DELIVERABLE 8.2

REPORT ON SOCIO-ECONOMIC ASSESSMENT AND VALIDATION

Work Package 8

Assessment and validation

December 31st, 2023

Funded by the European Union (H2020 Grant Agreement no 862915).Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them

Grant Agreement number	**862915**
Project title	**UNITED: multi-Use platforms and co-locatioN pilots boostIng cost-effecTive, and Eco-friendly and sustainable proDuction in marine environments**
Deliverable title	Report on socioeconomic assessment and validation
Deliverable number	8.2
Deliverable version	Resubmission
Contractual date of delivery	December 31st, 2022
Actual date of delivery	February 28th, 2023 (Version 1.0) December 31st, 2023 (Version 2.0) June 20th, 2024 (Version 3.0)
Document status	Final
Document version	Version 3.0
Online access	Yes
Diffusion	Public
Nature of deliverable	Report
Work Package	WP8 – Assessment and validation
Partner responsible	ACTeon
Author(s)	Zaiter, Y; Berge, M; van Duinen R. (ACTeon)
Editor	Van Den Burg, S.
Approved by	Ghada El Serafy
Abstract	This report is part of Work Package 8 focused on the assessment and validation of proposed solutions across the economic, social, and environmental dimensions. The main objective is to carry out a socio-economic assessment allowing to comprehend and compare the results from multiple pilots and come up with recommendations. The report consists of two distinct parts:

	- The first part is the economic analysis through evaluating strengths and weaknesses of applying the economic assessment framework to MUCL projects. - The second part assesses social acceptability and impacts of the five UNITED pilots. Moreover, additional work consisting of assessing the Business Analysis Framework by evaluating the strengths and weaknesses of the business analysis framework to MUCL projects will be carried out.
Keywords	Economic Assessment, Business Analysis Assessment, Social Assessment.

HISTORY OF CHANGES

VERSION 2.0	December 2023	D8.2 required information from D3.3. This information was not yet available at the time of the original submission because D3.3 had a later due date. This version (2.0) has incorporated the required information from D3.3.
VERSION 3.0	June 2024	Amendments to the cover page and introduction. Additional comments and explanations are provided in the Conclusions section.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

BAF	Business Analysis Framework
BMC	Business Model Canvas
CBA	Cost Benefit Analysis
CEA	Cost-effectiveness analysis
MCA	Multi-criteria analysis
MS	Member State
MUCL	Multi-Use and/or Co-Location Platforms
OWF	Offshore Wind Farm
PESTEL	Political, Economical, Social, Technological, Environmental, and Legal factors
SWOT	Strength, Weakness, Opportunity, Threat factors
WP	Work Package

1. EXECUTIVE SUMMARY

The H2020 project UNITED aims to demonstrate the technological and economic viability of Multi-Use and/or Co-Location platforms in offshore sites by implementing multi-use concepts in five pilots (Danish, Dutch, Belgian, German, and Greek) across European regional seas (the North Sea, the Baltic Sea, and the Mediterranean Sea).

The pilots combine diverse activities, including Offshore Wind Farm (OWF) with aquaculture and seaweed cultivation or pairing OWF with tourism. The primary aim is to offer evidence supporting the feasibility of marine multi-use. These pilots are divided into two phases: some are already commercially operational, achieving full capacity, particularly those where individual uses are established and financially viable, such as the Greek pilot (combining tourism and aquaculture) and the Danish pilot (combining tourism with OFW). In contrast, the remaining pilots (BE, DE, and NL) are still in the research phase and not yet fully operational.

This report is part of Work Package 8 focused on the assessment and validation of proposed solutions across the economic, social, and environmental dimensions. The main objective is to carry out a socio-economic assessment allowing to comprehend and compare the results from multiple pilots and come up with recommendations. The report consists of two distinct parts:

- The first part consists of assessing the economic analysis through evaluating strengths and weaknesses of applying the economic assessment framework to MUCL projects.
- The second part consists of assessing social acceptability and impacts of the five UNITED pilots.

Moreover, additional work consisting of assessing the Business Analysis Framework by evaluating the strengths and weaknesses of the business analysis framework to MUCL projects will be carried out.

