Version 1.1

MUSES PROJECT

CASE STUDY 1A
OFFSHORE WIND AND COMMERCIAL FISHERIES IN THE EAST COAST OF SCOTLAND

MUSES DELIVERABLE:
D3.3: CASE STUDY IMPLEMENTATION – ANNEX 1

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Introduction

The overall goal of the MUSE project is to facilitate the implementation of Multi-Use (MU) in European Seas. The project approaches the MU concept at an EU, sea basin, and national levels (Work Package 2, Sea basin overview) as well as local level (Work Package 3, Case studies). Lessons learned from all work packages are distilled in a series of actions to promote MU in all 5 European sea basins (Work Package 4, Action Plan).

Case studies aim at identifying and assessing MU barriers and opportunities. Furthermore, relevant considerations, emerging from the context, as well as stakeholder experiences and perceptions at a local level, will inform the Action Plan. A series of case studies are included in MUSES project with different thematic, geographic, and focus area dimensions. This case study report presents the results from one of the 10 Multi-Use case studies, carried out in the framework of the Multi-Use in European Seas (MUSES) project, Work Package 3 (WP3). The focus of the case study presented here is offshore wind farms and multi-use combination with commercial fisheries in the East Coast of Scotland, in the North Sea.

1 GEOGRAPHIC DESCRIPTION AND GEOGRAPHICAL SCOPE OF THE ANALYSIS

The North Sea is one of the busiest seas for maritime industries in the world. Various sectors, such as offshore wind, play a major part in generating economic value and employment and are set to expand in line with smart 'Blue Growth' objectives. Wind energy (both onshore and offshore markets) already meets 10.4% of the EU's power demand, and is the most competitive source of new power generation. European offshore wind has seen a strong and steady growth since the early 2000s. By the end of 2016, 81 offshore wind farms with a total of 3,589 offshore turbines have been installed and are grid-connected in in 10 European countries, making a cumulative total of 12,631MW. All top 5 European countries with the largest amount of installed offshore wind capacity are bordering the North Sea. Combined, the top five countries of the North Sea represent 97% of all grid-connected turbines in Europe (Figure 1).

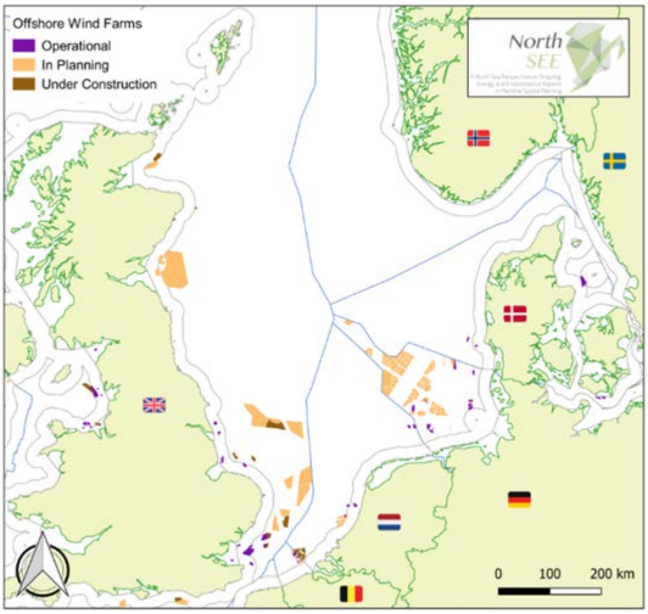

Figure 1 Map of offshore wind farms in the North Sea (Source: NorthSEE project – www.northsee.eu**)**

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The UK currently leads with the largest amount of installed offshore wind capacity in Europe, representing 40.8% of all installations. WindEurope, Europe's wind energy trade association, predicts that the UK offshore market will dominate developments up to 2020[1] (with additional 5.2 GW or 42% of the new grid-connected capacity) and is expected to maintain a leading role in the wind market by 2030[2].

The vast majority of UK installed developments are currently found in the southern North Sea (east coast of England), however significant developments (utility scale) are expected in Scotland (mostly in the East coast, see Figure 2). This is due to ambitious renewable energy government targets, including meeting 100% of Scotland's electricity needs from green sources, including offshore wind, by 2020.

Most utility-scale offshore wind developments in Scotland (and generally around Europe) are traditionally bottom-fixed, and use mono-pile, gravity-based, or jacket foundations. Mono-pile consists of a steel pile driven into the seabed. Gravity-based foundations consist of a large concrete block resting on the seabed. Jacket foundations consist of a lattice tower with smaller piles penetrated into the seabed fixing its location.

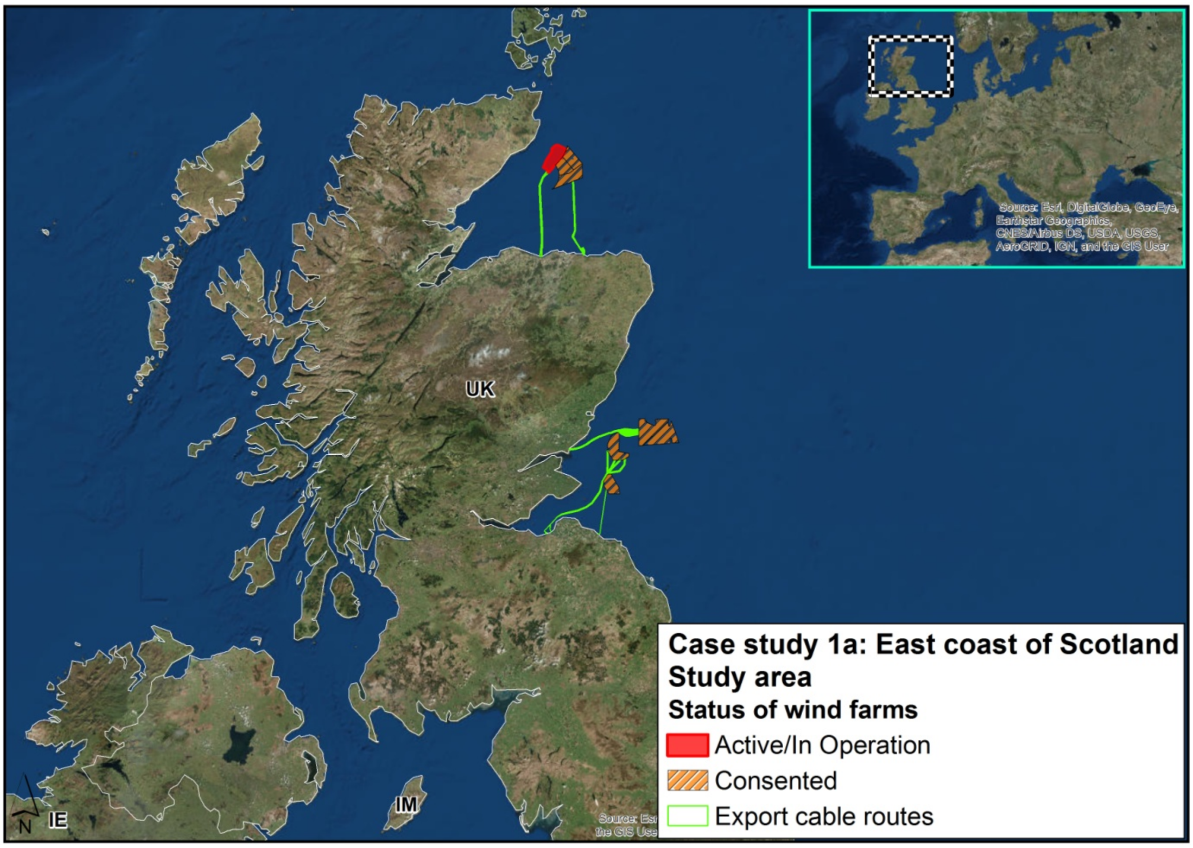

Figure 2 Map of offshore wind farms in the East coast of Scotland

1 WindEurope (2017) Wind Energy in Europe: Outlook to 2020.

2 WindEurope (2017) Wind Energy in Europe Scenarios for 2030.

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However, the offshore energy industry is constantly evolving with new advancements in technology, such as floating wind farms, allowing larger developments of bigger and more powerful wind turbines to be built further offshore. A floating wind turbine is an offshore wind turbine mounted on a floating structure that allows the turbine to generate electricity in water depths, where bottom-mounted structures are not feasible. Scotland currently leads the way in the floating wind market with a number of pilot projects in Scottish waters. In 2017, became the home to the world's first floating wind farm generating electricity.

The current and future expansion of offshore wind in Scotland (both bottom-fixed and floating wind farms) creates an interesting dynamic with other traditional maritime users, including commercial fisheries. Access to the same locations, due to similar required space characteristics (e.g. shallow areas, specific depth ranges, sediment types, proximity to coast, etc.), often leads users to compete. Sometimes, incompatibility between competing maritime uses results in claims for exclusive access to space. However, in the case of commercial fisheries (especially static gears) and offshore wind farms, users are compatible and colocation of their activities is possible. Furthermore, the policy framework in Scotland and the UK encourages the reinstatement of commercial fishing activity, after the construction of a wind farm.

As a result, the multi-use combination between commercial fisheries and offshore wind farms in the East Coast of Scotland presents an excellent opportunity to be used as a case study of existing MU. This case study focus on identifying and assessing MU current barriers for the its realisation, opportunities for further expansion, as well as document stakeholder experiences and perceptions at a local level. More specifically, the case study report documents:

- Policy, legal and industry drivers for facilitating multi-use between the two industries,
- Barriers hampering the further development of multi-use between offshore wind farm developments and commercial fisheries, and
- Resulting economic, environmental, and social effects of the multi-use drivers and barriers, also referred to as added values (positive effects) and impacts (negative effects), respectively.

It is argued that lessons learned from this case study are easily transferable to a number of other multi-use locations around the UK, North Sea and other EU sea basins. Multi-use combinations exploring interactions with offshore wind farms and another widespread maritime user can benefit from the principles for coexistence presented here.

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2 CURRENT CHARACTERISTICS AND TRENDS IN THE USE OF THE SEA

Scotland's seas host a variety of marine uses with an increasing demand for ocean space. There are increasing plans for emerging activities in Scottish waters including offshore wind, to match aspirational energy targets set by government. Ambitious renewable energy targets include meeting 100% of Scotland's electricity needs from green sources, including offshore wind.

Consented and proposed offshore wind farms are found mainly in the East coast of Scotland. Offshore wind has achieved tremendous progress over the last years in Scotland. A total of five utility-scale, bottom-fixed offshore wind sites in the East coast (comprising 8 offshore wind farms) have been granted all necessary marine licenses and consents and act as the main focus for this study (see Figure 2).

