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Deliverable 9.2

Mapping of the Governance Landscape

ULTFARMS

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Abstract	The ULTFARMS project serves as a pioneering model in the sustainable integration of low-trophic aquaculture within European offshore wind farms, striving for economic viability while minimizing the environmental impact. This governance mapping report outlines the complex network of actors and policies spanning hierarchical, market, network, and knowledge governance at various levels, from individual

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	pilots to broader societal considerations. These insights are aimed at informing decision-making and fostering collaborative multi-use governance, ensuring a balance between conservation efforts and the growing demand for marine resources.
Keywords	Multi-Use, Governance, Actors

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Acronyms

ASC: Aquaculture Stewardship Council
BBSR: Bundesinstitut für Bau-, Stadt- und Raumforschung (Federal Institute for Research on Building, Urban Affairs and Spatial Development)
BLE: Federal Office for Agriculture and Food
BMBF: Federal Ministry of Education and Research
BfN: Bundesamt für Naturschutz (Federal Agency for Nature Conservation)
BNetzA: Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen (Federal Network Agency for Electricity, Gas, Telecommunications, Post, and Railway)
BSH: Federal Maritime and Hydrographic Agency
CFP: Common Fisheries Policy
CMEMS: Copernicus Marine Environment Monitoring Service
DLV: Flemish Government Department of Agriculture and Fisheries
DTU: Technical University of Denmark

EAS: European Aquaculture Society
EMFAF: European Maritime, Fisheries and Aquaculture Fund
EU: European Union
GDWS: Generaldirektion Wasserstraßen und Schifffahrt (General Directorate for Waterways and Shipping)
HELCOM: Helsinki Commission
IO: International Organization
KER: Key Exploitable Result
LTAP: Low-Trophic Aquaculture Pilots
MLG: Multi-Level Governance
MSP: Maritime Spatial Planning
MU: Multi-Use
MUMM: Management Unit of the North Sea Mathematical Model
NGO: Non-Governmental Organization
NORA: Native Oyster Restoration Alliance
NSC: North Sea Commission
OSPAR: Oslo-Paris Agreement
PFS: Federal Public Service Public Health, Food Chain Safety, and Environment
RVO: Netherlands Enterprise Agency
VASAB: Vision and Strategies Around the Baltic Sea
WP: Work Package
WR: Wageningen Research

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Executive Summary

The ULTFARMS project serves as a pioneering model in the sustainable integration of low-trophic aquaculture within European offshore wind farms, striving for economic viability while minimizing the environmental impact. This governance mapping report outlines the complex network of actors and policies spanning hierarchical, market, network, and knowledge governance at various levels, from individual pilots to broader societal considerations. These insights are aimed at informing decision-making and fostering collaborative multi-use governance, ensuring a balance between conservation efforts and the growing demand for marine resources.

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1. Introduction

1.1 A brief overview of ULTFARMS

The ULTFARMS project is designed to expand Europe's low-trophic aquaculture by utilizing offshore marine spaces more efficiently within a multi-use set up. The project's goal is to create viable low-trophic aquaculture operations in challenging offshore environments, with a focus on preserving biodiversity, minimizing the carbon footprint, and ensuring economic viability.

ULTFARMS is set to enhance Europe's ability to cultivate low-trophic species by introducing new techniques that improve production in demanding offshore settings. It aims to integrate low-trophic aquaculture within offshore wind farms, paving the way for ecologically sound and profitable aquaculture products. The project pilots stand out for developing innovative cultivation structures, growth systems, and environmentally friendly designs, marking a significant step forward in the sphere of sustainable offshore aquaculture. By gathering a diverse group of stakeholders from the offshore wind and low-trophic aquaculture industries, ULTFARMS aims to produce environmentally friendly, low-carbon, and safe products, from conceptualization to market launch.

The project implements six Low-Trophic Aquaculture Pilots (LTAPs) distributed across the North and Baltic Seas, encompassing four countries: 1) Belgium-Belwind, 2) the Netherlands-Borssele, 3) Germany-FINO2 & FINO3, and 4) Denmark-Anholt Offshore Wind Farm & Samsø, each featuring combinations like seaweed, mussels, and oysters.

Moreover, ULTFARMS will improve technical services by integrating sophisticated monitoring and management platforms such as the HiSea service platform and leveraging existing databases and forecast systems like CMEMS and SeaDATANET. This integration is projected to support the planning and execution of low-trophic aquaculture.

1.2 Approach to the task

1.2.1 Objective

The ULTFARMS Task 9.2 aims to identify relevant actors and their actions that influence the governance of multi-use at sea. These actors are associated with governments, insurance companies, civil society, and the value chains. The mapping of these actors/stakeholders was conducted at three levels of analysis (1) the national/pilot level, (2) the European/ sea basin level and (3) the international/societal level.

1.2.2 Target audience

The target audience for this report is the project team and stakeholders involved in multi-use governance. This includes government officials, insurance representatives, various actors across the value-chain, and civil society members who have a vested interest in understanding and influencing the governance of multi-use practices. The report aims to provide important insights and information to assist decision-making processes and policy development.

1.2.3 Methodology

The methodology adopted for Task 9.2 was tailored to present an initial mapping of the governance landscape, acknowledging the limitations of the scope and the sources of the data. The approach drew upon the practical experiences of pilot leads, supplemented by insights from Work Packages 2 and 5 and selected academic literature.

The components of our methodology included:

1. **Selected Literature Review**: A review of existing literature, research papers, reports, and relevant documents from past multi-use projects were conducted to gain an understanding of the current state of multi-use governance. This helped identifying key actors and their roles within the multi-use governance framework on different levels – pilot, sea basin, and societal level.
2. **Pilot Lead Consultations**: Pilot leads were consulted to gather first-hand experiences, challenges, and perspectives of the pilots regarding governance issues. This qualitative approach provided valuable insights into the practical aspects of multi-use governance**.**
3. **Collaboration with other Work Packages (WP):** To ensure alignment across the different WPs of the project and a sufficient knowledge base of the data already gathered within ULTFARMS, collaboration with WP2 and 5 was established.

1.2.4 Interaction with other Work Packages of ULTFARMS

The preparation of this report required an interaction with other WPs within the project to ensure a holistic approach to multi-use governance. Specifically, collaboration took place with WP2 (Stakeholder Engagement) to align data collection methods and integrate stakeholder perspectives. Additionally, this report informs the work of other WPs, such as WP10 (Roadmap to Upscaling), by providing insights into the governance landscape and identifying key actors influencing multi-use practices.

1.2.5 Output

This report presents an output of research conducted under the ULTFRAMS Task 9.2. It provides a comprehensive governance mapping of multi-use practices at three levels: the pilot level, sea basin level, and societal level. The mapping identifies and analyses the actors influencing multi-use governance, including government entities, insurance representatives, actors along the value-chain, and civil society. The report includes insights gathered through a literature review, interviews of pilot study participants, and expert interviews. These insights can serve as a valuable resource for decision-making processes, policy development, and stakeholder engagement within the multi-use initiatives.

1.3 Reading guide

Chapter one sets the scene for the governance mapping and gives an overview of all actors relevant for MU governance. Chapters two to five provide a more detailed discussion of each of the governance types (hierarchical governance, network governance, market governance and knowledge governance) identified in D9.1 and their actors.

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2. Multi-Use Governance

As laid out in Deliverable 9.1 Multi-Use governance does not only encompass the activities and frameworks of the national government but rather includes a multitude of different actors from the public as well as the private realm. Following, four ideal-typical forms of governance were identified based on scientific literature and build the conceptual framework of this deliverable (Van den Burg et al., 2023).

1. **Hierarchical governance**: Hierarchical governance rests on the assumption that it is possible to realize coordination based on power relations, on ordination and subordination. In essence, hierarchical governance is about top-down steering. The classical bureaucratic organization is the prototype of hierarchical governance (Van Buuren & Eshuis, 2010)
2. **Market governance**: Market governance is based upon the economic principles of the interplay between the demands of consumers and the supply of producers. It coordinates through the invisible hand of the price-based system of exchange between self-interested actors (e.g. Williamson, 1985). Within the public domain, market principles are used to formulate incentives that safeguard the proper working of imperfect markets. In some cases, governments provide a market for goods with specific merit aspects which are not produced by the common market (Van Buuren & Eshuis, 2010; Williamson, 1985).
3. **Network governance**: Network governance refers to the interdependence of the (many) actors that are involved in planning and governing issues in modern societies. These actors represent a range of interests and perceptions on the problems at stake, as well as on the preferred solutions. Network governance assumes that policy is developed and implemented in networks of organizations. These networks emerge and continue to exist because actors cannot reach their objectives without each other (Edelenbosch and Teisman, 2008; Klijn and Teisman, 2003).
4. **Knowledge governance**: Knowledge governance addresses two interrelated processes: (1) new forms of governing through information, and (2) transformative changes in governance institutions due to the new information flows appearing in the Information Age (Soma et al., 2016).

The complexity of contemporary governance, however, does not merely stem from its increased width of actors influencing governance but also from increased layers of policy making. The concept of multi-level governance, acknowledges that decision-making and implementation do not solely reside at a central or national level but are distributed across multiple layers, including regional, national, and international bodies. MLG recognizes the interdependence and cooperation among these levels, leading to a more intricate governance system. This complexity is characterized by overlapping competencies and the need for

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coordination between various actors across different governance levels. Such a multi-faceted approach has significant implications for policy formulation, implementation, and the overall functioning of governance systems (Stephenson, 2013). This means that the governance of multi-use cannot only be understood in different governance categories but also needs to address the different levels of governance. To recognize the complexity of MLG, the deliverable considers multi-use governance at a societal/international, European/sea basin and national/pilot level.

To pave the road for a **holistic approach to governance**, this deliverable provides an integrated analysis of relevant actors and governance structures along the vertical as well as horizontal line.

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3. Relevant Actors Influencing Multi-Use Governance

The concept of governance actor is defined differently across the academic realm, based on the different conceptual understanding of governance. In line with the broadened definition of governance discussed in chapter 1, governance actors in this deliverable are understood in general terms based on Rhodes definition. According to Rhodes (1996), a governance actor is any individual or organization involved in the complex process of governing, which includes not only governmental institutions but also non-state actors like businesses, non-governmental organizations (NGOs), and community groups. This perspective emphasizes the complexity of modern governance.

In this deliverable governance actors are therefore defined as *"any organization, group or office that possesses the ability to affect the policies, decisions, or operations of multi-use initiatives."*

This chapter will provide an overview of all relevant actors influencing MU governance identified in the research process on an international, sea basin (Baltic and North Sea) and pilot level (NL, DE, DK and BE). Further chapters will each dive deeper into one governance-category, the respective actors and the governance patterns. It is however important to note that one actor can be involved in multiple governance types.

3.1 Actors in Multi-Use International Governance

As the concept of ocean multi-use, particularly the integration of offshore wind and aquaculture, is still in its early stages, predominantly at the pilot level and only gradually emerging as a commercial option in some countries, many societal and international level actors have not yet played a significant role in its governance. However, as this sector evolves and expands, the following actors might become influential in shaping the governance landscape of ocean multi-use involving offshore wind farms and aquaculture:

1. **International Organizations (IOs):** IOs such as the United Nations (UN) can play a significant role in setting global standards, sharing best practice examples and facilitating international cooperation in ocean multi-use strategies.
2. **Global NGOs:** Organizations like WWF and Oceana can be instrumental in shaping environmental policies and practices in multi-use projects. National branches, such as WWF Belgium, are already involved in the governance at the pilot level. However, the adoption of a more global perspective is still lacking.

3. **Transnational Corporations:** International energy corporations, like Vattenfall, have the potential to become key players in the development of ocean multi-use projects, particularly in the realm of aquaculture installations in offshore wind farms. Their involvement at the pilot level in countries like Germany is paving the way for larger-scale operations and could influence global trends. Cooperation and knowledge transfer within and among international companies could lead to streamlined processes and the development of operational and technical standards.
4. **International Partnerships:** International partnerships bring together global expertise and resources, fostering innovative approaches and solutions for sustainable ocean governance. The Belmont Forum, for example, demonstrated a growing interest in ocean multi-use, having funded the first global multi-use project MULTIFRAME, which is coming to an end this December 2023.
5. **Science Organizations/Institutions:** Renowned marine science organizations, such as the International Council for the Exploration of the Sea (ICES), offer scientific advice and data. Their contributions could become a critical part of informed management decisions and policy development. ICES Working Group on Open Ocean Aquaculture (WGOOA) for example, has set concepts of marine multi-use and site selection as one of its focus areas.
6. **Civil Society:** Public awareness, consumer trends, and grassroots movements can drive changes in policy and corporate practices. As awareness of environmental issues and the potential of sustainable ocean use grows, civil society can advocate multi-use, influence consumption patterns, and hold various stakeholders accountable.

3.2 Governance Actors at European/Sea Basin Level

Ocean governance in the European Union is increasingly characterized by a process of regionalization. This approach brings together a wide range of actors at the EU and sea basin levels to collaboratively manage and utilize marine resources. It involves the integration of diverse interests and policies from various actors, including government entities, regional organizations, industry groups, environmental advocates, and scientific communities. This multifaceted involvement reflects complex and interconnected challenges faced in marine environments, aiming for sustainable and balanced development across different regions. This approach requires harmonizing various maritime activities—like aquaculture, shipping, and renewable energy production—within the same ocean areas. Successful implementation of multi-use strategies depend on effective collaboration and integrated management among the diverse actors involved.