Evaluation of the economic assessment framework

The evaluation of the economic assessment consisted of two main steps:

(i) Creation of an evaluation grid designed to assess the critical aspects of applying economic analysis. The evaluation grid was constructed using key elements defined in the economic analysis guidance document.

(ii) Investigating the strengths and weaknesses of applying the economic assessment framework to the UNITED pilots. The information extracted for each key element was critically reviewed and analyzed to understand whether the same methodology was followed across all pilots, and, more importantly, whether the same level of information and challenges were encountered in the analysis.

Furthermore, the evaluation grid and the extracted information allowed us to understand whether the economic assessment methodology captured all relevant socio-economic dimensions of MUCL projects.

Three key messages were derived from the assessment:

- Diversity in the level of information across pilots due to the complexity of data collection and analysis.
- Challenges in data collection stemming from various reasons, such as the research-oriented nature of the pilots, the novelty of sectors (e.g., seaweed, aquaculture), and the confidential nature of some information.
- Difficulties in conducting ex-ante economic analysis; additional ex-post investigations are needed to gain a comprehensive understanding of the overall costs and benefits of the different pilots.

Indeed, despite the reported disparities in information across the pilots, the economic analysis framework demonstrated its efficacy in capturing socio-economic data. For instance, in the case of two pilots (BE and DK), they were able to provide certain socio-economic data, particularly related to market revenues and costs. However, due to the research nature of these pilots, it was challenging to collect comprehensive data. This does not put in question the methodology employed, but rather the timing of the analysis. As previously mentioned in the third key point (see above), performing an ex-ante economic assessment was proven to be challenging due to the evolving research-oriented of the projects. Consequently, an ex-post economic assessment may be more appropriate

allowing to evaluate the economic impacts once the pilots have advanced further in their development and operational stages.

Evaluation of the Business Analysis Framework

Similar to the evaluation of the economic assessment, the evaluation of the Business Analysis Framework was carried out following two steps.

The first step consisted of the creation of an evaluation grid designed to assesses the Business Analysis Framework of UNITED. Due to the different nature of information reported, two sets of evaluation grids, and key elements, were proposed.

(i) The first set of evaluation grid and key elements aimed to assess the business model of the different UNITED pilots. The information assessed were the information reported in the Business Model Canvas.

(ii) The second set of evaluation grid and key elements aimed to assess the internal and external factors influencing pilot activities. For this evaluation grid, the information assessed were the information reported in the PESTEL and SWOT analysis.

The second step consisted of extracting and investigating the strengths and weaknesses of applying the UNITED Business Analysis Framework. This was done through a critical review of the information. Moreover, the information extracted was investigated to understand whether the business analysis methodology was able to capture all the needed information, in particular the internal and external factors influencing the pilot activities and determine the business models of the different pilots.

The assessment showed a consistent methodology for the application of the business analysis and data collection and analysis across all pilots. Further, the methodology applied did not reveal any challenges in data collection, but rather a disparity in the level of information collected per pilot related to many factors such as content differences and the research-oriented nature of the pilots. The methodology proved effective in gathering all the necessary information on the pilots' internal and external factors and business models.

Social impact assessment

In order to complement and contextualize the economic analysis and assessment, an assessment of the social impacts of the pilots has been conducted. Unless the economic assessment, the social assessment was qualitative and exploratory, with a twofold objective: gathering knowledge about the potential impacts of the pilots and raising awareness about social impacts among the pilots' partners and stakeholders.

The social impacts were explored during participative workshops, relying on what project partners and external stakeholders perceive as potential impacts of the upscaled pilots. Regarding the pilots, the participatory assessment was conducted with internal and/or external stakeholders, regarding the possibilities of each pilot.

Some of these impacts concern the local economic fabric (creation of local jobs directly on the multiuse site or indirectly, alternative to other economic activities or limitation of those, improvement of the energy and food security, etc). The working conditions of multiuse site employees are identified as an important factor, with potential new risks and a necessity of upskilling/reskilling that might generate both opportunities and exclusion for local workers.