Fixed-foundation offshore wind farms in Scotland

There are currently three offshore wind farm sites in the outer Moray Firth, comprising neighbouring projects – Moray Offshore Wind farm (East) Limited, Moray Offshore Wind farm (West) Limited (formerly collectively known as Moray Offshore Renewables; MORL), and Beatrice Offshore Wind farm (BOWL). Moray Offshore Wind farm (East) Limited has consent to build three wind farms (Telford, Stevenson, and MacColl) in the Moray Eastern Development Area (EDA), with a total capacity of up to 1,116 MW and up to 62 turbines on each farm. The Moray Offshore Wind farm (West) Limited proposal has completed scoping for a proposal of up to 90 turbines and a generating capacity of up to 750 MW in the Moray Western Development Area (WDA). BOWL is currently installing 84 turbines with a capacity of up to 664 MW.

Four offshore wind farms - Inch Cape, Neart Na Gaoithe, Seagreen Alpha and Seagreen Bravo – gained consent in the Forth and Tay area in 2014. According to the consents currently held:

- The Neart na Gaoithe wind farm east of the Fife Ness coastline is for up to 75 turbines, generating 450 megawatts (MW) of power.
- The Seagreen Alpha and Bravo developments combined will consist of up to 150 turbines, around 27-38 km off the Angus coastline, and could generate 1050MW, and
- The Inch Cape development, also off the Angus coastline, will total no more than 110 turbines, with a total capacity of 784 MW.

The Forth and Tay developers have all recently approached the licensing authority and completed scoping, with the intention of submitting new applications for revised developments in order to take advantage of advances in turbine technology since their original design in 2012.

Floating wind farms in Scotland

Floating wind in Scotland currently consists of the Hywind pilot park (world's first floating wind farm), and Kincardine Floating Offshore Wind farm. Hywind, found 25 km off the coast of Peterhead, Aberdeenshire in Scotland, consists of a 30 MW wind turbine farm made up of 5 wind turbines on floating structures at Buchan Deep. The pilot park covers around 4 square kilometres, at a water depth of 95-120 metres. Kincardine, found approximately 15 km south east of Aberdeen, Scotland consists of 8 floating wind turbines, with a maximum generating capacity of 50 MW. Once built, the wind farm will cover around 110 square kilometres, at a water depth of around 60-80 metres.

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Besides floating wind, Scotland is home to Floating Power Plant (FPP), the world's first successfully offshore-tested combined wind and wave device and the first Offshore hybrid to generate power to the grid. FPP's device, the P80, is a floating platform that hosts a single wind turbine ranging from 5 MW to 8 MW. The platform integrates 2 MW to 3.6 MW wave power dependent on the wave resource. A joint venture between FPP and DP Energy (Katanes Floating Energy Ltd) is looking to set up a pilot demonstration project in Scotland, featuring FPP's hybrid wind-wave technology. It is expected by the developer that the first 7.6 MW platform will be installed at the Scottish project, possibly as early as 2019.

Plan options for offshore wind

In addition to the above, 28 sectoral plan options around Scotland have recently been identified for future renewable energy developments to further support SG renewable energy policy targets (I. M. Davies, Watret, & Gubbins, 2014; Scottish Government, 2013c, 2014b). The Scottish Government has developed plans for offshore wind, wave and tidal energy in Scottish waters. The plans identified spatial plan options for offshore wind, wave and tidal energy, which will contribute to meeting Scotland's target of generating the equivalent of 100% of electricity demand from renewable sources and also seek to maximise the contribution of these technologies to achieving a low carbon economy. The offshore renewable energy plan options have been laid before parliament for consideration by Scottish Ministers.

Commercial fisheries in Scotland

Commercial fisheries have been historically vital to Scottish seas both economically and culturally. Scotland also hosts one of Europe's largest commercial fishing fleets with 2,046 working vessels and employs ca. 5,000 fishers (Scottish Government, 2015b). The Scottish fishing fleet has a widespread distribution with annual landings reaching ca. £466 million in first sale value (Scottish Government, 2015b). Based on landings, the fleet is often split into broad sectors comprising pelagic, demersal (or whitefish), mixed demersal, and shellfish fleets. Scottish shellfish fisheries target crustaceans and molluscs, such as scallops, *Nephrops,* crabs, and lobsters. Due to their resource requirements, shellfish fisheries are those in overlap with offshore wind farm the most.

The Scottish King Scallop Dredge fishery

Scallop fisheries in Scotland include King scallops (*Pecten maximus*) and Queen scallops (*Aequipecten opercularis*). Scallops are caught commercially either with metal dredges or by diving (Sainsbury, 1996). Scallop fisheries are commonly targeted by two distinct size categories: smaller vessels (<15 m) with home ports close to scallop fishing grounds and limited operational range, and larger "nomadic" boats which target grounds throughout the UK. Larger vessels (≥ 15 m) comprise just one fifth of the total Scottish fleet, however account for the majority of total landings value (ca. 85%; Scottish Government, 2015b). Dive caught king scallops fetch a higher price at market, but only contributes 5% to the total landings of the species. Besides king scallops, a smaller fishery using dredges takes place for Queen scallops, but accounts for less than 10% of the scallop landings and the majority of landings are caught in the Irish sea. The scallop dredge fishery is constrained by the distribution of the target species (sandy sediments, mostly up to 50 m).

The Scottish *Nephrops* Trawl fishery

The crustacean species *Nephrops norvegicus*, also known as the Scottish langoustine, is an important commercial species to the Scottish demersal fishing fleet. *Nephrops* is second only to demersal fish, such us haddock, in terms of landed volume, however, it is top in terms of value due to

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the high market price. *Nephrops* vessels with gear configured in the same way as that used to target whitefish, but with modified nets. Vessels tow one or more trawl nets (single or twin rig) along the seabed. The *Nephrops* fishery is constrained by the distribution of the target species. *Nephrops* have a mobile range of within 100 m of the burrows in which the live. These burrows are only found in specific substrate types (suitable sediments for *Nephrops* are composed of mud or silt no more than 10% sand). Consequently, the *Nephrops* fishery in the northern North Sea is directed mainly over four grounds where such substrates occur. *Nephrops* operating patterns and practices include

The Scottish creeling fishery

Crab (brown and velvet) and lobster are principally targeted by full time static gear vessels setting creels (pots). Crab is targeted on a variety of substrates, lobsters are targeted on rocky, uneven ground and around wreck sites. Crab and lobster are not currently quota restricted, although all vessels landing over a particular weight (200 kg of lobster, 750 kg of crab) must be licensed. The Peterhead inshore fleet is largely comprised of vessels up to 12 m in length which operate from the harbour on a daily basis. The majority of activity occurs along the coast within 3 nautical miles (nm), although a moderate number of the vessels also fish out to 6 nm. Brown crabs are generally targeted between early spring to early May and from September to November. The lobster season commences in May, peaks in July and August and finishes in December. Velvet crab landings fluctuate from year-to-year and the highest catches are recorded in April and May and between October and December. As a result of the limited size of vessels in the area, weather conditions are a significant factor in determining levels of activity in the winter months. In addition to full time vessels, there are also a number of part time vessels that will set a small number of creels in inshore areas during the summer months.

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3 MU OVERVIEW

This section presents the results of the desk-based analysis, which helped identify existing MU combination of offshore wind farm and commercial fisheries (Step 1 of MUSES Case study methodology D3.1). It also integrates input from interviews with 9 relevant stakeholders (see Section 7 for stakeholder identification). More specifically, this section describes the MU activities, their common resource needs and their level of maturity. Furthermore, the legal and policy background behind the MU combination Is presented.

3.1 MU activities background

Despite significant benefits from emerging marine uses (e.g. greenhouse gas emission reduction from renewable energy sources), they raise important spatial concerns to traditional users (e.g. commercial fisheries), who often find themselves primarily concerned about the issue of exclusion (see section 2 for a detailed description of the individual characteristics of each activity). Increased competition for marine space (Baxter *et al.*, 2011), results in significant concerns amongst stakeholders (Pomeroy and Douvere, 2008; Douvere and Ehler, 2009; Smith and Brennan, 2012; Jentoft and Knol, 2014), as well as has a range of direct and indirect, positive and negative, economic, social and environmental effects on individual fishers, the fishing industry, fishery-dependant coastal communities and wider society (Kafas *et al.*, 2017).

Both offshore wind farms and commercial fisheries seek access to locations, which share the same physical characteristics (e.g. shallow areas, specific depth ranges, sediment types, proximity to coast, etc.). Similar space characteristic requirements often lead to a spatial overlap (Figure 3). Spatial overlap between offshore wind farms and commercial fishing activity impedes on movements of fishing vessels (FLOWW, 2014; SeaPlan, 2015; Vries *et al.*, 2015; Gray *et al.*, 2016). Offshore wind farm development areas constrain crossing or circumnavigation of fishing vessels during construction and operation phases, effectively acting as area closures. As a result, offshore wind farms limit access to traditional fishing grounds. Consequently, fishermen may re-allocate (displace) their fishing effort to alternative sea areas with lower profits and/or less reliability in catches. Furthermore, harvesting the fish resource in alternative locations might run the risk of catching vulnerable elements of the stock. Interactions may also include access to the same pool of human resources (e.g. access to technical staff) as well as infrastructure and other technical resources (e.g. vessel access, port facilities)

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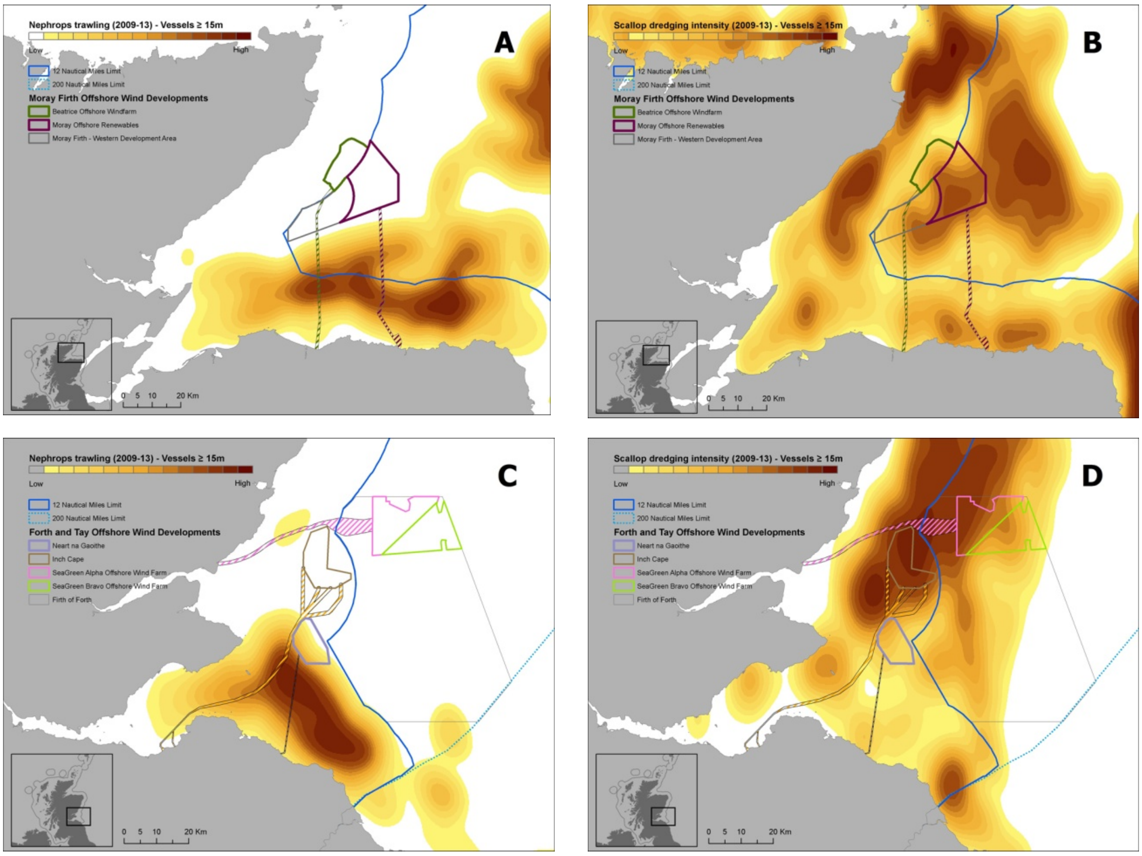