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Following table provides an exemplary overview of relevant actors in the multi-use governance on a European and sea basin level (based on researcher's own experience and desk research):

Table 1: Relevant Governance Actors at European/Sea Basin Level and their involvement in MU

Actor	Description	Involvement in Multi-Use Governance
EU / European Commission	Central authority in EU policy making, integrating multi-use concepts in maritime policies.	The EU Commission is involved in policy-making relevant for MU development and various projects and initiatives/projects for ocean multi-use. Under Horizon2020 and Horizon Europe several innovation and research programs were developed, such as MUSES, UNITED, OLAMUR, ULTFARMS.
Oslo-Paris Agreement (OSPAR)	Governs marine protection in the North-East Atlantic, relevant for sustainable marine use.	Setting environmental standards and recommendations influencing multi-use. For example, the OSPAR Decision 98/31 requires that all offshore installations are fully removed at the end of their useful life, affecting multi-use through any repurposing of decommissioned oil rigs and in the future also wind turbines.
Helsinki Commission (HELCOM) & VASAB	Protects the Baltic Sea environment, influencing sustainable use of marine resources.	Policy development, environmental regulation and MSP collaboration impacting multi-use development. Furthermore, HELCOM-VASAB is involved in multiple projects, such as the EU funded Blue4All, which integrates MPAs and other marine activities. The Planners Forum, a HELCOM-VASAB initiative, serves as a knowledge exchange platform on the topic of MSP, including the MU approach.
The North Sea Commission (NSC)	Facilitates cooperation and development of regional maritime policies.	Advocacy and development of regional strategies that could include multi-use aspects.
Industry Sounding Board (ULTFARMS Project)	Set up to provide industry insights into multi-use feasibility and development.	Providing industry perspectives and expertise in the development of multi-use projects. The industry sounding board was set up by the ULTFARMS project.
Native Oyster Restoration Alliance (NORA)	Focuses on oyster restoration, relevant for	Promoting practices and collaborations that integrate aquaculture in multi-use spaces.

	sustainable aquaculture in multi-use settings.	
WindEurope	Advocates for wind energy development, key in offshore wind farm integration.	Facilitating policies and practices for the integration of wind energy in multi-use projects.
The European Blue Forum (MARIN initiative)	Promotes smart and sustainable use of maritime environments.	Encouraging innovations and collaborations that support multi-use of marine spaces.
The European Aquaculture Society	An organization that supports the sustainable development of aquaculture across Europe, focusing on innovation, knowledge transfer, and best practices.	Influences policies and standards for sustainable aquaculture practices, which are integral to multi-use concepts, especially in integrating aquaculture with other maritime activities.
European Blue Forum	An initiative to foster dialogue and collaboration between maritime stakeholders, with a focus on sustainable use and policy development.	Acts as a platform for stakeholders to discuss and advocate for multi-use practices, share knowledge, and influence policy at the European level.
North Sea Farmers (NSF)	An organization promoting sustainable seaweed farming in the North Sea, contributing to the blue economy.	Engages in research and development to integrate seaweed farming with other uses like wind farms, practically applying multi-use in marine spaces.
CPMR Baltic Sea Commission	A political network representing regional authorities from around the Baltic Sea, working towards sustainable development in the region.	Facilitates multi-level governance and integrated maritime policy that may include aspects of multi-use within the Baltic Sea region.
EMODnet	A network of organizations and groups providing access to marine data, products, and services to support maritime policy and decision-making.	Supplies critical data for marine spatial planning, which can inform and enable multi-use scenarios by providing environmental, economic, and social data layers.
Copernicus	The European Union's Earth observation program, offering information services based on satellite Earth Observation and in situ (non-space) data.	Provides geospatial data that can be utilized for marine spatial planning, contributing to the development and management of multi-use maritime areas.

European Observation Network for Territorial Development and Cohesion (ESPON)	A research program aimed at supporting sustainable territorial development and cohesion through improved policy-making in Europe.	Conducts research and provides evidence on territorial trends, which can influence multi-use policies and practices at various governance levels.
International Society of Applied Phycology	An organization that promotes the application of algal research and development, including the cultivation of seaweed for various uses.	Supports advancements in phycology that can be applied in multi-use contexts, such as the integration of seaweed cultivation with other maritime activities for environmental and economic benefits.

3.3 Actor Mapping at the National/Pilot Level

Following section displays the identified relevant actors influencing[1] multi-use governance at the national and pilot level of the four ULTFARMS pilot countries based on WP2 findings and further pilot lead questionnaires. Further chapters will elaborate on the different governance categories and the role of the identified actors. Actors were identified based on WP2 efforts and additional questionnaires filled out by pilot leads.

[1] The figures in this chapter display all actors whose power to influence MU was categorized as "high" or "medium".
Power is defined as: The ability to change the course of one or more outcomes of the project, should this party choose to act, whether or not motivated by intrinsic interests.

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Figure 1 Relevant Actors in the German Pilot

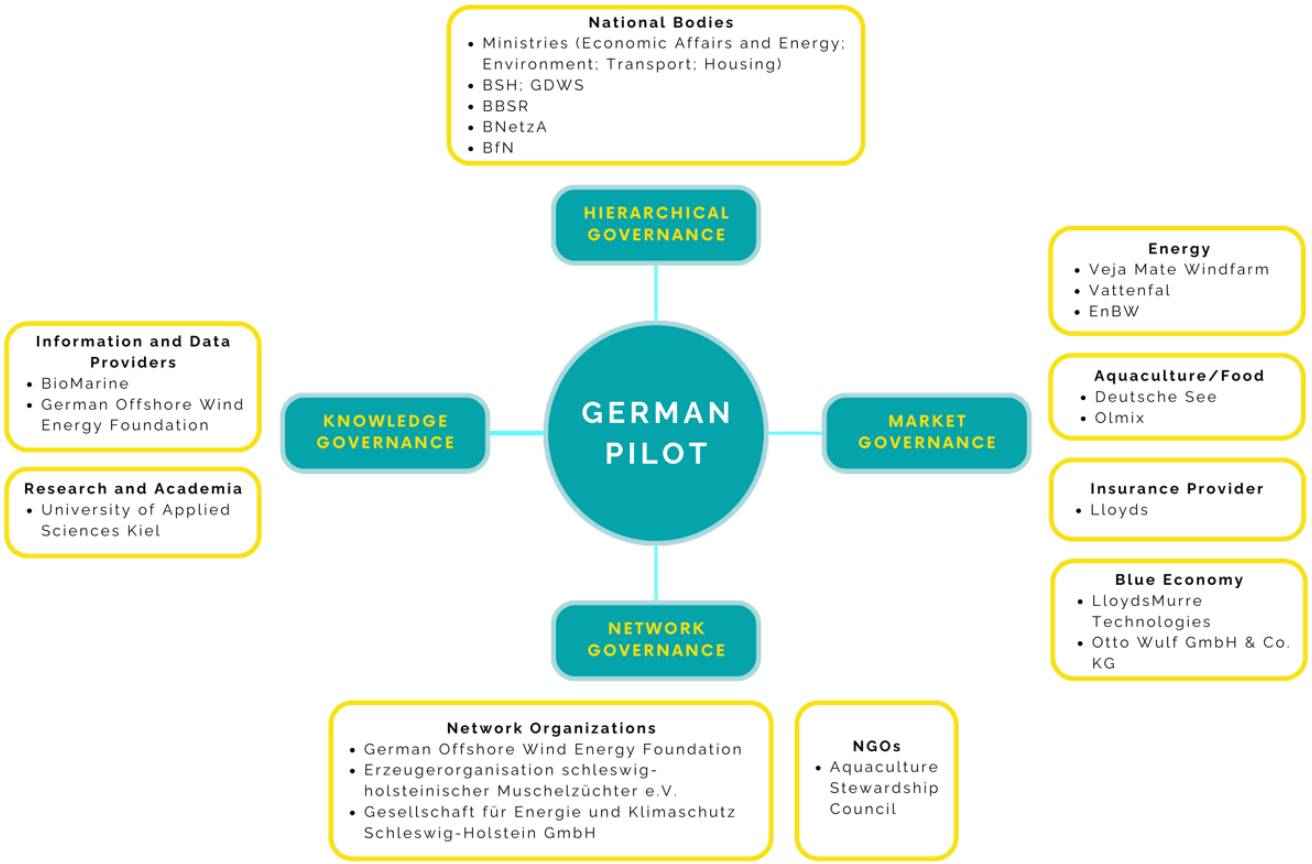

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Figure 2: Relevant Actors in the Belgian Pilot

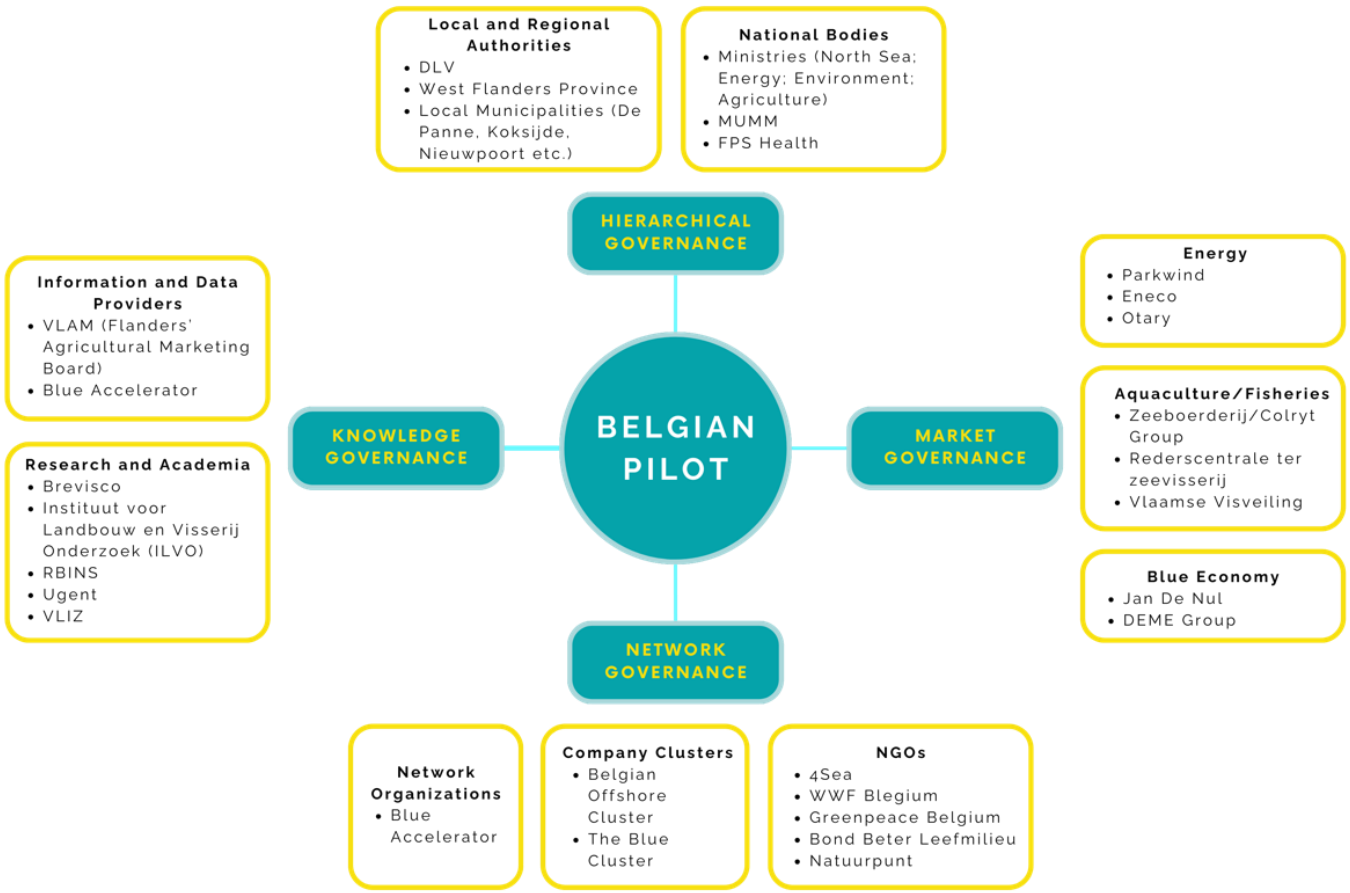

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Figure 3: Relevant Actors in the Dutch Pilot

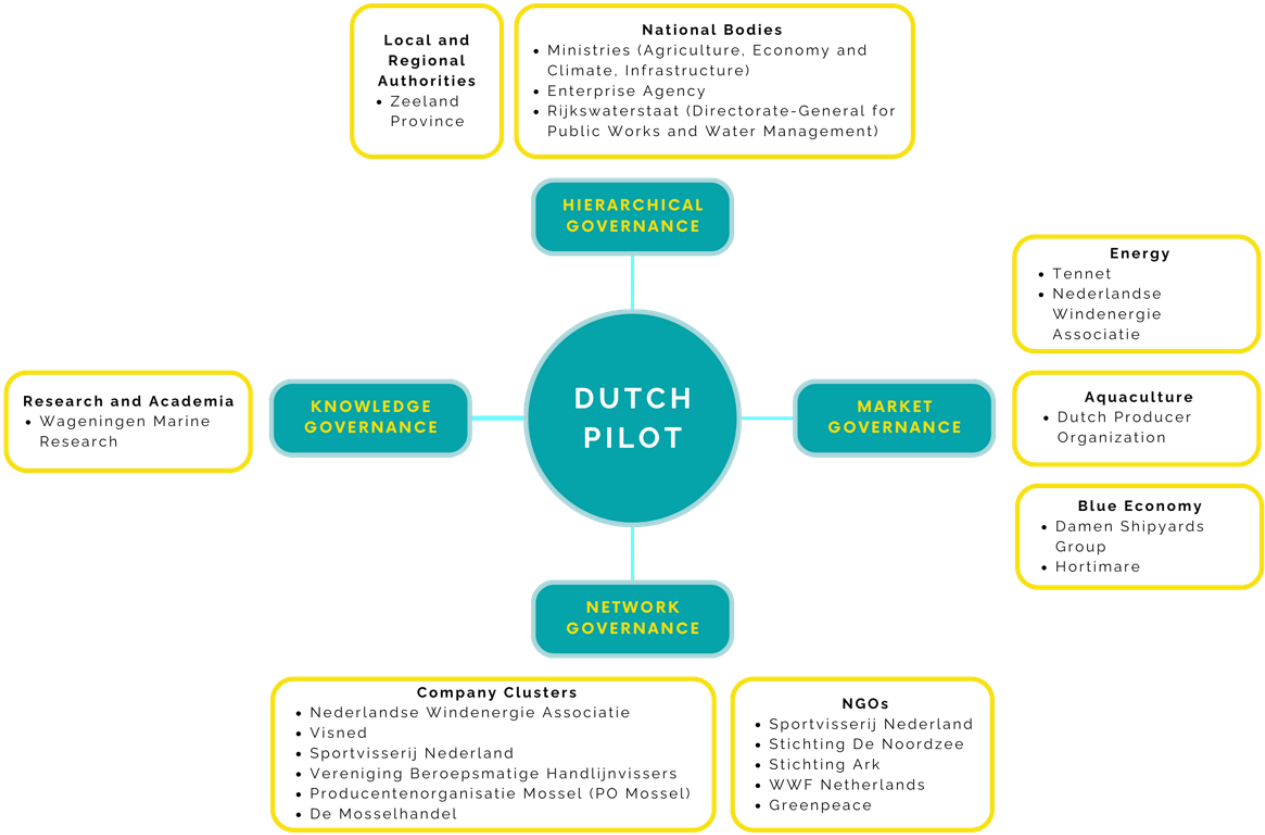

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Figure 4: Relevant Actors in the Danish Pilot

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4. The Policy Landscape: Hierarchical Governance

Hierarchical governance in maritime policy and planning is fundamental to the governance and steering of multi-use. Policymakers and planners, utilizing this governance model, play a vital role in establishing the frameworks, policies, and plans that guide the development, implementation, and monitoring of multi-use projects in marine environments.