The educational aspect of UNITED's pilots is an important outcome of the multi-use combinations, especially by raising awareness about ocean preservation and sustainable use of the sea. The North Sea pilots seems to have a more local effect on awareness raising, while the two pilots with a tourism activity target mainly a non-local audience. By bringing visitors closer to windfarms and aquacultures, multiuse could raise interest to those activities and have an impact on their overall trust and acceptability of those, creating new habits and behaviours that might be more sustainable. In several pilots, the multiuse site is considered an opportunity to develop a sustainable local tourism, which could be a way to mitigate the negative effects of single use activities on local communities.

2. INTRODUCTION

The H2020 project UNITED aims to demonstrate the technological and economic viability of Multi-Use and/or Co-Location Platforms (MUCL) in offshore sites, by implementing multi-use concepts in five pilots across European regional seas – the North Sea, the Baltic Sea, and the Mediterranean Sea. Figure 1 shows the different pilots of the UNITED project, their location, and the combined activities.

Figure 1 Location of the five UNITED pilots (source: https://www.h2020united.eu/pilots)

These pilots combine different activities such as Offshore Wind Farm (OWF) with aquaculture and seaweed cultivation, or OWF with tourism activity with an objective to provide evidence for the viability of marine multi-use (see Table 1).

The pilots participating in the UNITED project are in two different phases. On the one hand, some of the pilots are already in the commercial phase, operating at full capacity and providing products and services for the different consumers. Notably, this is the case for two specific pilots: DK (combining tourism activity with OWF) and EL (combining tourism activity with aquaculture). On the second hand, the other pilots of UNITED (NL, BE, and DE) are still in their research phase and have not transitioned into the commercial phase, remaining not yet fully operational.

Table 1 : Activities per pilot (source: UNITED Deliverable 1.3).

	Activities				*TRL level*
Pilot	Aquaculture	OWF	Tourism	Floating Solar	
DK		x	x		6
NL	x	x		x	6-7
BE	x	x			5-6
DE	X	x			5
EL	X		x		3-5

Different synergies allowing better operations, planning, management, and reduction of costs are expected under UNITED. The project is deployed across five different pillars: technological, economic, environmental, societal, and legal.

2.1. Objectives of Task 8.2

Deliverable 8.2 is part of WP8 of UNITED which is focused on the assessment and validation of proposed solutions across the economic, social, and environmental dimensions. According to the Grant Agreement, the objective of WP8 is to "*validate and assess the solutions' acceptability across the economic, social and environmental dimensions and hence short-list the proposed solutions".* In other words, the WP aims at drawing conclusions regarding the viability and suitability of the proposed solutions based on their alignment with economic, social, and environment criteria. The assessment and validation aim to determine the acceptability of the proposed solutions in terms of their impact on the three dimensions mentioned above.

Within the UNITED project, economic and social assessment have been carried out under different WPs, namely Work Package (WP) 3 (related to the economics of multi-use platforms) and WP5 (related to societal interactions and engagement), for various pilots operating in different contexts. As a result of these varying pilots' activities and contexts, different results/outcomes are expected. Therefore, it is important to comprehend and compare the results from multiple pilots to come up with recommendations. Which is the objective of Task 8.2.

Consequently, and according to the Grant Agreements, task 8.2 comprises two main parts:

1. A fist part consisting of evaluating the economic analysis carried out for the different pilots of the project. The objective is to evaluate strengths and weaknesses of applying the economic assessment framework to MUCL projects[1]. This assessment will be performed by summarizing and comparing the analyses conducted in the five UNITED pilots.
2. A second part consisting of assessing social acceptability and impacts of the five UNITED pilots (social assessment and validation). This task will also assess the strength and weaknesses of the pilots in terms of social acceptability and impacts, using a participative approach in collaboration with WP5.

Furthermore, in addition to the two task requirements, an additional work consisting of evaluating the Business Analysis Framework (BAF)[2] is carried out and reported in this deliverable. Much like the evaluation of the economic assessment, the aim is to evaluate the strengths and weaknesses of implementing the BAF in the context of MUCL projects. The evaluation will rely on the information provided within Deliverable 1.3.

2.2. Approach

2.2.1. Evaluation of the Economic assessment

The evaluation of the economic assessment consisted of two main steps.