Figure 3 East coast offshore wind developments overlaid with amalgamated fishing activity over the last five years of available data (2009-2013) of the study fleets: nephrops trawling (A & C) and scallop dredging (B & D) in the Moray Firth and Forth & Tay regions respectively

However, more space for one user group should not always be directly translated as less for others. Peaceful co-existence is often possible and can yield a range of benefits (see section 4). However agreeing on space allocation and associated regulatory content requires each industry to represent their ocean space use effectively, reach a better understanding of the interactions between activities, and work towards negotiation and cooperation.

The overlap of utility-scale offshore wind developments and commercial fisheries in the East coast of Scotland is the prime focus of this case study. The sole MU combination explored here, includes the **MU combination of fixed foundation offshore wind farms and commercial fisheries (mobile & static gears)**. However, results are directly transferable to emerging floating offshore wind and hybrid platform markets in Scotland (as presented in section 2) and potentially other locations. Results from MU combinations of i) floating foundation offshore wind farms with commercial fisheries (static gears), and ii) hybrid platforms of offshore wind turbine and wave energy converter, and commercial fisheries (static gears) are not presented separately to avoid duplication and reflect the limited number of interviewees from those sectors.

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3.2 Legal & policy background

Information concerning legislation, institutional and administrative context at your local level are presented in this section.

EU MSP directive (2014/89/EU)

The European Commission supports the development of Maritime Spatial Planning (MSP) processes throughout the EU and had proposed legislative action on Maritime Spatial Planning in 2013. The MSP Directive (2014/89/EU) was adopted by the European Parliament and the Council, and came into force in the end of summer 2014 (transposition into member states' own laws will take place in September 2016). As such, MSP has a vital role to play in arbitrating between marine activities, such as marine renewable energy production and commercial fisheries. MSP can contribute to the protection of the marine environment by allowing for a more sustainable use of space and by limiting activities in, or near, ecologically sensitive areas. MSP can secure important fishing grounds for the sector. It ensures that fishermen have a voice in the development of EU seas.

UK Marine Policy Statement 2011

The UK Marine Policy Statement (MPS) is the framework for preparing Marine Plans and taking decisions affecting the marine environment. It contributes to the achievement of sustainable development in the UK marine area. The UK MPS commits marine planning authorities to consider the potential social and economic impacts of other developments on fishing activity, as well as potential environmental impacts. They should, for example, have regard to the impacts of displacement and whether it is possible for vessels to relocate to other fishing grounds. They should also consider the potential impacts of this displacement on the viability of fish stocks and on the marine landscape in the alternative fishing grounds. They will also wish to consider and measure the impacts on local communities of any reduction in fishing activity, redistribution of fishing effort or associated impact on related businesses as the result of a marine development' (p43). Wherever possible, decision makers should seek to encourage opportunities for co-existence between fishing and other activities (p43)

Scotland's National Marine Plan 2015

The introduction of the Marine (Scotland) Act in 2010 along with the UK Marine and Coastal Access Act 2009 provided the legal basis for the creation of a Scotland's National Marine Plan. The plan supports better management of the competing demands on marine resources and ensure increasing demands for the use of the marine environment are managed, economic development of marine industries is encouraged and environmental protection is incorporated into marine decision making. It also plays a role to manage adaptation to climate change. Marine planning in Scotland is undertaken in various levels. At a national level, Scotland's first National Marine Plan (Scottish Government, 2015) was adopted by Scottish Ministers in March 2015. This Plan covers both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles). It also applies to the exercise of both reserved and devolved functions. The plan comprise introductory chapter, a 'Vision, Objectives and Approach to Policies' chapter, a 'General Policies' chapter as well as sectoral chapters including Aggregates, Aquaculture, Carbon Capture & Storage, Defence, Offshore Renewable Energy, Oil & Gas, Recreation & Tourism, Sea Fisheries, Shipping, Ports, Harbour & Ferries, Submarine cables, and wild salmon & diadromous fish.

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4 CATALOGUE OF MU DRIVERS, ADDED VALUE, BARRIERS, IMPACTS (DABI)

This section presents the results of identifying the Drivers, Added values, Barriers, and Impacts (DABI) for the MU combination of offshore wind and commercial fisheries (Step 2 of MUSES Case study methodology D3.1). MU DABI factors are categorized by considering key issues for MU development, such as policies, administrative/legal aspects, environmental and socio-economic constrains, technical capacity, and knowledge gaps (technology, environmental impacts, health and security issues etc.). The DABI catalogue presented here (Table 1 and Table 2) is an integration of results from the desk analysis and from different stakeholder views as collected from interviews. The terms of the DABI catalogue are defined below:

- Drivers are those factors supporting the establishment and/or promoting the development of MU
- Added Values are the positive effects of establishing or strengthening MU
- Barriers are those factors hindering the establishment or negatively affecting of MU
- Impacts are the negative effects of implementing or strengthening MU

Barriers identified during interviews, different from those found in the literature, have been explored further with participants. This was an effort to distinguish between "real" vs. "perceived" barriers. Barriers with explicit references to legal, policy, or other administrative obstacles found in the literature should be treated as "real". Barriers resulted from stakeholder engagement (e.g. interviews, see section 7), where no explicit reference to a legal, policy or other administrative obstacle was found, should be treated as "perceived" barriers. The differentiation between the two types would be particularly important for the approach to be adopted to overcome those barriers in the Action Plan recommendations (see section 8).

Table 1 DABI catalogue for offshore wind and commercial fisheries combination. Part A includes drivers and barriers. Factors are grouped in categories

MU COMBINATION OFFSHORE WIND + COMMERCIAL FISHERIES

DRIVERS = factors promoting MU	**BARRIERS** = factors hindering MU
Category D.1 – Policy & legal drivers • Legal requirements preventing interference with legitimate maritime users e.g. fisheries • Policies supporting fisheries access to sea areas • Political support • EIA requirements to identify, consult, and mitigate affected stakeholders • No legislation justifying the exclusion of fishing operations from offshore wind farms • Policies for climate change adaptation	***Category B.1 – Economic barriers*** • Additional financial cost to offshore wind developers (e.g. insurance premiums, foundation types, installation methods, additional protection measures, micro-sitting, cable routing, additional survey cost, maintenance costs) • No direct financial benefits from MU to offshore wind developers

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DRIVERS = factors promoting MU	**BARRIERS** = factors hindering MU
Category D.2 – Administrative drivers • Requirement to satisfy marine licence conditions, related to commercial fisheries • Avoid potential licensing delays related to appealing stakeholders	***Category B.2 – Administrative barriers*** • Single-sector industry challenges impacting on the relationships between the 2 industries and attitude towards MU • Issues with consultation process including timing, frequency, insincere support, governance structure, representation, power imbalances, attitudes, and conflicts of interests • Design complexity of offshore wind farm developments discourages MU considerations • No spatial policies for commercial fisheries in marine planning
Category D.3 Indirect economic drivers • Avoid unnecessary additional costs to the offshore wind industry (e.g. delays in permitting, costly installation methods, delays with surveys) • Avoid unnecessary additional costs to the commercial fishing industry (e.g. loss of income, insurance premiums, loss of gears) • Wider indirect benefits to the local economy • Indirect economic benefits to the fishing industry (e.g. employment opportunities in the future)	***Category B.3 – Barriers related to technical capacity*** • Offshore wind farm components not always compatible with fishing operations • Incompatibility of fishing vessel and gear specifications with offshore wind farm altered sea conditions • Spatial data issues including availability, coverage, deficiencies & misrepresentation, access, interpretation, data gaps and resource requirements to fill those • Current EIA practice does not consider MU proactively
Category D.4 – Societal drivers • Contribution to food security • Cultural benefits from sustaining traditional fishing communities • Contribution towards Corporate Social Responsibility for offshore wind developers • Greater local acceptance • Positive attitudes for coexistence • Benefits to government for achieving sustainable development	***Category B.4 – Barriers related to social factors*** • Fishing industry perceptions around safety of operations within offshore wind farms • Negative attitudes of the fishing industry (e.g. limited engagement, claiming sole ownership of sea space, exploitation behaviour for compensation) • Negative attitudes of the offshore wind industry (e.g. deferring mitigation for later stages, insincere support to consultation, declining compensation) • Power imbalances: Fishing industry opposing multinational developers and government agendas
Category D.5 – Technological drivers • Available technology can satisfy current needs for MU (installation methods, navigation, gear and vessel technology)	***Category B.5 – Barriers related to safety*** • Ability to safely operate during extraordinary conditions (e.g. Engine failure, Snagging incident, extreme weather conditions, health issue, other force majeure)
	Category B.6 – Legal barriers • Commercial fishing parties are not statutory consultee in the marine licencing process • No legal requirement for compensation

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Table 2 DABI catalogue for offshore wind and commercial fisheries combination. Part B includes added values and impacts. Factors are clustered in categories