It is essential in establishing the overarching regulatory frameworks and policies that govern multi-use in maritime spaces. Policymakers, through this form of governance, define the legal boundaries, standards, and guidelines within which multi-use projects must operate. These frameworks ensure that such projects adhere to environmental regulations, safety standards, and sustainable practices.

Hierarchical governance is crucial in maritime spatial planning, including the designation of marine areas for specific uses. Planners can allocate space efficiently, balancing the needs of various stakeholders such as fisheries, aquaculture, shipping, and renewable energy projects. For instance, in the context of multi-use, planners may designate certain areas as suitable for both aquaculture and offshore wind farms, ensuring optimal use of marine space.

Policymakers and planners play a pivotal role in directing and steering the development of multi-use projects. Through hierarchical governance, they can influence the focus areas, priority sectors, and the scale of investment in multi-use projects. This can include prioritizing areas where multi-use would have the most significant benefit or ensuring that certain environmental or economic objectives are met.

Identifying those involved in the hierarchical governance on the EU, regional and pilot level is crucial in order to better understand the policy context, relevance actors that can influence not only the project (e.g. Granting permits on the pilot level) but be instrumental in the future policymaking and planning. A good understanding of the policy context and actors can help the UTFARMS project and its pilots to ensure that the collected knowledge is transferred to relevant actors and impact is achieved on the policy level as a result of project learnings.

4.1 International Level

As indicated above, due to its early stages, international policy on offshore wind and low trophic aquaculture multi-use is still developing. However, the UN stands as a primary global policy body influencing maritime governance overall and therefore also indirectly shaping the discourse of ocean multi-use through initiatives like the Sustainable Development Goals (SDGs), the Ocean Decade, and the United Nations Convention on the Law of the Sea (UNCLOS). These frameworks and agreements provide a broad context within which ocean multi-use policies can be developed, emphasizing sustainability, environmental protection, and economic viability in maritime activities.

4.2 European / Sea Basin Level

The *European Union* has established itself as a key actor in promoting and integrating multi-use ocean policies. Multi-use aligns with the EU's broader objectives of sustainable marine resource use, environmental protection, and economic growth within its maritime sectors. Within the EU the most prominent actors in multi-use governance appear to be the Commission and DG Mare, the Directorate-General for Maritime Affairs and Fisheries of the EU. The Commission develops and implements policies and initiatives that integrate various maritime activities, promoting sustainable use of marine resources. DG MARE, specifically, is instrumental in coordinating these efforts, focusing on maritime spatial planning, marine environment protection, and sustainable aquaculture development. This includes facilitating discussions, knowledge exchange, and studies related to multi-use.

Relevant policies and initiatives of the EU include (Lukic et al., 2023):

1. **MSP Directive**: This directive mandates EU member states to establish maritime spatial plans, crucial for coordinating and effectively managing various maritime activities. These plans are essential for facilitating multi-use development, ensuring the sustainable and harmonious use of marine spaces.
2. **Blue Growth Strategy**: This strategy is focused on harnessing the economic potential of the EU's oceans and seas, while ensuring sustainability. It aims to drive growth in the marine and maritime sectors, encompassing areas like aquaculture, coastal tourism, marine biotechnology, and ocean energy.
3. **Integrated Maritime Policy:** This policy enhances the integration and coherence of maritime-related activities across the EU. It aims to foster efficient and sustainable management of marine resources, encouraging synergies between different sectors such as shipping, fisheries, and environmental protection.

4. **Common Fisheries Policy (CFP):** The CFP is administered by the Directorate-General for Maritime Affairs and Fisheries, is the cornerstone of the EU's marine regulatory framework. Revised in 2013, the CFP underscores the importance of sustainable, economically viable, and socially responsible fisheries and aquaculture. This policy fosters an environment conducive to multi-use concepts, encouraging the coexistence of sustainable aquaculture alongside other maritime activities such as wind energy production.
5. **Strategic Guidelines for Sustainable and Competitive Aquaculture for the period 2021-2030:** These guidelines, set forth by the European Commission, aim to enhance the resilience, competitiveness, innovation, and sustainability of the European aquaculture sector. They propose clear administrative structures and improved access to space, pivotal for successful multi-use projects. By promoting innovation and setting environmental regulations, the guidelines directly contribute to the feasibility and implementation of multi-use ocean space.
6. **EU Green Deal**: The Green Deal, presented in 2019 frames these initiatives, with a comprehensive set of proposals targeting carbon neutrality in Europe by 2050. Under this deal, themes such as agriculture, industry, environment, and oceans are addressed, focusing on promoting biodiversity, sustainable food production, and sustainable economic growth of marine industries. The Farm to Fork Strategy, a component of the Green Deal, is dedicated to developing sustainable and healthy food systems. This strategy identifies sustainable food sources as those with neutral or positive environmental impacts, thus highlighting the potential of shellfish aquaculture, known for its environmental benefits like water filtration and habitat creation.
7. **Sustainable Blue Economy:** This approach sets a blueprint for marine industries to align with the Green Deal's objectives while contributing to economic growth. This approach underscores the importance of marine spatial planning, emphasizing multi-use as a crucial method for reducing conflicts between maritime users. It advocates for decarbonization, circular economy principles, biodiversity conservation, and sustainable food production, providing a comprehensive framework for multi-use integration in the marine sector.
8. **MSP Platform:** This platform plays an important role in facilitating discussions and knowledge exchange on the topic of ocean multi-use. It has been a focal point in the Maritime Spatial Planning Expert Working Group, promoting the integration of multi-use concepts in maritime planning. The platform has supported various studies on multi-use and is expected to further integrate knowledge in this area.
9. **Horizon 2020/Horizon Europe**: EU's flagship research and innovation program provide critical funding and support for multi-use ocean projects. They focus on advancing scientific knowledge, fostering innovation, and developing sustainable technologies in various fields, including marine and maritime research. These programs play a key role in supporting

collaborative projects that explore and implement sustainable, innovative solutions for multi-use ocean spaces.

On a *sea basin level*, the *Oslo-Paris Agreement (OSPAR)* and the *Helsinki Commission (HELCOM) & VASAB* play significant roles. OSPAR sets environmental standards for the North-East Atlantic, influencing multi-use through directives like OSPAR Decision 98/31, which impacts the repurposing of decommissioned offshore installations. The decision states that offshore installations need to be fully removed, making multi-use scenarios with inoperative wind farms and oil rigs unlawful. HELCOM & VASAB, focusing on the Baltic Sea, contribute to policy development and environmental regulation. They are involved in projects like Blue4All, integrating Marine Protected Areas (MPAs) with other marine activities.

4.3 National/Pilot Level[2]

4.3.1 Germany

MSP in Germany encompasses the EEZs of the North Sea and Baltic Sea, as well as the territorial sea, which is under the jurisdiction of the three coastal federal states - Lower Saxony, Schleswig-Holstein, and Mecklenburg-Vorpommern. Germany adopted its "Maritime Spatial Plan for the German Exclusive Economic Zone in the North and Baltic Sea" on September 1, 2021. This plan focuses on several key areas, including ensuring the safety of shipping, promoting the development of the blue economy, facilitating scientific use, and safeguarding the marine environment.

Implementation of the maritime spatial plan in the EEZ falls under the responsibility of the Federal Maritime and Hydrographic Agency (BSH) under the Bundesministerium für Verkehr und Digitale Infrastruktur (Federal Ministry of Transport and Digital Infrastructure), while the territorial sea (within 12 nautical miles) is managed by the respective state authorities. This also applies for energy permitting: The BSH oversees the application process for wind farms located in the German EEZ. However, for near-shore developments and grid connections in the coastal sea, the regional governments of the German 'länder' along the North Sea coast serve as the permitting authorities. This process involves adhering to various national laws and regulations, making it a time-consuming process.

In contrast to the Dutch MSP, the German approach designates priority areas for specific maritime uses, effectively excluding other uses in those zones if they are incompatible with the primary use. However, exceptions exist, such as the

[2] Based on Maes, F. et al. (2023). *Case Specific report on legal aspects and insurance issues – D6.2.* UNITED project. & Expert interviews

combination of military usage with sand and gravel extraction, and military with environmental protection.

Marine aquaculture is still emerging, and the marine spatial plan does not currently designate specific areas for aquaculture. This domain falls under the responsibility of fisheries authorities, with administrative control at the state level. Research activities are coordinated by decentralized institutions. Generally, neither aquaculture nor trawling is permitted in offshore windmill zones, although this stance could evolve with successful examples of MU in other North Sea countries.

The development of combining renewable energy production with sustainable food production is in an experimental phase. For example, the UNITED and ULTFARMS projects offer pilot projects in the EEZ. Even when executed within an research context, these projects undergo lengthy administrative processes, as predefined rules are lacking. Commercial aquaculture permits typically take between 5-10 years, reflecting a robust regulatory approach that may, at times, hinder innovation.

Table 2: German Policies relevant for the context of Offshore Wind and Aquaculture MU

Multi-Use and Marine Vision/Strategy				
Relevant Policy and Strategy Document	Document Content	How does the document address MU?	Relevant Policy Actors	Future Prospects
National Aquaculture Strategy 2021-2030 (Nationaler Strategieplan Aquakultur, NASTAQ)	Comprehensive framework for the development of sustainable and responsible aquaculture practices in Germany	• Includes co-location of nature protection and low trophic aquaculture in the Wadden sea • Addresses the potential for MU combination OWF and Aquaculture in the future; no short-term commercial implementation	BMEL, BfN, coastal states, coastal municipalities	Might be used to implement and further MU
Multi-Use and Maritime Spatial Planning				
MSP Document	Nature of the Policy	How does the MSP address MU?	Relevant Policy Actors	Future Prospects
Spatial Planning Act (Raumordnungsgesetz, ROG)	Lays down legal requirements for the conditions, tasks, and guiding principles of spatial planning. The document operates as the legal basis for the MSP.	• Does not address MU	BBSR, BSH	MU should be included in future versions
Maritime Spatial Plan 2021 (Raumordnungsplan)	Digital Map and supplementing explanatory documents Germany's second maritime spatial plan, including the EEZ and territorial waters of Lower Saxony, Schleswig-Holstein and Mecklenburg-Vorpommern. Sets up priority, reserved and suitability areas	• Enables MU in OWE areas EN20 and EO2 (OWE and Research) • Establishes the legal competence to coordinate competing uses and delegate MU areas • Acknowledges that MU compatibility need to be determined based on a case to case assessment • Establishes areas of co-existence between maritime activities and	BSH, BMWK, BMVI, BMU, coastal state governments	Could provide a framework for MU site delegation in the future. The plan already directly addresses the need for space efficiency and announces a planned research project to

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		nature conservation but not between different maritime activities yet		uncover the feasibility of MU sites in Germany.
Flächenentwicklungsplan 2023 (site development plan)	Specialized plan for offshore wind energy 1. Defines areas for OWE and their grid connections 2. Schedules years where auctions are held as well as commissioning of OWE 3. specifies cross-border electricity transmission lines	• Does not include specific areas for MU • Includes other energy generation areas (not connected to the grid, i.e. hydropower) which might be relevant for MU in the future • Defines a test area to support research and development	BSH, BMVI, BNetzA, BfN, GDWS, coastal state governments	MU should be included in future versions
Multi-Use Policy and Permitting				
Relevant Regulatory and Permitting Policies (OWF, Aquaculture, MU)	General Policy Content	How does the policy address MU?	Relevant Policy Actors	Future Prospects
Offshore Wind Energy Act (Windenergie auf See Gesetz, WindSeeG)	Legal framework for offshore wind energy 1. Tendering Procedure 2. Approval Procedure 3. Site Preliminary Investigation	• MU not directly addressed • No requirement to conduct MU testing when conducting site testing for the possibility of OWE projects • MU with fishing/shipping restricted due to introduction of a safety zone around OWF	BMWi, BSH, BMU, BNetzA, GDWS	Could create a tendering framework for MU in OWF in the future
Federal Nature Conservation Act (Bundesnaturschutzgesetz, BNatSchG)	Legal foundation for the protection of natural and landscape assets and the measures of nature conservation and landscape management	• Provides a legal framework for introducing other activities in nature conservation areas	BfN, BMU	MU should be considered in all its forms.
Law on environmental impact assessment (Gesetz über die Umweltverträglichkeitsprüfung, UVPG)	Legal framework for assessing the environmental compatibility of projects that may have significant impacts on the environment due to their nature, size, or location	• Does not address MU directly but establishes a legal framework for cumulative EIA (so far only include cumulative impact from similar activities)	BMU, BSH	Could provide a framework for MU EIA in the future

4.3.2 Belgium

In 2003, the issue of governance fragmentation in Maritime Spatial Planning (MSP) at the federal level was addressed through the appointment of a Minister for the North Sea, marking the first time such a position was created by a decision of the Council of Ministers. This appointment aimed to facilitate a more coherent North Sea policy for the federal government without diminishing the authority of other relevant ministers, a structure that remains in place today. In essence, this means that there has been no redistribution of responsibilities among ministers with jurisdiction over North Sea matters.