[1] The economic assessment framework of MUCL projects was carried out under WP3, and reported in Deliverable 3.3 of the project; Araujo A.; Lago M.; Stelljes N.; Seeger I.; Kögel, N.S.; Zaiter Y.; Van Duinen R.; Barlow J.; Ziemba A. (2023) Assessment of the Added Value of Marine Multi-use within UNITED pilots. UNITED Deliverable 3.3.

[2] The Business Analysis Framework of MUCL projects was carried out under WP1 and WP3, and reported in Deliverable 1.3 of the project; Zaiter Y.; Van Duinen R.; Lago M.; Stelljes N.; Seeger I.; McDonald H.; Aroujo A.; Chouchane H.; Van Den Burg S.; Ziemba A.; Dekorte E. (2023) Business Analysis of UNITED Pilots. UNITED Deliverable 1.3.

The first step consisted of the **creation of an evaluation grid** designed to assess the critical aspects of applying economic analysis and to make comparisons across all pilots. This evaluation grid was constructed using seven key elements derived from the economic analysis guidance document (see Table 2).

Each key element corresponds to a step within the economic analysis process (see Deliverable 3.3). The objective was to scrutinize, for each key element, the work carried out, notably: the methodology followed, the information gathered, the challenges encountered, and gaps identified, etc. For the purposes of this deliverable, and to facilitate the assessment under this task, certain key elements were subdivided into sub-key elements (also called sub-elements). This subdivision aimed to simplify the process of searching and extracting information in a later step.

The second step consisted **of investigating the strengths and weaknesses** of applying the economic assessment framework to the UNITED pilots. This was done through critical review of results included in Deliverable 3.3 of UNITED. The information was extracted and stored in the evaluation grid. Moreover, the information extracted and stored in the evaluation grid were investigated to understand whether the economic assessment methodology can capture all relevant socio-economic dimensions of MUCL projects.

While it is true that additional information regarding gaps and challenges could have been gathered from project partners, especially the pilot leads and partners responsible for economic analysis, the analysis was constrained by time limitations. Therefore, the examination concentrated solely on the data provided in Deliverable 3.3.

Table 2 : Key elements and sub-elements of the evaluation grid

Key elements	Description of the key element	*Sub-elements*
Environmental, social, and economic characterization of marine use/s	The key element ascertains whether the economic analysis has effectively provided a description of the pilot characterization. The key element investigates whether the different aspects of the pilot: legal framework, environmental conditions, and ecosystem services, socio-economic, as well as the different key actors involved in the pilot have been accounted for in the economic analysis (e.g. defining the area of marine space area, identifying the adjacent land area, developing the socio-economic storyline, etc.). Also, the key element sheds the light on any challenges encountered during the context characterization.	*Definition of the pilot area* *Legal* *Environmental* *Socio-economic* *Key actors*
Definition of baseline and alternatives	The focus of the key element is to examine if the definition of the baseline and alternative options have been provided. The key element investigates whether the timeframe for the analysis of different scenarios have been considered in the design of the baseline and alternative options	*Baseline and alternative options* *Time-frame*
Identification of environnemental impacts	The aim of the key element is to investigate whether environmental impacts of the pilots have been accounted for in the economic analysis, as well as the main gaps and challenges encountered in assessing environmental impacts.	
Identification and prioritization of impacts (environmental, economic, and social)	The main objective of the key element is to investigate the different methods applied in the economic analysis to identify and prioritize impacts. The key element investigates the methodology followed, the information mobilized, and the gaps in information.	
	The objective of the key element is to investigate whether the different impacts (environmental, economic, and social) have	*Payment for market goods and services*

Quantification and monetization of benefits (environmental, economic, and social)	been captured, quantified, and monetized. The key element examines the methodology used to quantify and monetize the impacts, as well as the different information mobilized, and information gaps. It also explores the obstacles and complexities associated with monetizing these benefits when no such monetization has taken place.	*Payment for non-market goods and services* *Broader economic externatlities*
Economic costs	The key element investigates whether the different economic costs of each pilot were captured and monetized. Moreover, the key element investigates the challenges encountered in collecting information/data on the different cost categories (e.g. one-off cost, ongoing cost).	*One-off cost* *Ongoing cost* *Cost of negative environmental externalities*
Comparison of options	The objective is to examine if the options have been compared. The key element will focus on examining the methodology followed to compare the option, the time-horizon investigated, as well as the impact of the discount rate applied on the final outcomes.	