MU COMBINATION OFFSHORE WIND + COMMERCIAL FISHERIES

ADDED VALUES = positive effects of MU	**IMPACTS** = negative effects of MU
Category V.1 – Economic added values • Collaborative working relationships between the two industries (alternative employment opportunities, in-kind information feeding into assessments, avoiding survey disruption) • Proliferation of alternative gears and financial gain for the new fleet segment • Cost reduction from shared infrastructure for operations and maintenance	***Category I.1 – Economic impacts*** • Loss of income from area exclusions • Other indirect economic impacts on fishing operations, in relation to displacement, overcrowding, reduced quality of catches, knock-on effect on the supply chain • Higher energy cost to consumers due to increased development costs • Financial impact on offshore wind developers through more demanding baseline and post-installation surveys, increased risk to asset integrity, inter-array cable installation method and protection measures • Other direct cost to fishermen from increased steaming distances, capital costs for diversifying, costs from any fishing equipment
Category V.2 – Societal added values • Promotes longevity of the fishing industry • Community funding from developments can act as a catalyst for better governance, fisheries management, and engagement of the fishing industry in the scientific world • Builds trust with local fishermen • Promotes innovation in fishing methods as well as in foundations, installation methods, protection measures etc.	***Category I.2 – Social impacts*** • Locking up of productive biological resources and impacts on food security • Disempowering local stakeholders and creating an unjust society with power imbalances towards powerful multinationals • Social and cultural impacts from curtailment or cessation of fishing businesses, including loss of cultural traditions, additional conflicts between fishing groups, and loss of local knowledge • Fishermen welfare and health • Negative attitude and inability to diversity in alternative employment opportunities resulting in unemployment
Category V.3 – Environmental added values • Increased in yield and contribution to food security • Artificial reefs by providing protected habitats for marine species • Nurseries and sheltered areas contributing to strategic fisheries management as marine protected areas	***Category I.3 – Environmental impacts*** • Impacts on shellfish stock recruitment and resettlement during and after construction, due to sediment suspension • Closed areas may impact on prey-predator interactions with undesirable effects on commercial stocks • Noise impacts on sensitive life stages of commercial stocks • implications for the environment and fish stocks in adjacent areas in cases of localised displacement • Electro-magnetic field effects on shellfish
	Category I.4 - Technical impacts • Competition for access to port infrastructure with other marine users
	Category I.4 - Health & Safety impacts • Increased safety risks and snagging potential

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5 RESULTS OF DABI SCORING: ANALYSIS OF MU POTENTIAL AND MU EFFECT

This section ranks the MU drivers and barriers (Step 3 of MUSES Case study methodology D3.1) and MU added values and impacts (Step 4 of MUSES Case study methodology D3.1) factors identified in section 4. A semi-quantitative scoring system is applied. The scoring scale ranges from 0 to +3 for "Drivers" and "Added Values", and from 0 to -3 for "Barriers" and "Impacts". The relative balance between "drivers" and "barriers" and between "added value" and "impacts" identifies the overall "MU potentials" and the net "MU effect" in the study area, respectively. Each term is defined below:

- MU Potential is the degree of opportunity in the study area for MU to be established or further developed.
- MU Effect is the balance of pros and cons of establishing or further developing MU in the study area

Average scores were calculated averaging scores given by all the stakeholders for the same factor. Details about the scoring system can be found in section 2.2.4 of the MUSES Case study methodology D3.1. The scores presented here is the integration of expert knowledge, literature research, and relative importance given by all participants during interviews. It should be noted that readers should treat individual scoring and overall ranking of DABI factors with caution, due to the small number of interviews conducted as part of this case study (n = 9, See section 7). Table 3 and Table 4 present the average score of each DABI factor. Table 5 presents the average score of the DABI categories. Factors and Categories are presented in descending order, starting with the one with the highest absolute value. Derived estimation of MU potential and MU effect provided at the bottom of the table. Annex 1 provides the overall DABI scoring table, indicating scoring results from all the stakeholders.

Table 3 Scored DABI factors for offshore wind and commercial fisheries MU combination. Factors are ranked in descending order

MU COMBINATION OFFSHORE WIND + COMMERCIAL FISHERIES

DRIVERS = factors promoting MU			**BARRIERS** = factors hindering MU		
Factor	**Category**	**Average score**	**Factor**	**Category**	**Average score**
Avoid unnecessary additional costs to the offshore wind industry (e.g. delays in permitting, costly installation methods, delays with surveys)	Indirect economic drivers	3.0	Single-sector industry challenges impacting on the relationships between the 2 industries and attitude towards MU	Administrative barriers	-2.7
Contribution to food security	Societal drivers	3.0	Offshore wind farm components not always compatible with fishing operations	Barriers related to technical capacity	-2.7
Cultural benefits from sustaining traditional fishing communities	Societal drivers	3.0	Additional financial cost to offshore wind developers (e.g. insurance premiums, foundation types, installation methods, additional protection measures, micro-sitting, cable routing, additional	Economic barriers	-2.6

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DRIVERS = factors promoting MU			BARRIERS = factors hindering MU		
Factor	**Category**	**Average score**	**Factor**	**Category**	**Average score**
			survey cost, maintenance costs)		
Contribution towards Corporate Social Responsibility for offshore wind developers	Societal drivers	2.9	Incompatibility of fishing vessel and gear specifications with offshore wind farm altered sea conditions	Barriers related to technical capacity	-2.6
Avoid unnecessary additional costs to the commercial fishing industry (e.g. loss of income, insurance premiums, loss of gears)	Indirect economic drivers	2.8	Spatial data issues including availability, coverage, deficiencies & misrepresentation, access, interpretation, data gaps and resource requirements to fill those	Barriers related to technical capacity	-2.4
Greater local acceptance	Societal drivers	2.8	Fishing industry perceptions around safety of operations within offshore windfarms	Barriers related to social factors	-2.3
Legal requirements preventing interference with legitimate maritime users e.g. fisheries	Policy & legal drivers	2.8	Issues with consultation process including timing, frequency, insincere support, governance structure, representation, power imbalances, attitudes, and conflicts of interests	Administrative barriers	-2.2
Requirement to satisfy marine licence conditions related to commercial fisheries	Administrative drivers	2.6	Design complexity of offshore wind farm developments discourages MU considerations	Administrative barriers	-2.1
Policies supporting fisheries access to sea areas	Policy & legal drivers	2.5	Current EIA practice does not consider MU proactively	Barriers related to technical capacity	-2.1
Wider indirect benefits to the local economy	Indirect economic drivers	2.5	Ability to safely operate during extraordinary conditions (e.g. Engine failure, Snagging incident, extreme weather conditions, health issue, other *force majeure*)	Barriers related to safety	-2.1
Political support	Policy & legal drivers	2.0	No direct financial benefits from MU to offshore wind developers	Economic barriers	-2.0
EIA requirements to identify, consult, and mitigate affected stakeholders	Policy & legal drivers	1.8	Negative attitudes of the fishing industry (e.g. limited engagement, claiming sole ownership of sea space, exploitation behaviour for compensation)	Barriers related to social factors	-1.9
Indirect economic benefits to the fishing industry (e.g. employment opportunities in the future)	Indirect economic drivers	1.8	Negative attitudes of the offshore wind industry (e.g. deferring mitigation for later stages, insincere support to consultation, declining compensation)	Barriers related to social factors	-1.9
Positive attitudes for coexistence	Societal drivers	1.5	No spatial policies for commercial fisheries in marine planning	Administrative barriers	-1.7
Avoid potential licensing delays related to appealing stakeholders	Administrative drivers	1.4	Power imbalances: Fishing industry opposing multinational developers and government agendas	Barriers related to social factors	-1.7
No legislation justifying the exclusion of fishing operations from offshore wind farms	Policy & legal drivers	1.3	Commercial fishing parties are not statutory consultee in the marine licencing process	Legal barriers	-1.7

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DRIVERS = factors promoting MU			BARRIERS = factors hindering MU		
Factor	**Category**	**Average score**	**Factor**	**Category**	**Average score**
Available technology can satisfy current needs for MU (installation methods, navigation, gear and vessel technology)	Technological drivers	1.3	No legal requirement for compensation	Legal barriers	-1.2
Benefits to government for achieving sustainable development	Societal drivers	1.0	Single-sector industry challenges impacting on the relationships between the 2 industries and attitude towards MU	Administrative barriers	-2.7
Policies for climate change adaptation	Policy & legal drivers	0.5	Offshore wind farm components not always compatible with fishing operations	Barriers related to technical capacity	-2.7
DRIVERS average score		**2.1**	**BARRIERS average score**		**-2.1**
MU POTENTIAL			**0**		

The case study scored a MU potential of 0. It appears to be a balance between factors promoting MU development and factors hindering it. The development/strengthening of MU will therefore depend upon which of them will prevail. The knowledge of positive and negative factors is very useful to address actions aimed at facilitating MU development (see section 8)

Table 4 Scored DABI factors for offshore wind and commercial fisheries MU combination. Factors are ranked in descending order

ADDED VALUES = positive effects of MU			IMPACTS = negative effects of MU		
Factor	**Category**	**Average score**	**Factor**	**Category**	**Average score**
Promotes longevity of the fishing industry	Societal added values	3.0	Impacts on shellfish stock recruitment and resettlement during and after construction, due to sediment suspension	Environmental impacts	-2.8
Community funding from developments can act as a catalyst for better governance, fisheries management, and engagement of the fishing industry in the scientific world	Societal added values	3.0	Locking up of productive biological resources and impacts on food security	Social impacts	-2.4
Increased in yield and contribution to food security	Environmental added values	2.4	Increased safety risks and snagging potential	Health & Safety impacts	-2.4
Artificial reefs by providing protected habitats for marine species	Environmental added values	2.3	Loss of income from area exclusions	Economic impacts	-2.3

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ADDED VALUES = positive effects of MU			IMPACTS = negative effects of MU		
Factor	**Category**	**Average score**	**Factor**	**Category**	**Average score**
Nurseries and sheltered areas contributing to strategic fisheries management as marine protected areas	Environmental added values	2.2	Other indirect economic impacts on fishing operations, in relation to displacement, overcrowding, reduced quality of catches, knock-on effect on the supply chain	Economic impacts	-2.3
Builds trust with local fishermen	Societal added values	2.1	Higher energy cost to consumers due to increased development costs	Economic impacts	-2.3
Promotes innovation in fishing methods as well as in foundations, installation methods, protection measures etc.	Societal added values	2.0	Disempowering local stakeholders and creating an unjust society with power imbalances towards powerful multinationals	Social impacts	-2.1
Collaborative working relationships between the two industries (alternative employment opportunities, in-kind information feeding into assessments, avoiding survey disruption)	Economic added values	1.9	Financial impact on offshore wind developers through more demanding baseline and post-installation surveys, increased risk to asset integrity, inter-array cable installation method and protection measures	Economic impacts	-2.0
Proliferation of alternative gears and financial gain for the new fleet segment	Economic added values	1.8	Social and cultural impacts from curtailment or cessation of fishing businesses, including loss of cultural traditions, additional conflicts between fishing groups, and loss of local knowledge	Social impacts	-2.0
Cost reduction from shared infrastructure for operations and maintenance	Economic added values	1.1	Other direct cost to fishermen from increased steaming distances, capital costs for diversifying, costs from any fishing equipment	Economic impacts	-1.9
			Competition for access to port infrastructure with other marine users	Technical impacts	-1.8
			Closed areas may impact on prey-predator interactions with undesirable effects on commercial stocks	Environmental impacts	-1.7
			Fishermen welfare and health	Social impacts	-1.0
			Negative attitude and inability to diversity in alternative employment opportunities resulting in unemployment	Social impacts	-1.0
			Noise impacts on sensitive life stages of commercial stocks	Environmental impacts	-1.0
			implications for the environment and fish stocks in adjacent areas in cases of localised displacement	Environmental impacts	-1.0
			Electro-magnetic field effects on shellfish	Environmental impacts	-1.0

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ADDED VALUES = positive effects of MU			IMPACTS = negative effects of MU		
Factor	**Category**	**Average score**	**Factor**	**Category**	**Average score**
ADDED VALUES average score		**2.2**	**IMPACTS average score**		**-1.8**
MU OVERALL EFFECT			**0.4**		

The overall MU effect has been evaluated by averaging the average added value's score and the average impacts' score. A slight positive value (0.4) of MU effect has been calculated.