The Minister for the North Sea holds the political authority to coordinate activities at sea through an MSP. This led to the establishment of the first legally enforceable MSP for the period 2014-2020 in 2014, followed by the formulation of a long-term MSP vision for 2050 in 2017 and a new MSP for 2020-2026 in 2019. The legal foundation for MSP and its adoption procedure has been integrated into the Law on the Protection of the Marine Environment of 1999 (LPME) since 2012, underlining the significance of environmental conservation.

The MSP process involves the creation of an MSP advisory commission comprising representatives from all relevant federal government departments and some Flemish government authorities. Furthermore, discussions on implementation matters involving 17 different governmental institutions and operational efficiency at sea take place in a forum for coastal cooperation, known as the Coast Guard. This forum promotes collaboration among all Coast Guard partners, respecting each other's authority and optimizing resource utilization to minimize additional costs. The Coast Guard functions as a platform for deliberation and consultation among public administrations involved in North Sea affairs and plays an advisory role in the MSP procedure.

Regarding offshore renewable energy projects, concessions can span up to 20 years, with the possibility of extension to a maximum of 30 years. Restoration to the original site condition is required before the 30-year mark, unless a different decision is made by the Minister, such as a partial removal of the installation. Domain concessions for electricity transmission installations have a time limit of 40 years, extendable in 10-year increments, up to a maximum of 70 years. The disparity reflects anticipation of future growth and increased capacity of these installations.

Operators of offshore wind energy projects must obtain an environmental permit under the 1999 LPME, granted by the Minister of the Environment. This process necessitates an Environmental Impact Assessment (EIA) conducted by the operator and approved by relevant authorities. When different activities of the same nature, such as wind energy and tidal energy, require separate licenses or authorizations, a single integrated environmental impact report and EIA can be permitted.

Access to Belgian offshore wind farms is restricted to military vessels, vessels used for scientific research (in consultation with the concession holder), maintenance ships for cables and pipelines, aquaculture operations, and passive fisheries (in consultation with the concession holder), as well as ships in distress, those contributing to safety at sea and safeguarding properties, and during force majeure events. MU is encouraged in the planning legislation for the new renewable energy concession zone known as the Princess Elisabeth zone, where the new tendering mechanism includes non-financial selection criteria, including MU.

The MSP2014-2020 allowed commercial aquaculture in two designated zones within wind farm concession areas only with the consent of the relevant wind farm operator. Additionally, these aquaculture projects were required to reduce the eutrophication level in their respective zones. This obligation prompted feasibility studies for integrating offshore aquaculture within operational wind farms, and pilot projects were initiated in 2017. These projects addressed challenges such as data specificity, operational capabilities, investment scale, public opinion, and consumer trust. They emphasized the importance of cross-sector partnerships characterized by mutual trust and understanding, validating business case assumptions. Several subsequent initiatives explored MU of space, deploying pilot projects. Moreover, there is growing interest in bringing offshore aquaculture products to the market, as evidenced by initiatives such as "Mosselen van de Vlaamse Banken" by Brevisco and "Seafarm Westdiep" by Colruyt Group, which became feasible through integration into zones designated for industrial and commercial activities in the MSP 2020-2026. At the conclusion of scientific projects, aquaculture installations must be removed and cannot be upscaled to commercial projects.

The introduction of exotic species poses significant concerns for further development in Belgium. The import of materials for restoration objectives, like the European oyster, is challenging due to the requirement that the material must be 'Bonamia-free,' often necessitating import from Norway, which increases the risk of introducing other exotic species. There is an ongoing discussion on definitions; while EU legislation permits the introduction of Crassostrea, Belgian national authorities are more cautious in this regard.

Table 3: Belgian Policies relevant for the context of Offshore Wind and Aquaculture MU

Multi-Use and Marine Vision/Strategy				
Relevant Policy and Strategy Document	Document Content	How does the document address MU?	Relevant Policy Actors	Future Prospects
North Sea Vision 2050 (2018)	Basic precondition for the development of the Belgian North Sea: conservation, protection and restoration of the environment	• Establishes three types of MU: 1) Dynamic: where activities only temporarily occupy space, for example, shipping. 2) Semi-dynamic: between a static element and a mobile user, for example, between a marine protected area and recreational activities. 3) Static: such as the concession zone for renewable energy. • Setting up a MU working group • Proposes MU as integral part of the tendering/permitting procedure	Lead: Minister of the North Sea, who is also Minister of Justice and vice-prime Minister (2020-2024); Ministry of Energy; Ministry of the Environment	The vision predicts/aims to achieve: In the future (by 2050), the principle of multiple use will be the norm for all the uses of marine space in Belgium.
Multi-Use and Maritime Spatial Planning				
MSP Document	Nature of the Policy	How does the MSP address MU?	Relevant Policy Actors	Future Prospects
Marine Spatial Plan (2020-2026):	Strategic framework that coordinates and	• integration of aquaculture in zones for industrial and	Lead: Minister of	Spatial allocation and

Royal Decree of 22 May 2019	manages the diverse activities within its North Sea territory/EEZ. Second Maritime Spatial Plan	commercial activities (i.e. Thornton Bank offshore renewable energy zone); agreement with concession holder and eutrophication reduction required • in new ORE concession zone (Princess Elisabeth zone), MU (with aquaculture, passive fishery and nature protection) as an award criteria; this MU does not depend on the consent of the offshore wind operator anymore • Procedure for User Permits for Commercial and Industrial Activities for obtaining permits for commercial and industrial activities in areas designated in the MSP (MU as criteria)	the North Sea; Ministry of Energy for offshore wind concession zones + energy islands; Ministry of the Environment: permits and EIA; Marine Environment Service, FPS Health	administration of Multi-Use on a wide scale.
Multi-Use Policy and Permitting				
Relevant Regulatory and Permitting Policy (OWF, Aquaculture, MU)	General Policy Content	How does the policy address MU?	Relevant Policy Actors	Future Prospects
Marine Environment Act (amended 2021)	Establishing a legal framework for marine protection, EIA assessments, permitting, guiding the human interaction with the sea.	• Activities that require a permit, if of same nature, can conduct combined EIA and impact report, if MUMM allows it • User agreements for MU marine protection and other marine activity	MUMM, MSP advisory commission, Coast Guard, Ministry of Climate, Environment, Sustainable Development and Green Deal	The act aims to guide and regulate the multi-use of marine spaces, ensuring sustainable interaction with the marine environment.
Electricity act (1999)	Legal Basis for tenders and concession zones	• Tenders and OWF concession zones (i.e. in Princess Elisabeth Park MU is a small requirement of the tendering conditions)	Ministry of Energy, Ministry of the North Sea	Potential framework for developments in offshore wind farms incorporating MU considerations in tendering processes.

4.3.3 Netherlands

Offshore wind farm development played a pivotal role in shaping the Dutch Maritime Spatial Planning (MSP). The National Spatial Planning Policy Document, initiated as early as 2005, aimed to bolster the economic significance of the North Sea while concurrently safeguarding and fostering international ecological features. In 2013, a non-binding North Sea vision was formulated, endorsed by the government, guiding the renewed North Sea policy from 2016 to 2021. This updated policy was largely influenced by wind and harbour development, resulting in the creation of new shipping lanes and increased sand extraction activities.

The most recent MSP, established in 2022, revolves around three major drivers: ecosystem health, renewable energy, and sustainable food production. The plan is under the authority of the Minister for Infrastructure and Water Management, who coordinates the integrated maritime policy. This program builds upon the Dutch North Sea Agreement adopted in parliament in January 2021, focusing on the energy transition, nature restoration, and sustainable fisheries. The MSP incorporates insights from discussions with stakeholders, regional, and local authorities.

An innovative approach of the Dutch MSP is the use of "opportunity maps" that indicate potential future use areas. These maps, although not legally binding, highlight areas with growth potential. Furthermore, the management plan introduces "joint initiatives" that encourage co-location, ensuring a balance with the marine ecosystem as outlined in various directives and conventions.
The MSP is structured according to priority areas, including sand extraction, renewable energy production, oil and gas development, shipping, and military use. Offshore wind development in the Netherlands is governed by a comprehensive regulatory framework, including location criteria, a long-term tender schedule, clear consenting procedures, and state responsibility for offshore grid connections. The Netherlands Enterprise Agency (RVO) acts as the coordinating administrator, ensuring trustworthy site survey data, environmental impact information, fair tendering, and timely permitting. MU is encouraged, with the MSP allowing non-priority uses in specific areas. Furthermore, the Netherlands has introduced non-financial tendering criteria in their OWF tendering processes, fostering the integration of MU solutions into the early stages of offshore wind farm development. The plan introduces "area passports" to guide MU within offshore wind farms.

Innovative initiatives and the promotion of a sustainable blue economy are streamlined through the "Community of Practice North Sea," functioning as an incubator for innovations such as floating solar PV, aquaculture, ocean energy, and MU. Finally, MU applications in aquaculture and renewable energy, are in progress at the research level, with test areas available, slowly moving to a commercial readiness level. While a "maripark" in the Netherlands is envisioned for sustainable MU projects, no such area is in operation as of now.

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Table 4: Dutch Policies relevant for the context of Offshore Wind and Aquaculture MU

Multi-Use and Marine Vision/Strategy				
Relevant Policy and Strategy Document	Document Content	How does the document address MU?	Relevant Policy Actors	Future Prospects
North Sea 2030 Strategy	Guideline for North Sea Commission and priority list for cooperation around Dutch North Sea region	• Setting up Stakeholder Platform: Community of Practice North Sea (incubator for innovations such as MU)	Ministry of Infrastructure and Water Management; Ministry of Agriculture, Nature and Food Quality; Ministry of Economic Afairs and Climate Policy; Ministry of the Interior and Kingdom Relations	Could initiate/support a paradigm shift from SU to MU approach.
Multi-Use and Maritime Spatial Planning				
MSP Document	Nature of the Policy	How does the MSP address MU?	Relevant Policy Actors	Future Prospects
North Sea Policy (2016-2021)	Sets out a framework for the spatial use of the North Sea in relation to the marine ecosystem	• Determines MU to be one of the five core maritime themes until 2050 • Permits vessels passage through and MU in OFW (as of 2017), based on approval obtained for each individual initiative • Sets out the assessment framework for MU	Ministry for Infrastructure and Water management; Directors' Consultative Body North Sea; Ministry of Economic Affairs and Climate; Ministry of Agriculture, Nature and Food Quality	
North Sea 2050 Spatial Agenda	Integrated policy and joint research providing vision for long-term (multi-)use of the sea and guiding MSP in the NL	• Document centered around five themes (one oft hem being MU) • Examines the opportunities and problems of MU	Ministry of Infrastructure and the Environment	
North Sea Program 2022-2027 (Maritime Spatial Plan)	Spatial planning of the Dutch EEZ and the non-administratively classified Territorial Sea (in achieving good environmental status) Focuses on the priority activities: ORE, sand extraction, oil and gas, shipping and military use but also includes non-binding opportunity maps,	• Joint initiatives: invitation to MU • stimulates MU through indication/zonation for non-priority uses in specific areas • sets up: 1. Assessment framework for co-use in wind farms 2. Assessment framework for activities in the North Sea (Test 2: choice of location	Ministry for Infrastructure and Water management; Directors' Consultative Body North Sea; Ministry of Economic Affairs and Climate; Ministry of Agriculture, Nature and Food Quality	Futher development of MU zones possible

	defining potential future use	and assessment of space/time use incl. MU)		
North Sea Agreement 2020	Agreement between the Dutch government and various stakeholders, projecting wind energy development on the long run; defines the framework for licensing procedures OWF	Establishes following tools supporting MU: 1. Area passports: area-based approach, zoning 2. Transition fund: support the implementation of the agreement	Ministry of Infrastructure and Water Management; Ministry of Agriculture, Nature and Food Quality; Ministry of Economic Affairs and Climate Policy	
Multi-Use Policy and Permitting				
Relevant Regulatory and Permitting Policy (OWF, Aquaculture, MU)	General Policy Content	How does the policy address MU?	Relevant Policy Actors	Future Prospects
Offshore Wind Energy Act	Legal framework for tendering procedures ORE	• establishes tender instruments for OWF (can include MU as tendering criteria)	Ministry of Economic Affairs and Climate Policy	Could provide the basis for MU oriented tendering procedures
Offshore Wind Energy-Roadmap 2024-2030	Sets out which new Wind Farm Zones, or parts thereof, will be subject to development and when	• highlight investment package for the transition to sustainable food supply from the North Sea; includes research and innovation of shared use in OWF • notes the investigation of the opportunities to develop Langelander Wind Farm Zone as an offshore 'multi-energy zone' after 2030	Ministry of Economic Affairs and Climate Policy, Netherlands Enterprise Agency	

4.3.4 Denmark

In 2021, Denmark introduced a new, legally binding MSP encompassing Danish marine internal waters, the territorial sea, and the EEZ in both the North Sea and Baltic Sea. The digital map, the core output of the 2021 MSP was developed by the Danish Maritime Authority, in collaboration with other relevant ministries, coastal municipalities, and relevant stakeholders.