Finally, the information collected was critically reviewed and analysed and presented in the following section of this deliverable. The results focused on (i) showing strengths and weaknesses of applying the economic assessment framework to MUCL projects; (ii) exploring the relationship between costs, benefits, and social acceptability; and (iii) providing recommendations on the application of evaluation frameworks to MUCL projects, looking also in more detail at economic evaluation techniques such as Cost-Benefit Analysis (CBA), Cost-Effectiveness Analysis (CEA) and Multi-Criteria Analysis (MCA).

2.2.2. Evaluation of the Business Analysis Framework

Similar to the evaluation of the economic assessment, the evaluation of the Business Analysis Framework (BAF) was carried out following two steps.

The first step consisted of the **creation of an evaluation grid**, designed to assess the BAF of UNITED. However, due to the different nature of information reported in the business analysis, more precisely in Deliverable 1.3, two sets of key elements were proposed.

The first set of key elements consisted of assessing the business model of the different UNITED pilots, through the extraction of information from the Business Model Canvas (BMC).

Although the BMC consists of nine building blocks, the evaluation concentrated exclusively on four elements (see Table 3): Targeted Segment, Cost Structure, Revenue Stream, and Value Proposition. The selection of these four building blocks was based on the idea that, while the other building blocks were expected to have different information as they are specific for each pilot, investigations are focused solely on these four blocks where similarities are anticipated.

Table 3 : Key elements to evaluate the business model of the different pilots

Key element	Description of the key element
Targeted segment	The key element investigates whether analysis has successfully identified and defined the targeted segment or market of the pilot.
Cost-structure	The key element examines whether the analysis has identified and included the various cost categories associated with different activities and pilots. Additionally, it evaluates whether these costs have been quantified, and it examines the methodology used for cost quantification, along with the sources of data and information mobilized.
Revenue Stream	The key element assesses whether the analysis has identified and included the various revenue categories associated with different activities and pilots. Additionally, it evaluates whether the revenues have been quantified, and it examines the methodology used for revenue quantification, along with the sources of data and information mobilized.
Value Proposition	The key element assesses whether the analysis identified the value proposition of the pilot activities. The criteria evaluates whether the analysis captured the unique benefits and advantages that the pilot offers to the different stakeholders, whether they are financial, economic, environmental, or social

The second set of key elements consisted of evaluating the internal and external factors influencing pilot activities. For that, the key elements were determined based on the information reported in the Business Analysis report (Deliverable 1.3) (see Table 4). The key elements were divided into four categories: (i) Strength (S); (ii) Weakness (W) – where both categories reflected the internal strength and weakens of the different pilots – (iii) Opportunities (O); and (iv) Threats (T) – where the last two categories reflected the external O and T influencing pilot activities. For the external factors, the PESTEL (Political; Economical; Social; Technological; Environmental; and Legal) factors were incorporated into the analysis. The key elements for the internal and external factors were determined based on the information obtained and reported in the SWOT and PESTEL of Deliverable 1.3.

In the first step, the aim was to thoroughly examine, for each key element, the work carried out, specifically focusing on: the methodology employed, the information gathered, the challenges faced, and any identified gaps.

The second step consisted of **investigating the strength and weaknesses** of the UNITED BAF, that comes in line with the evaluation of the economic assessment. This was done through critical review of the results included in Deliverable 1.3. The information was extracted and stored in the right comparison matrix. The information extracted was investigated to understand whether the business analysis methodology can capture all the needed information, in particular the internal and external factors influencing the pilot activities and determine the business models of the different pilots.