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Table 5 Scored DABI categories for offshore wind and commercial fisheries MU combination. Categories are ranked in descending order

MU COMBINATION OFFSHORE WIND + COMMERCIAL FISHERIES

DRIVERS = factors promoting MU		**BARRIERS** = factors hindering MU	
Category	**Average score**	**Category**	**Average score**
Category D.3 - Indirect economic drivers	2.6	Category B.3 - Barriers related to technical capacity	-2.4
Category D.4 - Societal drivers	2.5	Category B.2 - Administrative barriers	-2.2
Category D.1 - Policy & legal drivers	2.2	Category B.5 - Barriers related to safety	-2.1
Category D.2 - Administrative drivers	2.0	Category B.1 - Economic barriers	-2.0
Category D.5 - Technological drivers	1.3	Category B.4 - Barriers related to social factors	-1.9
		Category B.6 - Legal barriers	-1.4
ADDED VALUES = positive effects of MU		**IMPACTS** = negative effects of MU	
Category	**Average score**	**Category**	**Average score**
Category V.3 - Environmental added values	2.3	Category I.5 - Health & Safety impacts	-2.4
Category V.2 - Societal added values	2.3	Category I.1 - Economic impacts	-2.2
Category V.1 - Economic added values	1.5	Category I.2. - Social impacts	-2.1
		Category I.3 - Environmental impacts	-1.8
		Category I.4 - Technical impacts	-1.8

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6 FOCUS AREAS ANALYSIS

Case study results are further evaluated according to common conceptual categories, defined as "Focus Areas - FA". Focus Areas analysis is implemented by answering a set of Key Evaluation Questions (KEQs; Step 5 of MUSES Case study methodology D3.1). A list of the most relevant KEQs from FA1 (Addressing Multi-Use), FA2 (Boosting Blue Maritime Economy) and FA3 (Improving environmental compatibility) with their respective answers are presented below.

6.1 KEQs for Focus-Area-1 "Addressing Multi-Use"

1. Is it possible to establish / widen / strengthen MU in the case study area? For which MU combination in particular? What needs would MU satisfy?

Yes. It is possible to strengthen the MU of offshore wind farms and commercial fisheries. Interviewees mentioned various avenues for potential extensions, including:

- Enhancing the artificial reef effects. Wind turbine foundations can be engineered to host marine life or foundations can be further enhanced with additional rock armouring around their base. There was particular reference to crustaceans, specifically lobster hatchery.
- Investing further on the maritime tourism side of offshore wind farms. Offering/facilitating alternative employment opportunities for local fishermen with daily visits of the wind farm. Tourism links also including the promotion of alternative fishing/recreational fisheries within the wind farms.
- Supporting the establishment of alternative fishing practices targeting new species within offshore wind farms. Furthermore, developers can subsidise marketing costs to support the niche markets.
- Offering of services/benefits from the offshore wind industry to the fishing industry as a mitigation measure for cases obstruction. This may include covering costs for certification/labelling of sustainable fishing practices, new safety equipment, electrifying energy-intensive processing plants, providing electricity to fishing vessels (linked to a long term vision of hydrogen-fuelled transportation), or funding scientific research (e.g. fisheries stock assessments, gear modification studies, audiograms of fish species to aid in environmental assessments).
- Combining offshore wind farms with other activities such as offshore storage, enhanced oil recovery, desalination, other forms of energy generation (e.g. wave energy), low-maintenance aquaculture (e.g. *laminaria*)

2. Is space availability an issue for MU development / strengthening in the case study area at present? Will space availability become an issue for your area in the future? For what elements space availability is / could become an issue?

No. Space is not considered an issue for the MU combination of offshore wind farms and commercial fisheries by the interviewees. The offshore wind market is constantly evolving with new advancements in technology allowing for larger developments of wind turbines to be build further offshore that are bigger and more powerful, such as floating wind, and hybrid platforms. These advancements are expected to move the offshore wind market further offshore and allow for greater flexibility when planning.

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3. What would be the most important resources to be shared between uses (infrastructures, services, personnel, etc.)?

The resource shared for the MU combination of offshore wind farms is mostly marine space. The two industries currently share the same space requirements (see Section 1). The potential of sharing of services and personnel were treated favourably by interviewees. MU extensions to cover sharing of infrastructures have been discussed with stakeholders during interviews but were not seen as of great potential.

4. Are existing and/or potential MUs taken into account within the existing or under development Maritime Spatial Plans?

Yes. The case study presented here is an existing MU combination that is already encouraged in Scotland's marine legislation and National Marine plan. However, no explicit reference to Multi-Use is made in any of the official documentation.

More specifically, Paragraph 1, Section 27 (Determination of Applications), Part 4 (Marine Licensing) of the Marine (Scotland) Act 2010 states that "In determining an application for a marine licence [...] the Scottish Ministers must have regard to the need to [...] prevent interference with legitimate uses of the sea, [...] must consult in relation to each application such persons" i.e. fisheries. Moreover, Schedule 9 (Preservation of amenity and fisheries) of the UK Electricity Act 1989 states that "a licence holder [...] shall avoid, so far as possible, causing injuries to fisheries or to the stock of fish in any waters".

5. Is the needed knowledge and technology for MU development/strengthening in the case study area already available? (Y/N) What is the level of maturity of available knowledge? What is the level of readiness of available technology? Are there still research needs?

Currently, technology is not considered a major barrier in the MU combination explored. However, there are a number of areas, where MU can benefit from technological innovation. The areas identified can be found in section 8 under "Technical innovation".

6. What action(s) would you recommend to develop / widen / strengthen MU in the case study area? What actor(s) do you see particularly important to develop / widen / strengthen MU in the case study area?

A range of MU extensions and case study recommendations to the Action Plan are presented as part KEQ 1 (see above) and section 8, respectively. Extensions and recommendations are addressed to a number of actors, including offshore wind developers and their environmental consultants, licensing and planning authorities, funding bodies, research & development (R&D) companies, and research institutions.

6.2 KEQs for Focus-Area-2 "Boosting Blue Maritime Economy"

1. Do you see added values for society and economy at large and/or for local communities of developing / widening / strengthening MU in the case study area? What are the most important ones?

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Yes. There is a great value for society and local economy for enhancing the MU combination of off-shore wind and commercial fisheries. Added values, as identified and ranked in Section 5, include better use of marine space, positive contribution towards food security, promotion of longevity of the fishing industry, support to fisheries management, engagement of the fishing industry to the scientific world, building of trust with local fishermen, innovation in fishing methods as well as in offshore wind foundations, installation methods, protection measures etc.

2. What are possible investors interested in developing / widening / strengthening MU in the case study area?

According to KEQ1 (see above) and Action Plan recommendations (section 8), companies and private investors looking to invest in artificial reefs enhancement, marine tourism, aquaculture, marketing and labelling of sustainable fishing practices, , as well as certification and insurance firms will find the MU combination of offshore wind and commercial fisheries attractive. Furthermore, investing opportunities exist for R&D companies looking to develop technical solutions in the fields of gear modifications, mooring designs, cable installation methods, cable protection measures, and over-trawlability surveys. Lastly, opportunities exist for consultancies, or other relevant organisations, looking to develop services and good practice documents on better fishery data integration and interpretation in EIAs, links of MU and Corporate Social Responsibility of offshore wind farms, mapping of navigational hazards, standardised systems for operational monitoring of cable exposure, and additional educational resources.

3. Is there sufficient dialogue between the stakeholder sectors for developing / widening / strengthening MU?

There is a long history of dialogue between the stakeholder sectors. However, consultation issues scored very high in the current barriers identified (see Table 3). Issues are related to the consultation timing, frequency, insincere support, governance structure, representation, power imbalances, attitudes, and conflicts of interests. Therefore, additional dialogue between the sectors on developing MU further would be beneficial.

6.3 KEQs for Focus-Area-3 "Improving environmental compatibility"

1. What are / would be the environmental added values (= positive environmental impacts) of developing / widening / strengthening MU in the case study area?

Environmental added values, as identified and ranked in Sections 4 and 5, include the Increase in yield and contribution to food security, potential for artificial reefs enhancement by providing protected habitats for marine species, as well as the provision of nurseries and sheltered areas contributing to strategic fisheries management as marine protected areas, if carefully placed.

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7 STAKEHOLDER ENGAGEMENT AND LOCAL STAKEHOLDER PROFILES

This chapter describes the activities carried out to engage stakeholders. The case study was developed both through desk activities of review & analysis, and direct stakeholder involvement via semi-structured interviews between July 2017 and October 2017. Where possible, face to face interviews with the stakeholders were conducted at a time convenient for the stakeholders. Alternatively, interviews were undertaken via videoconferencing facilities. Interviews lasted between 1.5-2 hours. Stakeholder identification and engagement were carried out in accordance with the methods described in the document D3.2 Stakeholder Engagement.

7.1 Stakeholder engagement

A number of relevant stakeholders were identified with offshore wind and commercial fishing interests in the East Coast of Scotland (Table 4). Offshore Wind Farm Energy Developers (and respective representative energy companies) who have submitted a marine licence application to the Scottish marine licencing competent authority (Marine Scotland – Licence Operations Team; MS-LOT) in the East Coast of Scotland have been identified as relevant for the MUSES Case Study 1 and included:

- Beatrice Offshore Wind farm Limited (BOWL), incl. Scottish and Southern Energy (SSE) Renewables
- Moray Offshore Wind farm Limited (MORL), incl. Energias de Portugal (EDP) Renovavels and Repsol
- SeaGreen Wind Energy Limited, incl. Scottish and Southern Energy (SSE) Renewables
- Inch Cape Offshore Limited, incl. Repsol Nuevas Energías UK
- Neart na Gaoithe (NNG) Offshore Wind Limited, incl. Mainstream Renewable Power
- Forthwind Limited, incl. 2-B Energy UK
- Kincardine Offshore Wind farm Limited (KOWL), incl. Atkins Ltd. And MacAskill Associates
- Hywind Scotland Pilot Park, incl. Statoil Wind Limited (SWL)
- Katanes Floating Energy Ltd , incl. Floating Power Plant (FPP)

Non-statutory consultees with commercial fisheries interests, who have submitted a response to the statutory consultation exercise performed by MS-LOT for offshore wind farm developments found above, have been identified as relevant for this MUSES Case Study 1. Stakeholders were listed in the Consultation Exercise Section, Annex B: Background Information and Scottish Ministers' considerations, of the "'Submission to Ministers' for each development project"[3], and are listed below:

- Scottish Fishermen's Federation (SFF)
- Scottish Inshore Fisheries Groups (IFGs), incl. East Coast Inshore Fisheries Group
- The Scallop Association (SA)
- Fife Fishermen's Mutual Association
- Firth of Forth 10 Metre and Under Association (10MUA)
- The Inshore Fishermen's Alliance (IFA)
- Arbroath and Montrose Static Gear Association (AMSGA)
- Firth of Forth Lobster Hatchery (FoFLH)

[3] http://www.gov.scot/Topics/marine/Licensing/marine/scoping

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Commercial fisheries response as part of the statutory consultation exercise have been reviewed and incorporated in the MUSES case study results.