The MSP structures the Danish waters based on 4 different zoning categories:

1. **Development Zones:** These areas are designated for various activities, including renewable energy and energy islands, oil and gas exploration and exploitation, CO2 storage, new infrastructure projects, aquaculture (including shellfish production and marine farming), and mineral resource extraction. These activities are exclusively permitted within the development zones and cannot take place in other areas.
2. **Special Use Zones:** These zones are specifically allocated for certain purposes, such as shipping corridors, aviation protection measures, cable

corridors for renewable energy, land reclamation, and pipelines. These activities can also be conducted in other zones, subject to approval by the competent authorities.

3. **Nature Conservation and Environmental Protection Zones:** These zones are designated for environmental conservation and protection.
4. **General Use Zones:** These areas do not have a predefined specific purpose and can accommodate activities like fishing, navigation, and other uses not covered in the MSP. This category includes activities like port expansions, coastal protection facilities, tourism, and recreational use.

Notably, fishing, shipping, tourism, and recreational activities are generally permitted in all zones unless sector-specific legislation or regulations explicitly prohibit or restrict them.

The primary objective of the MSP is to establish spatial priorities. Ultimately, the permitting authority decides whether an activity or installation is allowed in a specific location within a designated area.

MU is fostered by the MSP in several ways:

1. **Overlapping Zones:** The MSP designates zones where two or more types of activities can coexist, such as a combination of two different development zones in the same area or a combination of development zones with areas reserved for nature conservation and environmental protection. In overlapping zones, projects can only be approved after consultation with the Minister responsible for the other sector.
2. **Cross-Zone Activities:** Fishing, shipping, tourism, and recreational use are allowed in every type of zone unless prohibited by other sector-specific legislation.
3. **Development Zones for Renewable Energy:** Permits for other uses and facilities may be granted within development zones for renewable energy, but only after consultation with the Minister for Climate, Energy, and Utilities and under the condition that no development zones have been designated for that purpose, and the use aligns with renewable energy objectives.

Therefore, the Danish MSP recognizes the potential for promotes MU to some extent. However, there are no specific legislative provisions within the MSP or other regulations that define a unified application procedure or standards for MU projects that could facilitate their development.

The Danish Energy Agency, part of the Ministry for Climate, Energy, and Utilities, is the permitting authority for offshore renewable energy projects and acts as a one-stop shop for applicants seeking to develop offshore wind farms. OWF developers must enter into a concession agreement and obtain three permits: one for pre-investigation (feasibility), another for construction (including Environmental Impact Assessment or EIA), and the last for electricity production.

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Table 5: Danish Policies relevant for the context of Offshore Wind and Aquaculture MU

Multi-Use and Maritime Spatial Planning				
MSP Document	Nature of the Policy	How does the MSP address MU?	Relevant Policy Actors	Future Prospects
Maritime Spatial Plan	Digital Map, planning the use of the Danish waters	• No planning for MU directly, the plan includes "Overlapping zones" where a specific area includes more than one zone (i.e. Co2 storage and shipping). • Those zones do not guarantee co-existence (licenses could be given out after further assessment). • Support of MU with tourism.	Danish Maritime Authority; Ministry of Industry, Business and Financial Affairs; other concerned Ministries; coastal municipalities	Could provide spatial layout of MU zones beyond overlapping zones
Multi-Use Policy and Permitting				
Relevant Regulatory and Permitting Policy (OWF, Aquaculture, MU)	General Policy Content	How does the policy address MU?	Relevant Policy Actors	Future Prospects
Act on the promotion of renewable energy (No. 1392 of 2008)	Legislation promoting the production of energy using renewable energy sources such as wind, hydro, biogas, biomass, solar, wave and tidal energy and geothermal heat	• Does not address MU directly. • Establishes the Ministry of Climate, Energy and Utilities as the permitting agency for ORE. DEA functions as a one-stop-shop.	Danish Energy Agency; Ministry of Climate, Energy and Utilities	Could provide a foundation for ORE MU combinations in the future
Danish Fisheries Act	Regulations on the management and conservation of fishery, aquaculture and trade in related areas	• Sets up framework for fishing restrictions: Cable Protection Zones and OWF buffer zone • Compensation and agreement structures for loss of income of fishers due to OWF development required	DEA, Danish Fisheries Agency	

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5. Exploitation and Value Chains: Market Governance

5.1 Defining market governance

Market governance in the context of ocean multi-use (MU) combines regulatory frameworks and market mechanisms to manage and promote the integration of different maritime activities. As defined in D9.1, market governance in the MU context involves managing the interactions between various market actors, from raw material suppliers to end consumers, within the framework of regulatory policies and market dynamics. The sections below provide an overview of the key actors that can influence market governance, such as the certification bodies and insurance companies. It also analyses the actors along the value chain of multi-use that can affect market governance in ULTFARMS pilot countries and beyond. The analysis takes into consideration both EU and pilot levels. It is important to note that at the time of the preparation of this report the market analysis in ULTFRAMS was still unavailable. Therefore, this report may require an iterative approach and updates to reach its adequate usability.

5.1.1 Value Chain of MU Industry

The MU industry, specifically the combination of offshore wind and aquaculture, encompasses a broad spectrum of value chain activities. These include:

- **Materials acquisition**: Suppliers of raw materials are critical in the initial stages of the value chain. They provide the necessary inputs for constructing offshore wind turbines and aquaculture systems. By sourcing sustainable and high-quality materials, these suppliers can influence the longevity and environmental impact of MU operations.
- **Components manufacturing**: Manufacturers who specialize in creating specific components for wind turbines and aquaculture equipment play a vital role in the overall efficiency and reliability of MU projects. Their innovative designs and manufacturing processes can lead to more cost-effective and durable installations.
- **Manufacturing**: Assemblers of offshore wind turbines and aquaculture structures are at the heart of the value chain. Their expertise in constructing complex systems determines the final quality and operational efficiency of the MU installations.
- **Logistics**: Logistics companies manage the transportation and installation of MU structures at sea. Their coordination and planning skills are crucial for timely and safe delivery of equipment to offshore sites, which is essential for maintaining project timelines and budgets.
- **Development**: Actors involved in planning, designing, and obtaining necessary permits for offshore wind farms and aquaculture installations

govern the feasibility and compliance of MU projects. Their in-depth knowledge of regulations and design principles is vital for obtaining approvals and ensuring that installations meet all legal and environmental requirements.

- **Operations**: Operational managers are responsible for the ongoing management and maintenance of wind farms and aquaculture operations. Their role is crucial for the smooth functioning and sustainability of MU initiatives, as they ensure that operations comply with industry standards and achieve desired production targets.
- **Certification and Insurance:** Certification bodies and insurance companies provide third-party validation and financial risk mitigation throughout the MU value chain. Their role is comprehensive, intersecting with each part of the value chain to ensure that MU projects are viable and adhere to required standards.

Relevant categories of actors in this value chain include wind farm operators, mussel, oyster and seaweed farmers, engineering firms, logistics companies, certification bodies, insurance companies and regulatory bodies.

5.1.2 The role of market actors in MU governance

Certification bodies

To date, several certification bodies like Lloyd's Register (with projects like SOMOS and UNITED), DNV-GL, and Bureau Veritas have engaged with MU projects. However, there are currently no specific standards or certificates exclusively for MU. Initiatives like the SOMOS risk assessment procedure and certification recommendations from past MU projects, including ORECCA, H2OCEANS, and MERMAID, lay the groundwork for future standards and certifications in this domain.

Based on the past multi-use projects it can be noted that the certification bodies can indirectly influence multi-use governance through several roles:

1. **Developing New Standards and Certificates:** New multi-use related standards and certifications can be developed to address the multifaceted aspects of MU projects, enhancing continuous quality improvement across all operations. Developing new standards (e.g. ISO) and certifications can help govern the market.
2. **Compliance Verification:** Certification bodies assess and confirm that MU projects comply with industry standards and regulations. Ensuring that operations like offshore wind energy, aquaculture, and nature restoration within MU frameworks adhere to safety, environmental, and quality standards is essential. This verification process bolsters confidence among stakeholders, including investors, regulatory bodies, and the general public,

by providing assurance that the MU initiatives are conducted responsibly and sustainably.

3. **Promotion of Multi-Use:** Certifications can symbolize trust, quality, and adherence to specific standards, thus aiding in the marketing and promotion of MU projects. For instance, the "Green Label Slovenia" serves as an endorsement of sustainable tourism, indicating destinations' compliance with the Green Scheme of Slovenian Tourism (GSST) criteria. Similarly, certification programs specifically designed for MU or space-efficient aquaculture could elevate the profile and credibility of such ventures.

Insurance Companies

Insurance companies have played a significant role in past and ongoing multi-use pilot projects, with UNITED being a notable example. In this project, they have provided insurance coverage for pilot activities, especially in the context of low-trophic aquaculture integrated into existing wind farms. It has been observed that generally, insurance companies have limited awareness of multi-use concepts. Additionally, their interest in insuring such projects is relatively low, partly because these projects are typically on a small scale. Where insurance is available, premiums tend to be high, reflecting a limited understanding of the risks and impacts associated with introducing additional uses into existing wind farms.
The issue of insurance and the role of insurance companies was discussed at several UNITED project workshops, including the UNITED Commercialisation Webinar and the UNITED Final Event held in November 2023 in Gothenburg. These discussions highlighted the crucial role of regulators in enhancing insurance companies' confidence by jointly addressing significant risk aspects and assessments, thereby ensuring market consistency in this area. Consequently, insurance companies are integral to the overall governance and progression of multi-use initiatives. Their non-participation or lack of awareness or interest can significantly impede the development process of multi-use. This has been identified as one of the main bottlenecks in current multi-use pilot projects, including ULTFARMS.

5.2 European Level

In the European context, the multi-use combination of offshore wind energy and aquaculture involves a diverse range of market governance actors who play significant roles in shaping the governance landscape. Key players include large-scale offshore wind energy companies such as Ørsted and Vattenfall, which lead in wind farm development and have the potential to incorporate aquaculture into their operations. Trade associations like WindEurope actively advocate for policies conducive to wind energy expansion, which partially encompass multi-use dimensions.

In aquaculture, actors range from large producers like Marine Harvest to smaller, specialized companies engaged in mussel, oyster, or seaweed cultivation. These entities are often represented by trade associations such as the European Aquaculture Society, which promotes industry standards and sustainable practices.

Financial institutions and investment funds with a focus on blue economy projects can also wield significant influence by directing capital towards sustainable multi-use initiatives. Moreover, the European Union's funding mechanisms, particularly through programs like Horizon Europe, EMFAF, and the BlueInvest initiative, provide critical support for research, innovation, and implementation of multi-use projects.

These actors collectively influence multi-use governance through their investment decisions, advocacy, and participation in policy-making processes. They contribute to shaping a regulatory environment that supports the integration of wind energy and aquaculture, advancing the goals of sustainable development, and efficient use of marine spaces.

5.3 Pilot/National Level

Each pilot country in the ULTFARMS project is focused on developing specific Key Exploitable Results (KERs) that cater to the unique characteristics and needs of their regional marine environments. These KERs range from technological innovations to consultancy services, all aimed at enhancing the efficiency, sustainability, and profitability of multi-use systems in offshore wind and aquaculture sectors. The collaboration among different stakeholders, including farmers, engineering companies, and regulatory bodies, is crucial for the successful commercialization and implementation of these KERs. The government's role in supporting these initiatives through regulatory frameworks, funding, and policy guidance is also a key factor in the development of a robust market for ocean multi-use in these regions.

5.3.1 Germany

In Germany, the focus is on developing technologies for seaweed and mussel cultivation. Key players include technology developers, research institutions, and government bodies. Government plays a role in facilitating research and development through funding and regulatory support.

1. Seaweed Strain Selection and Seeding:

- **Objective**: Develop efficient and sustainable methods for the selection and seeding of Baltic Sea species, aiming to maximize biomass production adapted to Baltic Sea conditions.

- **Stakeholders**: Seaweed farmers, research institutions.
- **Market Potential**: International market, particularly in the Baltic Sea area, with opportunities for joint ventures with other ULTFARMS partners.

2. Seed Supply and Culture Structures:

- **Objective**: Address the challenges of seed material delivery and the development of efficient growing structures for seaweed cultivation.
- **Stakeholders**: Aquaculture companies, ports, technology providers.
- **Market Potential**: International market, offering innovative solutions for seed transportation, storage, and application, as well as cultivation structure design.

3. Aquaculture System Adaptable to Offshore Structures:

- **Objective**: Develop an aquaculture system designed for marine environments, minimizing anchoring limitations in high-energy seas.
- **Stakeholders**: Marine or aquaculture engineering companies.
- **Market Potential**: International market, focusing on creating adaptable, resilient aquaculture systems for offshore environments.

4. Remote Monitoring for Mussel Production:

- **Objective**: Develop a remote monitoring method to assess mussel health and growth, enhancing farm management and operational efficiency.
- **Stakeholders**: Farmers, technology developers.
- **Market Potential**: International market, offering solutions for improved farm management through remote monitoring technologies.

5. Consulting for Offshore Aquaculture Projects:

- **Objective**: Provide specialized consultancy for the development and implementation of offshore aquaculture projects.
- **Stakeholders**: Marine engineering companies, farmers.
- **Market Potential**: National market, focusing on the German regulatory context and providing expert guidance in offshore aquaculture.

Table 6: Companies involved across the value chain in the implementation of German Pilot

Insurance	Aquaculture/Food	Energy	Subcontractors
Lloyds Insurance	Olmix Group Deutsche See Sylter Royal	Veja Mate Windfarm Vattenfal EnBW	Murre Technologies (NL) Otto Wulf GmbH & Co. KG

5.3.2 Belgium

Belgium's pilot includes developing technologies for seaweed and mussel farming. Key actors are aquaculture companies, technology providers, and consultancy services. The government influences the market through regulatory frameworks and support for sustainable practices.