Table 4 Key elements for the evaluation of the business analysis

Key element	**Description of the key element**
Internal factors	
Strengths	The objective of this key element is to investigate whether the internal strength factors have been captured and included in the analysis. The factor identified several strength factors to be considered.
Synergies between different activities (e.g. cost reduction, cooperation between partners, etc.)	
Technical know how	
Improved reputation and social acceptance	
Weaknesses	The objective of this key element is to examine whether the internal weakness factors have been captured and included in the analysis. The factor identified several weakness factors to be considered.
High operational (e.g. transport, cultivation, etc.), insurance and investment costs	
Lack of experience inducing operational delays	
Low synergies between activities (e.g. low financial benefits, technological challenges, etc.)	
External factors	
Opportunities	The objective of this key element is to assess whether the external opportunity factors have been captured and included in the analysis. The factor identified several opportunity factors to be considered.
Political support (at national and EU level) (P)	
Growing markets (for aquaculture, mussels, and renewable energy) (Ec)	
Increased social acceptance and preferences for locally produced products (S)	
Innovative environnement (e.g. positive innovation environment, new monitoring technologies) (T)	
Smooth regulation for tourism activities (L)	

Threats	The objective of this key element is to investigate whether the external threats factors have been captured and included in the analysis. The factor identified several threat factors to be considered.
Lack of regulations (P)	
Changing political climate (P)	
Infrastructure dependance (Ec)	
Political decisions (e.g. banning travel causing losses in revenues) (Ec)	
Absence of incentives (Ec)	
Fluctuation in electricity prices (Ec)	
High operation and maintenance costs (Ec)	
Difficulty to access funding (Ec)	
Lack of public awareness on multi-use benefits (S)	
Lack of technical knowledge and qualified staff (T)	
Short service life of infrastructure (T)	
Climate change risks (Env)	
Toxic algae blooms (Env)	
Unclear regulation requirements and difficulties in obtaining permits (L)	

* P = Political factor; Ec = Economical factor; S : Social factor; Env = Environmental factor; L = Legal factor.

2.2.3. Social impact assessment and validation

In order to complete the approach based on cost and benefits, a qualitative assessment of the social impacts has been performed for each pilot. Unlike the economic assessment, the social impact assessment of UNITED's pilots was not requested in other work packages. Therefore, it is integrated into Task 8.2 in order to enrich the approach on socioeconomic evaluation of the pilots.

The scope of social impacts considered for this assessment is based on the definition provided by the guideline for better regulation for new initiatives and proposals, issued by the European Commission[3]. It includes the following categories:

- Employment
- Health and safety
- Income distribution and inclusion
- Working conditions
- Social protection
- Cultural heritage
- Education
- Recreation
- Other…

In line with the approach proposed by the International Association for Impact Assessment in its guideline (Vanclay, Esteves, Aucamp, Franks, 2015), the social impact of the pilots have been explored during participative sessions, with a tailored process for each pilot:

- The German pilot started to rank the categories of social impacts with a group of stakeholders during an online socio-economic workshop taking place in November 2022. The results have then been discussed and completed by a group of partners meeting in person during the consortium's General Assembly in February 2023;
- The Belgian pilot co-created the social impact assessment during its socioeconomic workshop in Oostende in December 2023;
- The Dutch, Danish and Greek pilots explored its social impacts during a working group of partners meeting in person during the consortium's General Assembly in February 2023.

In the context of UNITED, the social impact assessment had a twofold purpose:

- producing knowledge about the social impacts of multiuse sites and how multiuse could help mitigate the negative impacts;
- raising awareness among the pilots' partners and stakeholders about social impacts and the importance of assessing them.

During the workshop sessions, the participants were asked to imagine what would be the positive and negative social impacts of an upscaled scenario of the pilot, and to evaluate the level of importance of the impact. The Belgian pilot did the assessment for 4 different upscaling scenarios. Some of the pilots formulated mitigation measures for the negative social impacts.

The results of the participative sessions have been summarized in the following template table (Table 5):

[3] Available online: *http://ec.europa.eu/smart-regulation/guidelines/toc_tool_en.htm*

Table 5 Example of evaluation grid to investigate social impacts and acceptability level of these impacts among the pilot's stakeholders

Social impacts identified by the participants	Level of importance of this impact	Level of acceptability of this impact
Description of the impact: Type(s) of stakeholders impacted:	High/medium/low	High/medium/low

The level of importance of the impact has been assessed in a subjective way, regarding how the participants in the workshops felt about the impact in regard to the information they have been provided on the pilot.

The results of these processes are presented in section 5.1.