Besides, the organisations listed above, a list of other UK and international experts were approached to share their experiences relevant to similar mature case studies in other geographical locations.

- UK National Federation of Fishermen's Organisations (NFFO)
- The Crown Estate's Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW)
- Holderness Fishing Industry Group, UK
- University of Hull, UK
- Kelley Drye Law firm, New York, NY, USA
- Johann Heinrich von Thunen Institute, Germany

Note that, due to no responses, unavailability and input overlap between stakeholders, not all stakeholders listed above were contacted, nor an interview was undertaken with each and every one. A total of 9 interviews was undertaken. The interviewee sample comprises 3 offshore wind developers (33%), 3 commercial fisheries representatives (33%), and 3 research organisations or other consultancies (34%).

In order to collect stakeholder knowledge, experience and perceptions, the following Issues were discussed with stakeholders:

- Policy and industry drivers for facilitating coexistence between the two industries
- Potential sources of conflicts between offshore wind farm developments and commercial fisheries, also referred to as barriers. For example, these include loss of access to fishing grounds, displacement of the fishing activity to alternative fishing locations etc.
- Potential economic, environmental, and social consequences of conflicts, also known as impacts (negative effects). For example, loss of earnings, overfishing, loss of local knowledge etc.
- Management interventions taken/ further needed to mitigate impacts (negative effects), and
- Resulting synergies and added value from Multi-use.

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Table 6 Consultation responses by commercial fisheries organisations for East coast of Scotland offshore wind energy developments

	BOWL	MORL	SeaGreen	Inch Cape	NNG	Forthwind	KOWL	Hywind
SFF								
IFGs								
Scallop Association								
Fife Fishermen Mutual Association								
10 Metre and Under Association								
IFA								
Arbroath and Montrose Static Gear Association								
Firth of Forth Lobster Hatchery								

7.2 Local stakeholder profiles

This section presents the overall attitude and power of relevant local stakeholder of this case study toward the MU combination of offshore wind and commercial fisheries. Stakeholders identified in the above section, have been grouped together in relevant stakeholder categories, including commercial businesses, business support (consultancies), research organisations, regulators, policy makers, insurance companies, and funding bodies. Each category has been characterised based on a list of attributes outlined below:

1. Overall attitude towards MU
2. Geographical scale at which certain stakeholder has the power
3. Organisation of stakeholders (How are stakeholders organized/connected?)
4. Type of power
5. Level of Power

Stakeholders' results are presented from the commercial fishing industry perspective in Table 7, from the offshore wind perspective in Table 8, and from the perspective of cross-sectoral organisation in Table 9. Key Evaluation Questions 5, 6 and 7 in 6 are also relevant to this section of local stakeholder profiles.

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Table 7 Local stakeholder profiles from the perspective of commercial fisheries.

MU: Offshore wind and commercial fisheries						
Theme: Commercial fisheries						
Attributes	1 - Overall interest in MU	2 - Overall attitude towards MU	3 - Geographical scale at which certain stakeholder has the power	4 - Organisation of stakeholders	5 - type of power	6 - Level of Power
Category						
Commercial Business	proactive	negative-but can positively influence barriers	national	couple of individual organisations	power to influence directly	strong
Research organisations	proactive	positive - driving forces	EU	a lot of individual organisations	Power to influence indirectly via someone	low
Regulators	proactive	positive - driving forces	national	monopoly of one organisation	power to control and make decisions	strong
Policy makers	proactive	positive - driving forces	national	monopoly of one organisation	power to control and make decisions	strong
Insurance companies	dormant	negative - imposing barriers	national	a lot of individual organisations	power to control and make decisions	medium

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Table 8 Local stakeholder profiles from the perspective of offshore wind developers.

MU: Offshore wind and commercial fisheries						
Theme: Offshore wind developers						
Attributes	1 - Overall interest in MU	2 - Overall attitude towards MU	3 - Geographical scale at which certain stakeholder has the power	4 - Organisation of stakeholders	5 - type of power	6 - Level of Power
Category						
Commercial Business	reactive	negative-but can positively influence barriers	national	strong clustering	power to influence directly	strong
Business support – consultancies	reactive	neutral/undecided	national	a lot of individual organisations	Power to influence indirectly via someone	low
Research organisations	proactive	positive - driving forces	EU	a lot of individual organisations	Power to influence indirectly via someone	low
Regulators	proactive	positive - driving forces	national	monopoly of one organisation	power to control and make decisions	strong
Policy makers	proactive	positive - driving forces	national	monopoly of one organisation	power to control and make decisions	strong
Insurance companies	dormant	negative - imposing barriers	national	a lot of individual organisations	power to control and make decisions	medium
Funding bodies	dormant	negative - imposing barriers	national	couple of individual organisations	power to control and make decisions	strong

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Table 9 Local stakeholder profiles from the perspective of cross-sectoral organisations.

MU: Offshore wind and commercial fisheries						
Theme: Cross sector						
Attributes	1 - Overall interest in MU	2 - Overall attitude towards MU	3 - Geographical scale at which certain stakeholder has the power	4 - Organisation of stakeholders	5 - type of power	6 - Level of Power
Category						
Commercial Business	reactive	neutral/undecided	national	a lot of individual organisations	power to influence directly	medium
Business support – consultancies	reactive	positive - driving forces	national	a lot of individual organisations	Power to influence indirectly via someone	low
Research organisations	reactive	positive - driving forces	national	a lot of individual organisations	Power to influence indirectly via someone	low
Regulators	proactive	positive - driving forces	national	monopoly of one organisation	power to control and make decisions	strong
Policy makers	proactive	positive - driving forces	national	monopoly of one organisation	power to control and make decisions	strong
Insurance companies	dormant	negative - imposing barriers	national	strong clustering	power to control and make decisions	strong
Funding bodies	dormant	neutral/undecided	national	strong clustering	power to control and make decisions	strong
NGOs and other intermediaries representing society at large	proactive	positive - driving forces	national	a lot of individual organisations	Power to influence indirectly via someone	medium

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8 RECOMMENDATIONS FROM THE CASE STUDY TO THE ACTION PLAN

Below, key solutions and actors are presented that can contribute to the enhancement of MU in the area.

Funding

- Risks introduced by MU novelty may affect insurance premiums As a result target innovation-leading, self-insured, utility-scale, offshore wind farm developers (e.g. DONG, StatOil etc.), who can absorb the risks introduced by the novelty nature of Multi-Use. Lobby MU and demonstrate its benefits, in order to steer innovation funding in MU applications.
- Greater MU links between the offshore wind and the fishing industries can be encouraged within existing funding mechanisms (e.g. Contracts for Difference; CfD). Bidding applications for subsidy rounds by developers can be scored favourably when development proposal maximises the sea use potential and enhances multi-use.
- Similarly, the CfD regime currently requires developers to develop supply chain plans, as part of bidding applications for subsidy rounds. Greater consideration and prioritisation of local fishing vessels can encourage multi-use with impacted stakeholders. Applications selecting local vessels can be scored favourably. However, there might be issues that might hinder the application of this recommendation, including European funding bodies requiring EU-wide competitions, and technical incompatibility of fishing vessels for certain operations.
- Technical innovation funding can be steered towards areas identified under research areas of “Technical Innovation” below. The establishment of fishing community funds, managed by an independent body, can aid the operational management of the funding.

Marine Planning

- Marine planning authorities to consider “MU opportunity mapping” as opposed to the current practice of sectoral planning following a “constraints mapping” approach
- Establish stronger coexistence policies in marine plans with explicit references to Multi-Use. Objective around the concept of “maximising the sea use potential" can feature in marine plans.
- Good practice guidance on how to construct a wind farm to make it fishing-friendly, and links to benefits to offshore wind developers

Marine Licensing

- Improve environmental assessment methodologies (EIAs, CIAs, etc.), to also account for indirect effect to commercial fisheries (e.g. fisheries displacement).
- Licensing authorities to request a co-existence plan prior to the submission of a licence application. Design statement of offshore wind farm developments could also demonstrate that MU was considered and adopted, where applicable.
- Earlier agreement on mitigation strategy (prior to securing a marine licence) will aid with stakeholder power imbalances. Currently, most of the mitigation options are examined, and agreed post-consent. Statement of common ground between developers and impacted fishermen can be a good starting point for the licensing authority.
- Licensing authorities to allow for innovation advancement in the field of MU by exempting small-scale pilot projects from full-scale assessments. To follow the Scottish example of the “Survey, Deploy, and Monitor” (SDM) policy for ocean energy.

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Technological innovation

- Empirical studies exploring the compatibility between offshore wind farms and commercial fisheries are needed e.g. setting gear specification and safety of operations, demonstrating the benefits of sharing infrastructure. These studies can drive insurance costs down, boost fishing industry confidence to return to fishing grounds, and can demonstrate direct financial benefits.
- Innovation studies on moorings (tension legs), cable installation methods (guaranteed burial depths, minimal suspension and post-installation obstructions), fishing-friendly cable protection measures, and gear modifications (seabed penetration of scallop dredge gears) will amplify the added benefits of this MU combination.
- Good practice guidance for the integration and interpretation of fisheries distribution data layers will improve the quality of EIA practice and assessments. Guidance on data sharing agreements and protocols e.g. for sharing ROV footage and bathymetric survey data by developers to demonstrate to fishers that fishing can take place safety within the wind farms.
- Good practice guidance to demonstrate the links of MU and Corporate Social Responsibility. Links to better consultation and ease of getting a licence might also be a good idea.
- Research gaps for better mapping of navigational hazards, particularly dropped objects during construction have been identified. Furthermore, the establishment of a standardised and agreed system for monitoring cables e.g. real-time alerts for exposed cable sections is needed.
- Further educational resources for commercial fishing to developers and contractors (similar to the SFF's fishing awareness course) and vice versa
- Over-trawlability surveys undertaken by fishing bodies and issuing a clear seabed certificate (similar to what has been provided in the Oil and Gas sector) can enhance MU.