1. Seaweed Platform:

- **Objective**: Develop a flotation product for seaweed production, integrable into various farm architectures.
- **Stakeholders**: Producers, manufacturers.
- **Market Potential**: International market, offering innovative equipment solutions for seaweed cultivation.

2. Low Environmental Impact Screw Anchors:

- **Objective**: Develop anchoring strategies for offshore aquaculture structures with minimal environmental impact.
- **Stakeholders**: Marine and aquaculture engineering companies.
- **Market Potential**: International market, presenting eco-friendly anchoring solutions for offshore structures.

3. Safety and Operational Training Courses:

- **Objective**: Provide training on safety procedures and best operational practices for offshore aquaculture systems.
- **Stakeholders**: Farmers, operators.
- **Market Potential**: National market, focusing on enhancing operational safety and environmental protection in aquaculture.

4. Data and Simulations for Aquaculture Structures:

- **Objective**: Analyze data on aquaculture structures' behavior in high-energy seas to develop resilient design simulations.
- **Stakeholders**: Marine or aquaculture engineering companies.
- **Market Potential**: International market, offering insights for designing sustainable aquaculture systems.

5. Low Trophic Aquaculture Consulting Services:

- **Objective**: Provide consultancy on design, installation, and environmental impact assessments of low trophic aquaculture.
- **Stakeholders**: Farmers, regulatory bodies.
- **Market Potential**: International/National market, focusing on consulting for nature-inclusive and legally compliant aquaculture practices.

Table 7: Companies involved across the value chain in the implementation of Belgian Pilot

Energy	Aquaculture/Fisheries	Food	Subcontractors
Parkwind Eneco Otary	Zeeboerderij/Colryt Group Brevisco AquaSpark Rederscentrale ter zeevisserij Vlaamse Visveiling	Buccinum Nomet (The Seaweed Croquette) The Seaweed Chef (Restaurant Le Homard et la Moule)	Oesterput DEME JDN DotOcean GeoXYZ VVC equipment

5.3.3 Netherlands

The Dutch pilot prioritizes near-shore mussel farming and environmental restoration. The key actors are mussel farmers, equipment manufacturers, and

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environmental groups. The government influences the MU market through regulations, subsidies, and support for pilot projects.

1. Monitoring and Data Communication:

- **Objective**: Develop a system for real-time data transmission with insights into crop health and growth.
- **Stakeholders**: Farmers, technology developers.
- **Market Potential**: International market, focusing on automated, AI-driven image recognition systems for crop monitoring.

2. Artificial Reef for Ecosystem Restoration:

- **Objective**: Promote ecosystem restoration through biodegradable artificial reefs placed under aquaculture structures.
- **Stakeholders**: Farmers, ecological tourism.
- **Market Potential**: International market, addressing the need for biodiversity restoration in wind farm fields.

Table 8: Companies involved across the value chain in the implementation of Dutch Pilot

Energy	Aquaculture	Subcontractor	Investment
Energy Beheer Nederland Tennet Nederlandse Windenergie Associatie (NWEA), Eneco Blauwwind	Dutch SeaWeed Group Dutch Producer Organisation	Murre Bakker Machinebouw Damen Hortimare	ABP Algemeen Burgerlijk Pensioenfonds Global financing Fund Rabobank

5.3.4 Denmark

Denmark's pilot focuses on mussel farming with innovative submersible structures. The main actors are mussel farmers and marine engineering companies. The Danish government's role is less pronounced in MU discussions, with more focus on the energy sector.

1. Submersible Tube and Net Systems for Mussel Cultivation:

- **Objective**: Develop a structure for mussel cultivation that can be submerged to mitigate adverse weather impacts.
- **Stakeholders**: Mussel farmers, marine or aquaculture engineering companies.
- **Market Potential**: International market, focusing on innovative, resilient structures for mussel farming in offshore environments.

Table 9: Companies involved across the value chain in the implementation of Dutch Pilot

Energy	Aquaculture	Investment
Vindenergi DK	Dansk Akvakultur	PensionDanmark

	Dansk TANG - Seaweed	

5.4 Link to Market Analysis in ULTFARMS

A market study has now been launched in the ULTFARMS Work Package 5 for the first exploitable results contributed by each of the pilots, but also by other ULTFARMS partners who will obtain marketable results. The market study will be carried out at different levels: regional, national and international, according to the potential of each and the expectations of the partner benefiting from the exploitation of the results. The first step is to identify the real needs of the market and trends, as well as the interests of potential investors who can provide long-term continuity. This will include an analysis of the competition, taking into account the added value of the results obtained, which are not comparable to traditional production or commercial exploitation systems, which is one of the main obstacles to overcome in order to successfully exploit the results of the project. On the other hand, one of the limitations is the type of regulation in each of the countries, so an analysis will be carried out of each of the regulations that may affect the exploitable results, as well as the protection figures for the exploitation of the results.

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6. Stakeholder Networks: Network Governance

Citizen and network organisations play a major role in governance. They bring together people with similar interest to boost ideas and innovation and they enable to raise a voice supported by a whole group of people and or companies.
This chapter gives an overview of some examples at different levels (national, sea basin and EU) and their relevance and impact towards fostering multi-use at sea and in specific LTA aquaculture within offshore wind farms.

6.1 Europe and Sea basin level

6.1.1 Europe

- **Native Oyster Restoration Alliance (NORA**): A European network aiming at reinforcement and restoration of the native European flat oyster (Ostrea edulis). Network members are representatives of governmental agencies, science, non-governmental organizations, as well as oyster growers and other private enterprises.
- **Aquaculture Sewardship Council:** The Aquaculture Stewardship Council (ASC) is an impact-driven NGO that aims at making aquaculture more sustainable. We do this by setting strict standards for seafood and farms and deliver high assurance throughout the supply chain.
- **WindEurope**: WindEurope is a network organization who, through effective communication and its engagement in the political decision-making processes, seeks to facilitate national and international policies and initiatives which strengthen the development of European and global wind energy markets, infrastructure and technology. In doing so, we achieve a more sustainable and cleaner energy future.
- The **European Aquaculture Society (EAS)**: The EAS is a non-profit international organization that aims to promote and develop European aquaculture in an environmentally and economically sustainable way. They focus on various aspects related to aquaculture, including research, technology, management and education. EAS organizes conferences, workshops, and symposiums to facilitate knowledge exchange among scientists, industry professionals, and policymakers in the aquaculture sector.
- The **European Blue Forum**: In an effort to create a mechanism to unite all stakeholders, the Commission announced the creation of a Blue Forum for users of the sea to coordinate a dialogue between offshore operators, stakeholders and scientists engaged in fisheries, aquaculture, shipping, tourism, renewable energy and other activities. It will develop synergies between their activities and reconcile competing uses of the sea and to identify innovative solutions to deliver bold and ambitious change, bringing real benefits to people and communities throughout Europe.

- The **BlueForum** is an initiative of MARIN to promote the smart and sustainable use of environment in the maritime sector, from energy to transport. The main objective is to bring together the actors that will enable an efficient implementation of the energy transition. Those actors are the industry, the research institutes and universities, the authorities. In order to reach such goal, we propose a series of presentations on ongoing innovations and projects and we provide an open platform (the Forum) to pitch new Joint Industry Project (JIP) Initiatives. Those pitches will hopefully allow the start of such collaborative projects, where participants can join force in research & development at pre-competitive level. The themes developed in the forum are: Renewable Ocean Energy (tidal, waves, floating wind, floating solar); Blue Life (use of the ocean for sustainable farming, fishing, biomass production, ocean life protection, sustainable human activities at sea); Natural Propulsion technologies (use of environmental forces such as wind, solar, water); Zero Emission transport and shipping.

6.1.2 North Sea Basin

- **The North Sea Commission (NSC)**: The NSC functions as a pivotal cooperation platform, uniting regions around the North Sea. Its core mission is to reinforce partnerships among regional authorities to collectively address the challenges and opportunities presented by the North Sea. The NSC actively engages in dialogue and forms formal partnerships to advocate for the North Sea's interests, particularly in interactions with European Union institutions, national governments, and other relevant organizations.
- **North Sea Farmers (NSF)**: As a non-profit entity, the NSF is committed to advancing the European seaweed industry. The organization's activities span the entire seaweed value chain, emphasizing aspects like sustainability, education, research, and innovation. NSF's operations are concentrated in the North Sea area. The organization has established an inclusive membership base, which is instrumental in fostering robust collaborations across the seaweed value chain. Key initiatives include facilitating knowledge exchange in the sector, enabling collaborations, representing the sector in policy discussions, and enhancing the visibility of the seaweed industry and its participants.

6.1.3 Baltic Sea Basin

- **HELCOM-VASAB Planners Forum**: This forum serves as a critical platform for policymakers, planners, and experts involved in marine and spatial planning in the Baltic Sea region. The forum facilitates the exchange of ideas

and expertise, contributing significantly to the development and implementation of effective marine spatial planning strategies in the region.

- **CPMR Baltic Sea Commission**: An international, independent consortium of Regional Authorities from across the Baltic Sea Region, the CPMR Baltic Sea Commission was established in 1996. It functions as a forum for policy-oriented cooperation and lobbying among Regional Authorities. Each member region is represented by prominent elected politicians. The Commission champions the specific interests of Baltic Sea regions, particularly toward EU institutions. It supports the main objectives of the EU Strategy for the Baltic Sea Region and strives for greater involvement of regional stakeholders in the governance and implementation of this strategy. Under the Commission's umbrella, various working groups operate, including the Energy and Climate Working Group, which has concentrated on forming a partnership to boost growth opportunities by enhancing the capacity of regional innovation actors.
- **HELCOM Fish Group**: A specialized group under HELCOM (Helsinki Commission), focusing on fisheries-related issues in the Baltic Sea. This group plays a vital role in advising and formulating policies related to sustainable fisheries management in the region.

6.2 Pilot/National Level

6.2.1 German Pilot

- **German Offshore Wind Energy Cluster**: Comprising companies, research institutions, and stakeholders in offshore wind energy production, this cluster is a key player in the German offshore wind sector.
- **Maritime Cluster Northern Germany (MCN)**: MCN fosters cooperation in the Northern German maritime industry, creating dialogue platforms and promoting cross-industry networks. It includes more than 350 Northern German companies.
- **BioEconomy on Marine Sites association (BaMS)**: Founded in 2019, BaMS includes members from leading universities, research institutions, and companies in Germany. It focuses on transitioning to a bio-based economy, seeking economically, ecologically, and socially viable solutions.
- **SUBMARINER Network**: This platform unites stakeholders from various sectors for the sustainable use of marine resources in the Baltic and North Sea regions, facilitating knowledge exchange and promoting innovation.
- **Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH (EKSH):** This organization focuses on promoting science, research, and education in energy and environmental protection. EKSH is a non-profit organization that annually allocates around 2 million euros for pilot projects and programs in areas such as sustainable mobility, renewable energies, sector coupling, and energy efficiency source.

6.2.2 Belgian Pilot

- **Blue Cluster**: The Blue Cluster is a key initiative of the Government of Flanders, focusing on sustainable and innovative economic developments in the Belgian part of the North Sea. It acts as an independent and neutral partner, aiding Flemish companies in forming partnerships for offshore economic activities.
- **Belgian Offshore Cluster (BOC)**: The BOC represents the Belgian offshore industry, spreading knowledge and experience and acting as a broad, independent industrial platform. It maintains relationships between the sector, governments, and international organizations.
- **Belgian Offshore Platform (BOP)**: As a non-profit association, the BOP includes investors and owners of wind farms in the Belgian North Sea. The BOP is an advocate for the development of wind energy in Belgian waters.
- **Flemish Aquaculture Platform**: Established in 2012, this platform supports the Flemish aquaculture sector's evolution, maximizing and promoting knowledge exchange. It encompasses a strategic steering committee, an information desk, and a network, advising on Flemish aquaculture policy and steering the platform's overall direction.
- **4Sea coalition**: This coalition unites four NGOs (WWF Belgium, Natuurpunt, Bond Beter Leefmilieu, and Greenpeace Belgium), pledging for a sustainable and healthy marine environment in the North Sea.

6.2.3 Dutch Pilot

- **Community of Practice Noordzee (COP Noordzee)**: This community brings together various stakeholders to strengthen the balance between energy, nature, and food in the North Sea, promoting a Sustainable Blue Economy.
- **NGOs**: Multiple NGOs, including Ambassade van de Noordzee, Stichting De Noordzee, and others, play a crucial role in advocating for sustainable practices and biodiversity restoration in the North Sea.
- **Dutch Wind Energy Association (NWEA)**: NWEA promotes the development of wind energy for a sustainable Dutch energy supply and works closely with its members to build a strong wind sector.
- **The Producers' Organization of the Dutch Mussel Culture**: This trade association represents all mussel growers in the Netherlands, aiming for economically profitable and ecologically sustainable mussel farming.
- **Fisheries sector organizations**: Various fisheries sector organizations, including Visned and Sportvisserij Nederland, influence policies and practices in the Dutch fishing industry.