2.3. Integration within UNITED

The work was built on the previous and/or ongoing deliverables of the UNITED project, in particular Deliverable (D)3.2, D3.3, D1.3; and, on the work of other WPs like WP1, WP3, WP5, WP7 and WP8. From here, it is possible to identify the links between Task 8.2 and other WPs. For instance, a link exists between D8.2 and:

- **WP1:** "Framework and Facilitation of Systems Learning and Upscaling Multi-Use". More specifically, there is a link with Task 1.3 "Optimise business cases and requirements definition" that aims to define the individual optimized business cases for each of the pilots and specify requirements.
- **WP3:** "Economics of Multi-Use Platforms". More specifically, there is a link with Tasks 3.2 "Development of an assessment framework on added value of multi-use platforms", and Task 3.3 "Application of assessment framework within pilots.
- **WP5:** the exploration of social impacts must include at least one iteration with stakeholders, therefore participative sessions were organized on this topic in collaboration with WP5.

2.4. Structure of the report

This report is structured as follows:

- **Section 3:** Presents the results of the evaluation of the economic assessment, focusing on four pilots: BE, DE, DK, and EL. The NL pilot is excluded from the analysis due to absence of information in Deliverable 3.3[4];
- **Section 4:** Provides the results of the evaluation of the Business Analysis Framework; and
- **Section 5:** Discusses the assessment of social impacts.

Each section incorporates an analysis of the findings, followed by a conclusion that includes lessons learned and key messages.

[4] The NL pilot can be included at later stage if the results of Deliverable 3.3 are updated.

3. EVALUATION OF THE ECONOMIC ASSESSMENT

3.1. Applying the evaluation grid

To compile the necessary information for the evaluation of the economic assessment, the information was extracted from the economic analysis conducted for the different pilots, all of which were documented in Deliverable 3.3 of the project.

The methodology relied on critically analysing the different steps of the economic analysis. To make this process easier, the economic analysis guidance document was used as a reference. It offered an overview of the required information and the sources to obtain it.

Following the guidelines outlined in the economic analysis guidance document, the approach involved a systematic exploration of the different key aspects for each section of the economic analysis:

1) The methodology employed to collect and analyse data, as well as the source of information mobilized.
2) The data and information gathered.
3) The challenges encountered during the analysis.
4) The identified gaps or areas where information was lacking.

This comprehensive analysis was carried out for every section of the economic analysis. The extracted information was organized and stored within the evaluation grid (see Appendix I).

Finally, it should be recalled that the economic assessment is carried out for only four pilots (BE, DE, EL, and DK) which have been categorized into two primary blocks:

- Block I (BE and DE pilots): comprising the pilots characterised by combinations of OWF with other marine uses (these included different aquaculture types: mussels, oysters, and seaweed).
- Block II (DK and EL pilots): comprising the pilots characterised by a combination of existing successful independent marine activities. Specifically, combination of existing uses (e.g. aquaculture, OWF), with touristic add-on activities.

3.2. Results and discussion

The subsequent section provides an analysis of the information extracted for each key element. This analysis primarily aims to offer a comprehensive overview of the similarities and differences observed across the pilots concerning these key elements.

3.2.1. Environmental, social, and economic characterization of marine use/s

The key element involved extracting information on five sub-elements, each comprising diverse characteristics contributing to a comprehensive pilot understanding. The sub-elements include: the definition of the pilot area, the legal aspects associated with the pilot, its environmental attributes, socio-economic features, and the identification of key actors involved in the pilot.

The evaluation revealed that the same methodology for economic analysis was used in the pilots. This consisted of desk-based research, allowing the extraction of information from past deliverables of the project, but also from other sources mentioned that were sometimes mentioned in the economic analysis guidance, and/or specifically related to the pilot context.

Although the same methodology was followed, it did not necessarily eliminate variations in the level of information gathered across the different aspects and characteristics of the pilots.

On the first hand, concerning the similarities, this was only noticed for one characteristic: the definition of the pilot area. In fact, the definition of the pilot area was already done at the beginning of the project and reported

(in the same way) in the past deliverables of the project. The economic analysis did not provide any additional insights and/or information on the pilots' location. Instead, it only relied on the information reported in the deliverables.