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APPENDIX 1 – OVERALL DABI SCORING TABLES

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	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4	Interviewee 5	Interviewee 6	Interviewee 7	Interviewee 8	Interviewee 9		
Combination: Offshore wind & commercial fisheries	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Factor average for all stakeholders**	**Category average (average of all factors averaged for all stakeholders)**
DRIVERS											
Category D.1 - Policy & legal drivers											
Legal requirements preventing interference with legitimate maritime users e.g. fisheries	2,0	3,0		3,0		3,0		3,0		2,8	
Policies supporting fisheries access to sea areas	2,0	3,0		3,0		3,0		3,0	1,0	2,5	
Political support	2,0									2,0	
EIA requirements to identify, consult, and mitigate affected stakeholders	1,0	1,0	3,0		2,0		1,0	3,0		1,8	
No piece of law justifying excluding fishing operations within offshore wind farm	1,0				2,0				1,0	1,3	
Policies for climate change adaptation	0,0						1,0			0,5	
Average	**1,3**	**2,3**	**3,0**	**3,0**	**2,0**	**3,0**	**1,0**	**3,0**	**1,0**		2,2
Category D.2 - Administrative drivers											
Requirement to satisfy marine licence conditions related to commercial fisheries	3,0	3,0	3,0	3,0	3,0	2,0	0,0	3,0	3,0	2,6	
Avoid potential licensing delays related to appealing stakeholders	2,0	1,0	2,0	3,0	1,0	1,0	0,0	3,0	0,0	1,4	
Average	**2,5**	**2,0**	**2,5**	**3,0**	**2,0**	**1,5**	**0,0**	**3,0**	**1,5**		2,0
Category D.3 - Indirect economic drivers											
Avoid unnecessary additional costs to the offshore wind industry (e.g. delays in permitting, costly installation methods, delays with surveys)	3,0		3,0		3,0					3,0	
Avoid unenecessary additional costs to the commercial fishing industry (e.g. loss of income, insurance premiums, loss of gears)		3,0		2,0		3,0	3,0	3,0	3,0	2,8	
Wider indirect benefits to the local economy		2,0							3,0	2,5	
Indirect economic benefits to the fishing industry (e.g. employment opportunities in the future)	1,0			2,0	1,0				3,0	1,8	
Average	**2,0**	**2,5**	**3,0**	**2,0**	**2,0**	**3,0**	**3,0**	**3,0**	**3,0**		2,6
Category D.4 - Societal drivers											
Contribution to food security		3,0		3,0		3,0	3,0			3,0	
Cultural benefits from sustaining traditional fishing communities							3,0			3,0	
Constribution towards Corporate Social Responsibility for offshore wind developers	3,0	2,0	3,0	3,0	3,0		3,0	3,0	3,0	2,9	
Greater local acceptance	3,0		3,0		3,0		3,0	2,0	3,0	2,8	
Possitive attitudes for coexistence	1,0		1,0	1,0	1,0		2,0		3,0	1,5	
Benefits to government for achieving sustainable development			1,0							1,0	
Average	**2,3**	**2,5**	**2,0**	**2,3**	**2,3**	**3,0**	**2,8**	**2,5**	**3,0**		2,5
Category D.5 - Technological drivers											
Available technology can satisfy current needs for MU (installation methods, navigation, gear and vessel technology)	0,0	2,0	2,0	2,0	1,0	1,0	2,0	1,0	1,0	1,3	
Average	**0,0**	**2,0**	**2,0**	**2,0**	**1,0**	**1,0**	**2,0**	**1,0**	**1,0**		1,3

	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4	Interviewee 5	Interviewee 6	Interviewee 7	Interviewee 8	Interviewee 9		
Combination: Offshore wind & commercial fisheries	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Factor average for all stakeholders**	**Category average (average of all factors averaged for all stakeholders)**
BARRIERS											
Category B.1 - Economic barriers											
Additional financial cost to offshore wind developers (e.g. insurance premiums, foundation types, installation methods, additional protection measures, micro-sitting, cable routing, additional survey cost, maintenance costs)	-2,0	-3,0	-3,0	-3,0	-3,0	-3,0	-2,0	-2,0	-2,0	-2,6	
No direct financial benefits from MU to offshore wind developers	-3,0	-1,0	-2,0	-1,0	-3,0	-1,0	-2,0	-3,0	-2,0	-2,0	
Average	**-3,0**	**-1,0**	**-2,0**	**-1,0**	**-3,0**	**-1,0**	**-2,0**	**-3,0**	**-2,0**		-2,0
Category B.2 - Administrative barriers											
Single-sector industry challenges impacting on the relationships between the 2 industries and attitude towards MU	-3,0	-2,0	-3,0	-3,0	-3,0	-2,0	-2,0	-3,0	-3,0	-2,7	
Issues with consultation process including timing, frequence, insincere support, governance structure, representation, power imbalances, attitudes, and conflicts of interests	-2,0	-3,0	-1,0	-3,0	-2,0	-3,0	0,0	-3,0	-3,0	-2,2	
Design complexity of offshore wind farm developments discourages MU considerations	-3,0	-2,0	-3,0	-1,0	-3,0	-2,0	-2,0	-1,0	-2,0	-2,1	
No spatial policies for commercial fisheries in marine planning	-3,0	-3,0	-2,0	-1,0	-2,0	0,0	0,0	-1,0	-3,0	-1,7	
Average	**-2,8**	**-2,5**	**-2,3**	**-2,0**	**-2,5**	**-1,8**	**-1,0**	**-2,0**	**-2,8**		-2,2
Category B.3 - Barriers related to technical capacity											
Offshore wind farm components not always compatible with fishing operations	-3,0	-3,0	-1,0	-3,0	-2,0	-3,0	-3,0	-3,0	-3,0	-2,7	
Incompatibility of fishing vessel and gear specifications with offshore wind farm altered sea conditions	-3,0	-3,0	-1,0	-2,0	-2,0	-3,0	-3,0	-3,0	-3,0	-2,6	
Spatial data issues including availability, coverage, deficiencies & misrepresentation, access, interpretation, data gaps and resource requirements to fill those	-2,0	-3,0	-2,0	-3,0	-2,0	-3,0	-2,0	-2,0	-3,0	-2,4	
Current EIA practice does not consider MU proactively	-3,0	-1,0	-3,0	-2,0	-2,0	-1,0	-2,0	-2,0	-3,0	-2,1	
Average	**-2,8**	**-2,5**	**-1,8**	**-2,5**	**-2,0**	**-2,5**	**-2,5**	**-2,5**	**-3,0**		-2,4
Category B.4 - Barriers related to social factors											
Fishing industry perceptions around safety of operations within offshore windfarms	-1,0	-3,0	-1,0	-3,0	-1,0	-3,0	-3,0	-3,0	-3,0	-2,3	
Negative attitudes of the fishing industry (e.g. limited engagement, claiming sole ownership of sea space, exploitation behaviour for compensation)	-2,0	-1,0	-3,0	0,0	-3,0	0,0	-2,0	-3,0	-3,0	-1,9	
Negative attitudes of the offshore wind industry (e.g. defering mitigation for later stages, insincere support to consultation, declining compensation)	-1,0	-3,0	0,0	-3,0	0,0	-3,0	-1,0	-3,0	-3,0	-1,9	
Power imbalances: Fishing industry opposing multinational developers and government agendas	0,0	-2,0	0,0	-3,0	0,0	-3,0	-1,0	-3,0	-3,0	-1,7	
Average	**-1,0**	**-2,3**	**-1,0**	**-2,3**	**-1,0**	**-2,3**	**-1,8**	**-3,0**	**-3,0**		-1,9
Category B.5 - Barriers related to safety											
Ability to safely operate during extraordinary conditions (e.g. Engine failure, Snagging incident, extreme weather conditions, health issue, other *force majeure*)	-1,0	-3,0	-1,0	-3,0	-2,0	-3,0	-1,0	-2,0	-3,0	-2,1	
Average	**-1,0**	**-3,0**	**-1,0**	**-3,0**	**-2,0**	**-3,0**	**-1,0**	**-2,0**	**-3,0**		-2,1
Category B.6 - Legal barriers											
Commercial fishing parties are not statutory consultee in the marine licencing process	-1,0	-2,0	-3,0	-2,0	-1,0	-2,0	-1,0	-1,0	-2,0	-1,7	
No legal requirement for compensation	-1,0	-3,0	-1,0	-1,0	-1,0	-1,0	-1,0	-1,0	-1,0	-1,2	
Average	**-1,0**	**-2,5**	**-2,0**	**-1,5**	**-1,0**	**-1,5**	**-1,0**	**-1,0**	**-1,5**		-1,4

Combination: Offshore wind & commercial fisheries	Interviewee 1 Score	Interviewee 2 Score	Interviewee 3 Score	Interviewee 4 Score	Interviewee 5 Score	Interviewee 6 Score	Interviewee 7 Score	Interviewee 8 Score	Interviewee 9 Score	Factor average for all stakeholders	Category average (average of all factors averaged for all stakeholders)
ADDED VALUES											
Category V.1 - Economic added values											
Collaborative working relationships between the two industries (alternative employment opportunities, in-kind information feeding into assessments, avoiding survey disruption)	3,0	1,0	2,0	2,0	1,0	3,0	1,0	1,0	3,0	1,9	
Proliferation of alternative gears and financial gain for the new fleet segment	1,0			2,0		1,0			3,0	1,8	
Cost reduction from shared infrastructure for operations and maintance	1,0	1,0	0,0	1,0	0,0	0,0	3,0	1,0	3,0	1,1	
Average	**1,7**	**1,0**	**1,0**	**1,7**	**0,5**	**1,3**	**2,0**	**1,0**	**3,0**		1,5
Category V.2 - Societal added values											
Promotes longevity of the fishing industry		3,0		3,0		3,0				3,0	
Community funding from developments can act as a catalyst for better governance, fisheries management, and engagement of the fishing industry in the scientific world									3,0	3,0	
Builds trust with local fishermen	2,0	2,0	2,0	2,0	2,0	1,0	3,0	2,0	3,0	2,1	
Promotes innovation in fishing methods as well as in foundations, installation methods, protection measures etc.									2,0	2,0	
Average	**2,0**	**2,5**	**2,0**	**2,5**	**2,0**	**2,0**	**3,0**	**2,0**	**2,7**		2,3
Category V.3 - Environmental added values											
Increased in yield and contribution to food security	2,0	3,0	1,0	3,0	2,0	3,0	3,0	2,0	3,0	2,4	
Artificial reefs by providing protected habitats for marine species		2,0	2,0	3,0	1,0	2,0	3,0	2,0	3,0	2,3	
Nurseries and sheltered areas contributing to strategic fisheries management as marine protected areas	3,0	1,0	1,0	3,0	2,0	2,0	3,0	2,0	3,0	2,2	
Average	**2,5**	**2,0**	**1,3**	**3,0**	**1,7**	**2,3**	**3,0**	**2,0**	**3,0**		2,3