6.2.4 Danish Pilot

- **WWF Denmark:** WWF is one of the largest conservation organization in the world aiming to create more space for nature and to preserve wildlife habitats through sustainable management of natural resources, monitoring of wildlife populations, protection of natural areas, and combating poaching. WWF Denmark specifically engages in collaborations with businesses, governments, local communities, and organizations to preserve biodiversity, marine life and foster sustainable energy production. WWF Denmark is involved in multi-use research projects such as ULTFARMS.
- **DN.DK (Danmarks Naturfredningsforening):** The Danish Society for Nature Conservation is Denmark's largest nature conservation and environmental organization. It operates as a membership organization engaged in local conservation work, lobbying, and specific projects. DN.DK is committed to conserving and protecting Denmark's natural environment, ensuring the preservation of biologically diverse natural forests and meadows, and promoting clean drinking water. The organization also works towards creating a greener and more sustainable Denmark, focusing on waste management, recycling, and renewable energy use source.
- **Green Power Denmark:** Green Power Denmark has been actively involved in the development of offshore wind turbines, focusing on expanding green energy sources. They have advocated for the coexistence of nature and wind turbines, emphasizing the need for marine nature funds to find solutions that allow both to thrive together.
- **Vindenergi Danmark:** Vindenergi Danmark is an independent electricity trading company and is currently the largest commercial entity responsible for managing the economic interests of wind turbine owners in the electricity market.
- **Dansk Akvakultur:** Dansk Akvakultur is a trade association that includes members such as feed companies, breeders (including those of pond culture, marine culture, eels, and mussels), as well as fish exporters and processing factories. It is led by a board with Karl Iver Dahl-Madsen as the chairman and has a secretariat located at the Ferskvandscentret near AQUA Freshwater Aquarium in Silkeborg. The organization works to ensure optimal framework and marketing conditions for its approximately 150 members.
- **Tang Netværket:** Seaweed Network, aims to promote knowledge about seaweed and its applications in Denmark, as well as in Greenland and the Faroe Islands. It focuses on fostering cooperation in research, development, cultivation, collection, and dissemination of seaweed-related topics on a factual and professional basis. The network comprises about 500 members in Denmark, ranging from industry professionals, universities, authorities, organizations, groups, and individuals who work with or are interested in seaweed.

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6.2.5 Link to Multi-Stakeholder & Citizen Engagement activities in ULTFARMS

ULTFARMS Work Package 2 focusses on the Multi-Stakeholder & Citizen Engagements of the ULTFARMS project. A Stakeholder Engagement Strategy has been developed to streamline all stakeholder engagement activities of the project (on pilot level, sea basin level and European wide). This is done to avoid stakeholder fatigue and to maximise potential synergies and collaborations with other relevant projects and initiatives in the sea basins, as well as with ongoing EU-wide and international initiatives. Best practices and lessons learned from other projects are detailed in this report, as well as identification and analysis of relevant stakeholders. The document describes not only the relevant stakeholders but also the ongoing stakeholder engagement initiatives and existing networks that have a link with multi-use of space at sea and how the project will interact with these initiatives and networks. As part of WP2 also an Industry Sounding Board is formed with key industry stakeholders.

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7. Research (Knowledge Governance)

7.1 Knowledge Governance: what it is and its role in multi-use

Knowledge governance allows us to focus on more distinct matters of information flows and learning (Soma et al 2016; Mol, 2008). In practice, Knowledge governance co-exist with the other modes or dimensions of governance; hierarchical, market and network governance, and as such influence each other.

The sea is now a highly contested space where maritime uses have soared in abundance and intensity over the last decades (Schupp et al, 2019 & Schäfer, 2009). Schupp et al (2019) also points out that advancements in technology and know-how are enabling those marine uses to become more diverse, intensive, and to create more value than ever. But at the same time, while established uses, such as shipping, fishing or resource extraction expand and intensify, new uses such as offshore aquaculture or wind and wave energy generation are emerging and attempting to carve out space in an already crowded and "urbanized" sea. Multi use is now one of the important issues coming up at the agenda. Due to a number of developments, such as continuing and accelerating activities, cumulative effects, competition and conflicts for limited marine space, increased stress on marine ecosystems (Schupp et al 2019), more knowledge is becoming pivotal to the developments. Knowledge is then also vital to the (widespread piecemeal) governance of the sea.

Knowledge governance in general contribute to MU through innovation, the development of best practises, identifying and dealing with trade-offs & synergies by research, and arriving at new mindsets through information development and sharing.

7.2 Knowledge Governance at sea basin level

Governments can influence MU knowledge production in various ways. They can promote and support MU in their policies, strategies and planning; they can adjust legal arrangements and administrative procedures to fit knowledge development and they can commission research and subsidies for multiuse. Governments can also follow the development closely to benefit from new insights.

7.2.1 Relevant transnational and regional actors

Various transnational and regional organisations influence the policy landscape by development, dissemination and exchange of knowledge. Programming and funding of research is a clear-cut example. Other activities can include sharing, collecting and dissemination of knowledge. The EU MSP Platform is one of the

organisational devices set up as a service for Member States to share relevant knowledge and experiences, designed to offer support with the implementation of MSP. It is funded by the EC Directorate-General for Maritime Affairs and Fisheries (DG MARE) through the European Maritime, Fisheries and Aquaculture Fund (EMFAF). The table below provides an overview of transnational and regional organisations involved in knowledge governance, and a first screening of their work on multi-use at sea.

Table 10: Transnational and regional organisations and their relation to MU at sea (note: limited to organisations relevant for the Ultfarms pilots)

Organisations	Relation to MU at sea
European Commission	Provides knowledge and guidance on MU in relation to MSP, see for example "Best Practice Guidance on multi-use issues and licensing procedures"[3]
Horizon Europe (European Union funded)	Funding knowledge development on MU, with a gradual shift from explorative research project to showing proof of principle
EMODnet	No explicit reference to MU in their maps
Copernicus	No information on MU at their website.
Olso-Paris Agreement (OSPAR)	No information on MU at their website.[4]
Helsinki Commission (HELCOM)	No information on MU at their website.
European Observation Network for Territorial Development and Cohesion (ESPON)	Multi-use discussed in the context of MSP and Land-Sea Interactions, providing insights and recommendations to ESPON members.[5]
UNESCO Intergovernmental Oceanographic Commission (UNESCO-IOC)	No information on MU at their website.
International Council for the Exploration of the Sea (ICES)	MU discussed in relation to ecosystem impacts[6] and to prospects for Open Ocean Aquaculture[7]

[3] https://op.europa.eu/en/publication-detail/-/publication/ef339e03-d23c-11eb-ac72-01aa75ed71a1/language-en/format-PDF/source-298080676
[4] Note a different use of the term "multiple use of platforms", related to monitoring platforms, here: https://www.ospar.org/documents?v=7347
[5] See https://www.espon.eu/MSP-LSI and various PPTs available on ESPON website
[6] https://www.ices.dk/news-and-events/news-archive/news/Pages/MMPs.aspx
[7] https://www.ices.dk/community/groups/Pages/wgooa.aspx

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International Society of Applied Phycology[1]	No information on MU at their website.

1: Mentioned by German pilot

It is noteworthy that, with one exception, these organisations were not listed in the stakeholder mapping presented in Chapter 3. This list is therefore compiled based on experience of the researchers involved in Ultfarms, task 9.2.

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7.2.2 Germany

Kiel Marine Science (KMS) is the Centre for Interdisciplinary Marine Science at Kiel University. KMS performs a central coordinating role for all researchers in natural sciences, the humanities, and social sciences whose work concerns oceans, coasts, and their interaction with humanity. Kiel Marine Science (KMS) is connected with regional, national, and international academic and science policy networks. Kiel Marine Science research focus area are committed to an active transfer of knowledge with society, with the goal of supporting knowledge-based options for effective protection and use of the seas. In particular, these activities include communicating research results to various interest groups in politics, business or civil society.[8]

7.2.3 Belgium

In Belgium VLIZ has a specific task to valorise marine research and translate it into usable policy products and services, and identify knowledge gaps. The government then is equipped with scientific input for their marine governance. This is in particular framed into the Province West-Flandern.

7.2.4 Netherlands

In the Netherlands the Informatiehuis Marine (IHM) is an organisation where governments work together on marine data and information on the North Sea and share this with stakeholders, professionals and other government parts. IHM is a collaboration between the ministries of Infrastructure and Water; Agriculture, Nature and Food Quality; and Defence.

7.2.5 Denmark

In Denmark there is Novena and DCE. DCE then runs five scientific data centres for the Danish Ministry of the Environment and Food under NOVANA (the National

[8] https://www.uni-kiel.de/en/research/priority-research-areas/kiel-marine-science/about-kms

Monitoring and Assessment Programme for the Aquatic and Terrestrial Environment). And DCE carries out some of the monitoring for NOVANA. These five scientific data centres are located at the Department of Bioscience and the Department of Environmental Science. Aarhus University.
NOVANA supports Denmark's EU obligations for the monitoring of environment and nature, and its own national requirements for knowledge about the state of the environment and nature for purposes such as preparing water and nature plans. The monitoring support the agreements Denmark has entered into regarding international monitoring conventions, including the HELCOM Convention for the Baltic Sea countries and the OSPAR Convention for the North Sea countries.

7.3 Knowledge governance: pilot level

7.3.1 German pilot

In the German pilot, knowledge governance is mainly centred around universities and regional and international companies. The R & D Centre of the University of Applied Sciences Kiel GmbH has close cooperations with professors and students at this same university. Another example is the partner University of Gothenburg, who is specialising on establishment of species cultivation. Beside the universities, close cooperations with regional (KMF, BBE Moldaenke, NSF) and international (DNV, Hortimare) companies that are partners in the consortium of ULTFARMS are in place. Knowledge development (research) is here thus part of a scientific project, where the resulting cooperation with these companies allows for direct organisation, interaction and transferral of knowledge from the ULTFARMS project. Knowledge is generated, developed and obtained in the ULTFARMS project at scientific and economic levels.

Several funding schemes exist in Germany to finance knowledge development. For example, the ULTFARMS project is financed under Horizon Europe. MU Projects might be also funded by other calls or funds such as EMFAF, BMBF, BLE. Some funds are even more specific tailored to companies such as ZIM, the 'Central Innovation Programme for small and medium-sized enterprises (SMEs)'. Finally, private funds might be used such ad DBU. Lastly, private funds such as DBU might be used as well.

Several research projects have been set up in Germany. Within the research sites at FINO2 and FINO3, a plethora of offshore projects have been conducted ranging from simple monitoring of environmental data, energy production, and reference site establishment to aquaculture trials. The same is true for the University of Gothenburg. Besides, the different economical partners took place in several research projects as well.

The type of organisations that are engaged in the knowledge governance are both public and private, because all the abovementioned partners are to a certain degree engaged in knowledge organisations, Considering IPR dictating the degree of output, the role these organisations play by co-creation and sharing is of utmost importance and is done in close coordination with all partners. Information is available through scientific publications but also through the several deliverables that are deemed fit for general publications.

The research questions and issues that are and have been part of the knowledge development in Germany are mainly emphasized to technical, economic and ecological type of questions. However, also legal social and ethical issues play an important role and will be covered, not only in the German pilot but within the whole of the consortium of ULTFARMS. This approach emphasizes to start implementing co- management and co-use on all levels (partners, consortium, stakeholders, regions, countries…)

The biggest challenge, but also the biggest asset, concerning knowledge development and usage is that multi-use is multi-facetted. Cooperations are born, challenges met, and problems solved that have not arisen before. Transferal of knowledge form seemingly nonrelated disciplines is of utmost importance. Leaving the comfort zone and thinking broader is key. Only close collaborations enable the pilot to succeed and go into directions that were not plannable beforehand. Adaptability is necessary on all levels. A critical factor to be considered is the sheer time needed to reach far offshore locations and the high energy environment in which the two German pilots are located. The diverse German pilot team spanning two Seas (North and Baltic Sea), 3 countries (DE, SE, NL), and public and private institutions and companies ensure a broad basis to build upon and meet future challenges.

7.3.2 Belgian pilot

In Belgium, knowledge development takes mainly place within a university led scientific program. Gent University is the leading institution of the Belgian pilot and includes involvement from the Laboratory of Aquaculture and Artemia Reference Centre (ARC), Phycology Laboratory, and Maritime Technology Division.
However, governmental research institutions at the federal and regional level are also involved in the knowledge development and organisation. These include the Royal Belgian Institute of Natural Science (RBINS) and the Flanders Marine Institute (VLIZ). UGent is primarily concerned with the design and testing of the aquaculture systems for seaweed and bivalves while RBINS is primarily responsible for monitoring within the wind farm. Together, UGent and RBINS

collaborate on the development of restoration methods for flat oysters (Ostrea edulis) in an offshore multi-use context.

Considering funding schemes and financing, the Belgian pilot is funded by Horizon Europe through the UNITED and ULTFARMS projects.

The Belgian pilot of ULTFARMS has its roots in the preceding research project of H2020 UNITED. The pilot was designed and installed over the course of the UNITED project, with nearshore trials informing the final offshore design. The same systems installed during UNITED will be continued in the ULTFARMS project. This includes the remaining long line system with screw anchors and restoration tables installed on the seafloor.

The type of organisations that are engaged in knowledge governance in the Belgium pilot are both public and private, which makes co-creation and knowledge sharing critical tools. The UGent Maritime Technology Division and Phycology lab are collaborating openly with the company and pilot partner IMPACT9 on the development of a submersible longline for seaweed cultivation. The Royal Belgian Institute of Natural Science (RBINS) leads the monitoring for the pilot and is co-designing the nature inclusive and restorative elements of the pilot with the UGent ARC lab. The Flanders Marine Institute (VLIZ) leads the stakeholder engagement and governance aspects of the pilot with support from the other partners. As the Belgian pilot includes private companies (IMPACT9, Jan de Nul, and Parkwind), intellectual property rights must be managed. Non-disclosure agreements are therefore part of the knowledge governance structure where intellectual property rights are concerned. Co-creation is also a priority in the formation of a community of practice (CoP). The CoP involves meeting with a group of interested stakeholders to discuss concerns and desired outcomes related to the Belgian pilot. Knowledge sharing also takes place through outreach events with the general public, scientific publications, and deliverables published by the ULTFARMS project which are publicly available.

The type of research questions and issues that are part of the knowledge development here are mostly technical. Thus far, the focus of the Belgian pilot is on LTA technology, cultivation methods, and development of nature inclusive designs. In the previous UNITED project, different methodologies for direct seeding of *Saccharina latissima* were compared in nearshore trials, then tested in the offshore pilot site. Several different oyster cultivation structures were also compared in both nearshore and offshore trials. 'Restoration tables' with adult oysters and substrate were placed on the sea bottom near the scour protection and sampled to determine survival rate and evidence of reproductive activity.

