linked to **public perception**, fisheries enjoys of a strong cultural and **social link** in local environments which may play a role in the conflict with wind farms	Here we identify a **mismatch** between the governance scale of fisheries (national, regional) and the scope of the potential conflict (local) which can led to a misinterpretation of the specific situation.	
		Resources usage	Exploitation		They don't exploit or extract the same resource. Conflict for space.						
		Spatial Character	Spatially explicit	For an activity that is conservative in its long-term attitude (fisheries) a future spatially explicit activity helps it to **defend** that specific **space** as it can react before it occurs		In the specific space reserved for the wind farm, fisheries will **not** be able to **extract** the resource	The conflict is about space but **not all the space** that any of the activity use.	The conflict will be in a **specific place** and **limited in time**				If wind farms have a direct effect on the environment from which fisheries is dependent, this impact will be spatially explicit (i.e. seabed habitats destruction) other impacts of wind farms can propagate further but these should be assessed and studied.
		Temporality	Permanent		The **impossibility to extract** the resource in the area will be **permanent**.	Of all the range of spatial action for fisheries, this space will be out of it permanently , although not always be of interest (mobile resource)	The conflict only exists when fisheries is happening , but for them, this negative effect is permanent in their time range of action if the resource is overlapping the wind farm area.				Although wind farms are "permanent" (in the sense that they will be there at least for 20 years) ,impacts on the environment of which is fisheries dependent, are likely to happen mostly at the phase of installation. From this point, there are some studies that suggest that the submerged structure may work as an **artificial reef**, incrementing the biomass production in the surroundings.
	EXTERNAL CHARACTERISTICS	Public perception	Tolerable		At local level this **public perception may change** in a view of landscape impact and the potential conflict with a societal relevant use (fisheries)						**Public perception** on wind farms might be **influenced** if there is significant impact on the environment and this affect fisheries
		Relevance	Strategically relevant	As part of national and international initiatives/**strategies**, windfarms will be supported and promoted while fisheries might try to defend the occupation of space through their **formal bodies of representation**					National and international initiatives/**strategies** may influence the public opinion of fisheries in opposition to wind farms, however, fisheries activity is very **socially important** in the area.	The relevance of both activities are based in totally different factors. For fisheries the social link at local level and the local economy that it supports it is the weighting factor while for wind farms will be the fact that they are a strategic sector (energy) considered in EU policies and initiatives (i.e. Green Deal) and that it has also economic relevance. However in the specific interaction it is very relevant to consider the **"power" of the fisheries sector in the area.**		
		Governance	National		This mismatch between the scale of the interaction and the scale of the governance system of both activities can be an issue for conflict resolution.						The two activities have part of their **governance** structure at **national** level which can be an opportunity to launch the collaboration of both activities at the governance level, as a first step	
		Dependency	Dependent on technological development		The place in which a wind farm can be installed is normally limited by depth, this might change with new technological developments.						Technical developments in wind farms installations and structure may reduce impact on the environment (i.e. floating wind farms)

Table 3. Interaction analysis between fisheries and wind farms in Galicia coast, Spain.

Key for "Building blocks"
Descriptors
Risks
Opportunities

3. Targeted approach

From the previous analysis, once the main aspects are raised it should be easier to identify the main steps to approach the situation. In this case, the "building blocks" of this scenario have been classified into "Descriptors", "Risks" or "Opportunities" and specific recommendations are proposed to tackle them (Table 4). Based in these recommendations a targeted approach is developed as a strategy to deal with the interaction.

Building blocks	Scenario		Recommendations
Descriptors	**Kind of conflict**	**Impact**	To assess the extent of the conflict it would be important to involve the direct stakeholders affected (fishermen that fish in the area that is designed for development of wind farms) and experts on fisheries stocks. This way the time and space can be detailed to the possible extent and the real negative impact for those fishermen can be assessed with more knowledge of cause. Possible measures if a real economic impact is described: Compensation measures (subsidies), reduction and/redistribution of the wind farm area.
	It is mainly a spatial conflict: - Limited in time but the time is not known (depends on a mobile resource) - It does not cover the totality of the space of any of the activities, but the specific area is unknown (mobile resource) So, even if the conflict is limited in space and time, these two variables are not constant but they vary due to the target resource of one of the activities, that is mobile (fisheries).	Fisheries would be the activity affected as once the wind farm is deployed it would not be able to access the resource in that space and there is a possibility that the resource itself could be affected.	
	There might be an indirect impact related to the construction phase of wind farms due to the environmental dependency of fisheries. Deployment of windfarms can produce seabed disturbance, which can affect the potential for the ecosystem to produce ecosystem services and goods (in this case, the fisheries resources). This indirect impact is expected to be limited in time and space. In addition, there could be also a disturbance to the fauna during operational process, there is known that some animals as sharks and rays could be affected by electromagnetically field.		
Risks	There is a mismatch between the scale of the conflict and the governance scale in both activities.		Hot spots of this interaction are related to scales and, in relation to this, to the relevance of both activities and the way of valuing it, which is different for each activity. In the view of the principle of subsidiarity, to tackle these issues, a nested approach of scales is recommended.
	As the conflict is at local level, the social relevance of fisheries can play an important role and influence the public perception on the conflict.		
	Their relevance is valued by different factors (Strategically/economically VS socially/culturally)		
Opportunities	After the wind farm is constructed, their submerged structures may act as artificial reefs and this can be considered as compensation for the disturbance caused by the construction phase.		It is important to act actively to favour this opportunity, this is, to assess the real implications of these opportunities and to be sure that the best is taken out of it (in collaboration with the fishermen affected and experts on the topic).
	Both activities have a relevant part of their governance structure at national level		MSP at national level could be the best platform to start this collaboration at the governance level and project it to the local and stakeholder scale .

Table 4. Building blocks and recommend ations

Based on the previous analysis, an example of *targeted approach* for this interaction could be the following:

The strategy to use for this interaction should be based in a **nested approach to scales** (of governance, and conflict). This is, the potential interaction should be identified at national level in the **framework of MSP** development. This forum can be the first step into downscaling to the level of the conflict scale (local). The MSP group shall, with the help of local administrations, identify the specific stakeholders affected (fishermen operating in the area of the potential development of a wind farm). The recommendation is to create an event (or working group) to involve these stakeholders together with experts on fisheries resources on the area and technicians from the wind energy sector. The objective of this workshop will be:

- To try to specify with greater detail the space and time variables of the conflict and possible synergies
- To conduct an assessment on the socio-economic impact of the interaction to the possible extent, taking into account the potential positive effect of the submarine structures acting as artificial reefs
- To identify potential alternatives (i.e., creation of "corridors" to allow some fishing gears to operate between groups of wind turbines), or compensation measures.

This forum should be maintained in the long term, after the construction of the wind farm, and to monitor the situation in case circumstances change. Also, this long-term monitoring of the interaction by both sectors in the framework of MSP could allow identifying possible synergies in the future.

In this case MSP is the framework in which to take the first step in this collaboration and to propose actions to solve the conflicts; and to identify synergies. However, specific actions proposed (i.e., relocation of wind farm areas, or compensation measures for fisheries) are decisions that will need to be taken by the respective competent authorities.