	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4	Interviewee 5	Interviewee 6	Interviewee 7	Interviewee 8	Interviewee 9		
Combination: Offshore wind & commercial fisheries	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Factor average for all stakeholders**	**Category average (average of all factors averaged for all stakeholders)**
NEGATIVE IMPACTS											
Category I.1 - Economic impacts											
Loss of income from area exclusions	1,0	-3,0	-2,0	-3,0	-2,0	-3,0	-3,0	-3,0	-3,0	-2,3	
Other indirect economic impacts on fishing operations, in relation to displacement, overcrowding, reduced quality of catches, knock-on effect on the supply chain	-2,0	-3,0	-2,0	-3,0	-2,0	-3,0	-2,0	-2,0	-2,0	-2,3	
Higher energy cost to consumers due to increased development costs	-3,0				-2,0				-2,0	-2,3	
Financial impact on offshore wind developers through more demanding baseline and post-installation surveys, increased risk to asset integrity, inter-array cable installation method and protection measures	-3,0	-2,0	-3,0	-1,0	-3,0	-1,0	-2,0	-1,0	-2,0	-2,0	
Other direct cost to fishermen from increased steaming distances, capital costs for diversifying, costs from any fishing equipment	-1,0	-2,0	-1,0	-3,0	-1,0	-3,0	-2,0	-2,0	-2,0	-1,9	
Average	**-1,6**	**-2,5**	**-2,0**	**-2,5**	**-2,0**	**-2,5**	**-2,3**	**-2,0**	**-2,2**		-2,2
Category I.2. - Social impacts											
Locking up of productive biological resources and impacts on food security	-2,0	-3,0	-1,0	-3,0	-1,0	-3,0	-3,0	-3,0	-3,0	-2,4	
Disempowering local stakehoders and creating an unjust society with power imballances towards powerful multinationals	-1,0	-3,0	-1,0	-3,0	-1,0	-3,0	-1,0	-3,0	-3,0	-2,1	
Social and cultural impacts from curtailment or cessation of fishing businesses, including loss of cultural traditions, additional conflicts between fishing groups, and loss of local knowledge							-2,0			-2,0	
Fishermen welfare and health									-1,0	-1,0	
Negative attitude and inability to diversity in alternative employment opportunities resulting in unemployment		-1,0								-1,0	
Average	**-1,5**	**-2,3**	**-1,0**	**-3,0**	**-1,0**	**-3,0**	**-2,0**	**-3,0**	**-2,3**		-2,1
Category I.3 - Environmental impacts											
Impacts on shellfish stock recruitment and resettlement during and after construction, due to sediment resuspension				-3,0			-3,0	-2,0	-3,0	-2,8	
Closed areas may impact on prey-predator interactions with undesirable effects on commercial stocks				-2,0	-1,0			-2,0		-1,7	
Noise impacts on sensitive life stages of commercial stocks								-1,0		-1,0	
implications for the environment and fish stocks in adjacent areas in cases of localised displacement						-1,0			-1,0	-1,0	
Electro-magnetic field effects on shellfish				-1,0						-1,0	
Average				**-2,0**	**-1,0**	**-1,0**	**-3,0**	**-1,7**	**-2,0**		-1,8
Category I.4 - Technical impacts											
Competition for access to port infrastructure with other marine users		-2,0		-3,0		-1,0			-1,0	-1,8	
Average		**-2,0**		**-3,0**		**-1,0**			**-1,0**		-1,8
Category I.5 - Health & Safety impacts											
Increased safety risks and snagging potential	-2,0	-3,0	-1,0	-3,0	-2,0	-3,0		-3,0	-2,0	-2,4	
Average	**-2,0**	**-3,0**	**-1,0**	**-3,0**	**-2,0**	**-3,0**		**-3,0**	**-2,0**		-2,4

DRIVERS	Category	Avg. Score
Avoid unnecessary additional costs to the offshore wind industry (e.g. delays in permitting, costly installation methods, delays with surveys)	Indirect economic drivers	3,0
Contribution to food security	Societal drivers	3,0
Cultural benefits from sustaining traditional fishing communities	Societal drivers	3,0
Constribution towards Corporate Social Responsibility for offshore wind developers	Societal drivers	2,9
Avoid unenecessary additional costs to the commercial fishing industry (e.g. loss of income, insurance premiums, loss of gears)	Indirect economic drivers	2,8
Greater local acceptance	Societal drivers	2,8
Legal requirements preventing interference with legitimate maritime users e.g. fisheries	Policy & legal drivers	2,8
Requirement to satisfy marine licence conditions related to commercial fisheries	Administrative drivers	2,6
Policies supporting fisheries access to sea areas	Policy & legal drivers	2,5
Wider indirect benefits to the local economy	Indirect economic drivers	2,5
Political support	Policy & legal drivers	2,0
EIA requirements to identify, consult, and mitigate affected stakeholders	Policy & legal drivers	1,8
Indirect economic benefits to the fishing industry (e.g. employment opportunities in the future)	Indirect economic drivers	1,8
Possitive attitudes for coexistence	Societal drivers	1,5
Avoid potential licensing delays related to appealing stakeholders	Administrative drivers	1,4
No piece of law justifying excluding fishing operations within offshore wind farm	Policy & legal drivers	1,3
Available technology can satisfy current needs for MU (installation methods, navigation, gear and vessel technology)	Technological drivers	1,3
Benefits to government for achieving sustainable development	Societal drivers	1,0
Policies for climate change adaptation	Policy & legal drivers	0,5
Average		**2,1**

BARRIERS	Category	Avg. Score
Single-sector industry challenges impacting on the relationships between the 2 industries and attitude towards MU	Administrative barriers	-2,7
Offshore wind farm components not always compatible with fishing operations	Barriers related to technic	-2,7
Additional financial cost to offshore wind developers (e.g. insurance premiums, foundation types, installation methods, additional protection measures, micto-sitting, cable routing, additional survey cost, maintenance costs)	Economic barriers	-2,6
Incompatibility of fishing vessel and gear specifications with offshore wind farm altered sea conditions	Barriers related to technic	-2,6
Spatial data issues including availability, coverage, deficiencies & misrepresentation, access, interpretation, data gaps and resource requirements to fill those	Barriers related to technic	-2,4
Fishing industry perceptions around safety of operations within offshore windfarms	Barriers related to social f	-2,3
Issues with consultation process including timing, frequence, insincere support, governance structure, representation, power imbalances, attitudes, and conflicts of interests	Administrative barriers	-2,2
Design complexity of offshore wind farm developments discourages MU considerations	Administrative barriers	-2,1
Current EIA practice does not consider MU proactively	Barriers related to technic	-2,1
Ability to safely operate during extraordinary conditions (e.g. Engine failure, Snagging incident, extreme weather conditions, health issue, other *force majeure*)	Barriers related to safety	-2,1
No direct financial benefits from MU to offshore wind developers	Economic barriers	-2,0
Negative attitudes of the fishing industry (e.g. limited engagement, claiming sole ownership of sea space, exploitation behaviour for compensation)	Barriers related to social f	-1,9
Negative attitudes of the offshore wind industry (e.g. defering mitigation for later stages, insincere support to consultation, declining compensation)	Barriers related to social f	-1,9
No spatial policies for commercial fisheries in marine planning	Administrative barriers	-1,7
Power imbalances: Fishing industry opposing multinational developers and government agendas	Barriers related to social f	-1,7
Commercial fishing parties are not statutory consultee in the marine licencing process	Legal barriers	-1,7
No legal requirement for compensation	Legal barriers	-1,2
Average		**-2,1**

ADDED VALUE	Category	Avg. Score
Promotes longevity of the fishing industry	Societal added values	3,0
Community funding from developments can act as a catalyst for better governance, fisheries management, and engagement of the fishing industry in the scientific world	Societal added values	3,0
Increased in yield and contribution to food security	Environmental added values	2,4
Artificial reefs by providing protected habitats for marine species	Environmental added values	2,3
Nurseries and sheltered areas contributing to strategic fisheries management as marine protected areas	Environmental added values	2,2
Builds trust with local fishermen	Societal added values	2,1
Promotes innovation in fishing methods as well as in foundations, installation methods, protection measures etc.	Societal added values	2,0
Collaborative working relationships between the two industries (alternative employment opportunities, in-kind information feeding into assessments, avoiding survey disruption)	Economic added values	1,9
Proliferation of alternative gears and financial gain for the new fleet segment	Economic added values	1,8
Cost reduction from shared infrastructure for operations and maintance	Economic added values	1,1
Average		**2,2**

IMPACTS	Category	Avg. Score
Impacts on shellfish stock recruitment and resettlement during and after construction, due to sedinment resuspension	Environmental impacts	-2,8
Locking up of productive biological resources and impacts on food security	Social impacts	-2,4
Increased safety risks and snagging potential	Health & Safety impacts	-2,4
Loss of income from area exclusions	Economic impacts	-2,3
Other indirect economic impacts on fishing operations, in relation to displacement, overcrowding, reduced quality of catches, knock-on effect on the supply chain	Economic impacts	-2,3
Higher energy cost to consumers due to increased development costs	Economic impacts	-2,3
Disempowering local stakehoders and creating an unjust society with power imballances towards powerful multinationals	Social impacts	-2,1
Financial impact on offshore wind developers through more demanding baseline and post-installation surveys, increased risk to asset integrity, inter-array cable installation method and protection measures	Economic impacts	-2,0
Social and cultural impacts from curtailment or cessation of fishing businesses, including loss of cultural traditions, additional conflicts between fishing groups, and loss of local knowledge	Social impacts	-2,0
Other direct cost to fishermen from increased steaming distances, capital costs for diversifying, costs from any fishing equipment	Economic impacts	-1,9
Competition for access to port infrastructure with other marine users	Technical impacts	-1,8
Closed areas may impact on prey-predator interactions with undesirable effects on commercial stocks	Environmental impacts	-1,7
Fishermen welfare and health	Social impacts	-1,0
Negative attitude and inability to diversity in alternative employment opportunities resulting in unemployment	Social impacts	-1,0
Noise impacts on sensitive life stages of commercial stocks	Environmental impacts	-1,0
implications for the environment and fish stocks in adjacent areas in cases of localised displacement	Environmental impacts	-1,0
Electro-magnetic field effects on shellfish	Environmental impacts	-1,0
Average		**-1,8**

DRIVERS	Category average
Category D.3 - Indirect economic drivers	2,6
Category D.4 - Societal drivers	2,5
Category D.1 - Policy & legal drivers	2,2
Category D.2 - Administrative drivers	2,0
Category D.5 - Technological drivers	1,3
Average	2,1

BARRIERS	Category average
Category B.3 - Barriers related to technical capacity	-2,4
Category B.2 - Administrative barriers	-2,2
Category B.5 - Barriers related to safety	-2,1
Category B.1 - Economic barriers	-2,0
Category B.4 - Barriers related to social factors	-1,9
Category B.6 - Legal barriers	-1,4
Average	-2,0

ADDED VALUE	Category average
Category V.3 - Environmental added values	2,3
Category V.2 - Societal added values	2,3
Category V.1 - Economic added values	1,5
Average	2,0

IMPACTS	Category average
Category I.5 - Health & Safety impacts	-2,4
Category I.1 - Economic impacts	-2,2
Category I.2. - Social impacts	-2,1
Category I.3 - Environmental impacts	-1,8
Category I.4 - Technical impacts	-1,8
Average	-2,0