Moving forward, the Belgian pilot will continue investigation into technological solutions and upscaling of aquaculture and restoration activities.
Currently, there is less focus on commercialisation and product development in the context of the Belgian pilot where technological challenges still need to be overcome to produce sufficient biomass. As the broader project has more focus on economic development, the Belgian pilot will likely benefit from ULTFARMS findings in the future.

The biggest challenges concerning knowledge development and usage in Belgium are related to the harsh physical conditions of the offshore Belwind site, as the pilot has faced significant difficulties here. Designing and maintaining aquaculture systems that can withstand the currents, wave energy and frequent storms in this area is a challenge. In the previous UNITED project, gear failures have been an issue for the Belgian pilot.
Secondly, planning and executing sea missions is also a major challenge for the Belgian pilot. There are only a limited number of vessels that are equipped to carry out the necessary work and can only do so in the calmest conditions (< 1 m waves). Vessels often need to be contracted months in advance for a contract of only one or two days of work on the Belwind site and must be vetted in advance by Parkwind to gain clearance to enter the wind farm. These administrative steps make it difficult to align with favourable weather windows which may be quite short. Unfavourable weather conditions may lead to frequent delays or cancellation of sea missions. Missions can also be cancelled if a vessel operator is offered a more lucrative contract elsewhere.
Thirdly, sea missions are also extremely costly, and therefore there is only room in the ULTFARMS budget for a limited number of missions. This means there is little room for flexibility if a sea mission deploys but is unable to carry out the necessary work (e.g., technical problems or change in weather conditions). There may not be enough budget left over to plan additional sea missions when necessary. Inability to carry out sea missions in the planned timeframe can have consequences for knowledge development and usage. For example, missing the seasonal window for harvesting seaweed can lead to the loss of significant data and results.

7.3.3 Dutch pilot

In the Dutch pilot, knowledge is organised through Wageningen Research (WR), which is a non-profit privatised research organisation that is part of Wageningen University and Research. Four divisions are involved in the ULTFARMS project: Wageningen Marine Research, Wageningen Economic Research, Wageningen Food Safety Research and Wageningen Food and Biobased Research. It is part of a scientific program with specific (sub)projects on the many issues involved.

Examples of issues are solar, wind and tidal energy; production and quality measurements, sensor technology monitoring biodiversity with a small ROV (Remote Operated Vehicle) and Environmental Impact Assessment; toxin and sanitary analysis.
At the pilot level it is now mainly about new technological solutions and productivity, how to grow mussel culture in an efficient way and monitor this development. In the broader project it is also about the development of a circular slow biodegradable and zero carbon sustainable reef outplacement system, and reef stability. WR will utilise the outcome of these actions to assess colonisation by reef forming species at the pilot site where this is deployed, publish the results, and contribute those results to task as well.
Subcontracting will be used but not for an entire task but rather specific activities or actions which support the partner in their role completing the above-mentioned tasks.

Next to Horizon Europe, there is national governmental funding for the financing of knowledge development in the Netherlands. This is also the case for implementing statutory tasks, such as for monitoring and validation. A project on camera usage is for instance financed through a national public funding scheme for science called the Knowledge Base. Besides, other pilots in the Netherlands are financed by the industry or through public-private-partnerships.

The development of research projects within the pilot has not come very far yet. The technology is in place, there are discussions on contracts, and required finance for pilot construction. The pilot is by-passing these discussion, and research and development focusses on other parts of the project. ROV development, monitoring reef, machine learning and productivity measurements are therefore applied on other locations (e.g. the Voordelta plot site) in the Netherlands. For instance, together with mussel producers.

The type of organisations engaged in the knowledge governance in the Netherlands are mainly research institutes. Wageningen Research is in charge of the knowledge governance and will share through scientific publications and reports to the larger group of involved stakeholders, such as industry, NGOs and government. Currently, the co-creation is more for the broader project, that goes beyond the pilot, with focus on nature-based solutions, upscaling and best practices. The governance and 'how to do it' goes beyond the pilot, at least for now. Thus, the co-creation with stakeholder engagement is more for the multi-use process and in the pilot it is about co-use. The main matter at hand now is how to make it work.

The type of research questions and issues that are part of the knowledge development in the Dutch pilot have most dominantly been related to the technical and biological productivity and economic performance until now. In the broader project the other issues have more attention; the ecological, social, legal

and ethical sides of riff restoration etc. These broader concerns of what to achieve in the future is not in the pilot. The pilot is used to develop approaches and to implement technology for automated and remote monitoring; for mussel performance, as well as biodiversity and reef structures. This is combined with research and assessment of product quality parameters.

In the pilot the greatest challenge concerning knowledge development and usage is to achieve the technological and economic performance needed. In the broader project or process it is about how to realize the riff and its technological and ecological performance. Multi-use is spatial planning and environmental dynamics in a situation where multi-use is not the best way for mussel-culture. The seabed dynamics make it less suited for growing mussel-culture; it is too dynamic. Thus, if you aim for joint solutions, the great challenge is how do you do that?
The broader system challenge is to achieve a regenerative, nature inclusive, solution. Currently, we focus less on future needs, but more on efficiency. Answering the question of how to add future needs for arriving at a regenerative and ecological balance remains. The basis for a regenerative aquaculture is still missing. There are still questions like 'which species do we use?' and 'what to do now to be better off in the future?'. Introducing seaweed species from Norway is for example not a solution 'with nature'.

7.3.4 Danish pilot

For the Danish pilot, knowledge is organised around different research projects and institutions. In relation to ULTFARMS, knowledge development (research) is carried out by DTU Aqua (National Institute of Aquatic Resources) and DTU Construct (Department of Civil and Mechanical Engineering). DTU Aqua participates in the EU project OLAMUR as well directly and indirectly through the privately funded 'Win@Sea' project, which is headed by Aarhus University and runs from 2023 to 2026. In relation to offshore wind energy, there are several institutions and funding programmes involved in research and there is not one specific organisation.

For the financing of knowledge development there are in Denmark several funding schemes involved in aquaculture respectively offshore wind energy. However, none of them is addressing multi-use directly.

Two research projects that have been set up in Denmark are ULTFARMS and OLAMUR. For the Danish ULTFARMS pilot, the research project is described in the pilot description and is successively implemented. DTU Aqua is involved in work at Kriegers Flak in the OLAMUR project and there are some synergies, for example in relation to anchoring.

The organisations engaged in the knowledge governance are currently only the ones participating in ULTFARMS (DTU, Nordic Seafarm AB, Blå Biomasse A/S and Ørsted

Wind Power A/S), so the type of organisations is both public and private. Within ULTFARMS, there is mostly focus on technical and ecological type of research questions. This is also because the biggest challenge for this pilot lies in the technical part of the project. The main question here is whether and how it is doable.

7.3.5 Knowledge Governance: a comparison of the pilots

We see here that all the pilots are conducting multidisciplinary research on multiuse at sea based on extensive collaboration. We also do observe that much of the research has a technical and business-oriented character, which might suggest that that the stage of research is oriented towards actual and usable ways of implementing multiuse. This is also the area where more knowledge development is needed, when looking at the biggest challenges that are mentioned by all pilots.

Table 11: Comparison of the four pilots

Question/Pilot	Germany	Belgium	Netherlands	Denmark
Organisation of knowledge development & governmental or scientific program	Scientific program, centered around universities and regional and international companies.	Mainly scientific program, university led (Gent University). Also governmental research institutions (RBINS, VLIZ).	Scientific program, by Wageningen Research. Subcontracting for specific tasks.	Around different research projects and institutions (DTU, Aarhus University).
Funding schemes	Several: Horizon Europe, EMFAF, BMBF, BLE, ZIM, or private funds like DBU	Horizon Europe	Horizon Europe, national governmental funding, financing by industry or public-private partnerships	Several fundings available (for aquaculture or offshore wind, but not MU specially)
Engagement in which research projects	Several (offshore) research projects	ULTFARMS, UNITED	ULTFARMS,	ULTFARMS, OLAMUR Win@Sea)
Type of organisations engaged in knowledge	Public and private, co-creation and sharing done in	Public and private, co-creation and knowledge	Mainly research institutes (public),	Public and private (the ones involved in ULTFARMS)

governance (public, private, NGOs)	close coordination with partners	sharing necessary	reporting to industry, NGOs and government	
Type of research questions and issues	Technical, economic and ecological. Also legal and ethical issues	Mostly technical (LTA technology, cultivation methods, nature inclusive designs)	Technical and biological productivity, economic performance	Technical and ecological
Biggest challenges concerning knowledge development	Multi-use is multi-facetted: solving issues but also discovering new challenges. Time to reach offshore locations & high energy environment.	1. Systems that can withstand harsh physical offshore conditions 2. Planning and high costs of sea missions (resulting in limited data/results)	Pilot level: achieve the technological and economic performance needed System level: achieve a regenerative, nature inclusive solution	Main focus on the technical part, whether and how it is doable

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8. Key findings and next steps

This governance mapping report outlines the complex network of actors and policies spanning hierarchical, market, network, and knowledge governance at various levels, from individual pilots to broader societal considerations. This refers to the various individuals, organizations, and entities involved in making decisions and influencing policies relevant in the context of offshore wind, low trophic aquaculture, and nature restoration multi-use. These insights are aimed at informing decision-making and fostering collaborative multi-use governance.

Multi-use governance in the framework of ULTFARMS implies that different actors and interests can coexist and find common ground. The report highlights that there is a need to promote collaborative governance approaches in ULTFARMS that involve multiple stakeholders working together to address complex issues such as offshore multi-use development in project pilots.

Several key remarks can be noted from the report relevant to the next steps of the ULTFRAMS projects:

Strengthening multi-level governance
The analysis conducted sows that there is a high complexity of governance in the context of multi-use. It arises from the diversity and interdependence of actors across different governance levels, necessitating extensive coordination and cooperation. ULTFARMS can have an important role in further strengthening multi-level governance by enhancing communication and cooperation between different governance layers.

Embracing the iterative nature of the governance analysis in ULTFARMS
This report may require an iterative approach and updates to reach its adequate usability. While the report already provides a good overview of the multi-use governance and key actors, it is important to note that at the time of the preparation of this report the market analysis in ULTFRAMS was still unavailable.

Collaboration with other projects and initiatives
While this report mainly relies on the context of ULTFARMS pilots and governance and actors mapping in past projects, it would be interesting to cross compare them with similar analysis in ongoing multi-use related sister projects e.g. OLAMUR. A collaboration with other initiatives focusing on specific topics such as Nature restoration can help better understand the different governance layers and enhance future rounds of governance analysis.

Uptake of the governance analysis findings in ULTFARMS stakeholder engagement processes

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The overview of actors that can be of relevance in the context of and influence multi-use governance can be of high importance to future stakeholder engagement initiatives in ULTFARMS. A well-coordinated multifaceted approach will be needed for a proper engagement of relevant actors representing various disciplines and governance levels.
Moreover, learning from the past initiatives it is evident that there is a need to increase the involvement and awareness of insurance companies in multi-use projects by addressing significant risk aspects and assessments jointly. This step is crucial for the overall governance and progression of multi-use initiatives.

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Annex 1 – Glossary (from D9.1 - Van den Burg et al., 2023)

Concept	Definition	Source
Civil society	A term that both describes and anticipates a complex and dynamic ensemble of legally protected nongovernmental institutions that tend to be nonviolent, self-organizing, self-reflexive, and permanently in tension, both with each other and with the governmental institutions that "frame," constrict and enable their activities.	Keane, 2009
Community of Practice	Groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.	Wenger, 1999
Hierarchical governance	Hierarchical governance rests on the assumption that it is possible to realize coordination based on power relations, on ordination and subordination. In essence, hierarchical governance is about top-down steering. The classical bureaucratic organization is the prototype of hierarchical governance.	Van Buuren & Eshuis, 2010
Holistic social-ecological governance	Social-ecological governance refers to the structures and processes that enable societies to manage their interactions with ecosystems, while also accounting for the social and economic factors that shape those interactions	Derived from Folke et al., 2005
Knowledge governance	Knowledge governance addresses two interrelated processes: (1) new forms of governing through information, and (2) transformative changes in governance institutions due to the new information flows appearing in the Information Age.	Soma et al., 2016

Marine governance	The sharing of policy-making competencies in a system of negotiation between nested governmental institutions at several levels (international, (supra) national, sub-national) on the one hand and state actors, market parties and civil society organisations of different maritime activities on the other to govern activities at sea and their consequences	Van Tatenhove, 2011
Market governance	Market governance is based upon the economic principles of the interplay between the demands of consumers and the supply of producers. It coordinates through the invisible hand of the price-based system of exchange between self-interested actors (e.g. Williamson, 1985). Within the public domain, market principles are used to formulate incentives that safeguard the proper working of imperfect markets. In some cases, governments provide a market for goods with specific merit aspects which are not produced by the common market.	Van Buuren & Eshuis, 2010 Williamson, 1985
Multi-use	Ocean multi-use is the joint use of resources in close geographic proximity by either a single user or multiple users. It is an umbrella term that covers a multitude of use combinations in the marine realm and represents a radical change from the concept of exclusive resource rights to the inclusive sharing of resources and space by one or more users.	Schupp et al., 2019
Network governance	Network governance refers to the interdependence of the (many) actors that are involved in planning and governing issues in modern	Edelenbosch and Teisman, 2008

	societies. These actors represent a range of interests and perceptions on the problems at stake, as well as on the preferred solutions. Network governance assumes that policy is developed and implemented in networks of organizations. These networks emerge and continue to exist because actors cannot reach their objectives without each other.	Klijn and Teisman, 2003
Self-governance	Self-governance is a form of governance in which 'the capacity of societal entities to govern themselves autonomously' is the central coordinative principle. In self-governance actors make voluntary agreements. Here we see it as a part of network governance.	Kooiman, 2003 Van Buuren & Eshuis, 2010
Value chain	A set of activities that a business carries out to create value for its customers.	Porter, 1985