On the second hand, the differences in the level of information were noted for the other characteristics, such as:

- **Legal characteristics**, while all the information needed on the allocation of property rights and permits was provided, differences were noted across pilots on the information reported concerning the (i) prohibited activities within the pilot area. For instance, the BE pilot reported restricted activities (e.g., vessel traffic, fisheries) within the offshore wind farm space. No such information was provided for other pilots; (ii) insurance matters: Not all pilots addressed the significant issue of insurance. Only the BE and DK pilots provided (partial) information covering the insurance issues due to multi-use. No such information was reported for the other two pilots (DE and EL).
- **Environmental characteristics** focused on providing a brief description of the positive and negative impacts of the pilots' activities in the marine environment. Only two pilots (BE and DE) provided additional (partial) information on the ecosystem services in the pilot area.
- **Socio-economic information/data**: while an effort was carried out for all pilots to compile socio-economic information on the different activities of the pilot and in the pilot location, differences in the disaggregation level of data was noticed. For instance, the analysis carried out showed that socio-economic information for two pilots (BE and DK) were provided on pilot level, allowing to have information on the investment cost of OWF, the number of employees (when it was possible), the production and added value of the activities, etc. Whereas for the other pilots (DE and EL), the information was given on national level making it difficult to compare across pilots but also to understand the importance of the pilot activities in a blue economy context.
- The process of identification of **key actors** was done for most of the pilots (BE, DE, and EL). Although the different pilots provided information on the different key actors/stakeholders, only one pilot (EL) distinguished between key actors at national level and local level. Moreover, information on the key actors for DK was missing due to different challenges in the acquisition of such information.

3.2.2. Definition of baseline and alternatives

The process of identifying baseline and alternative scenarios was carried out for the two distinct blocks (see above) using a consistent methodology. The same baseline and alternative scenarios were applied to the pilots within the same block.

A common challenge was encountered across pilots. This challenge revolved around the unavailability of information pertaining to the various ecosystem services in the area of the pilots, which was crucial for establishing the baseline, and, also, to estimate and quantify the multi-use impacts at a later stage in the economic analysis.

This information gap posed a significant obstacle in the comprehensive evaluation of the environmental aspects and potential impacts of the pilots. Consequently, efforts to address this information gap became a priority, highlighting the need for improved data collection and documentation to support the analysis.

3.2.3. Identification and prioritization of impacts (environmental, economic, social).

Regarding environmental impacts, there was a limited amount of available information. The analysis conducted for the different pilots only covered data concerning the environmental characterization, as detailed in section 3.2.1. However, this analysis did not yield further insights into the identification and prioritization of environmental impacts. The main challenge encountered was the absence of information related to the environmental baseline for each pilot, which made it difficult to identify and prioritize environmental impacts.

Concerning the other types of impacts, two distinct methodologies for prioritization of impacts were followed:

(i) The first methodology involved identifying impacts from existing literature. The extensive list of identified impacts was subsequently shared with the various stakeholders and actors associated with the pilot. The stakeholders were then given the opportunity to, in the first place, modify and add additional impacts based on the initial list, and in a second place, to prioritize these impacts, ranking them from most important to least important during a workshop. The workshop participants were also given the chance to estimate the scale of the impacts (e.g. local, regional, national, European).

(ii) The second methodology centered around identifying impacts based on the literature. The comprehensive list of identified impacts was then presented to the pilot leads, who provided their feedback regarding the priority of these impacts, arranging them in order of importance from the most crucial to the least significant.

The challenges reported were related to the organization of workshops. There were difficulties in identifying and mobilizing the needed stakeholders and actors to have their feedback.

3.2.4. Quantification and monetization of benefits (environmental, economic, and social)

For this key element, information was investigated across three distinct sub- elements: payment for market goods and services, payment for non-market goods and services, and broader economic externalities.

The investigation revealed a notable absence of data for the final two sub-key elements. This lack of information can be attributed to substantial challenges stemming from multiple sources. Firstly, there were significant obstacles related to the unavailability of information concerning the environmental attributes and the impacts of the pilot activities, as well as the ecosystem services present.

Furthermore, additional challenges were encountered during the data collection process due to the non-existence of economic information. This was primarily because certain sectors (such as seaweed and aquaculture activities) were classified as emerging or new sectors, and as such, no databases or information had been generated or made available for these sectors at that point in time. These challenges collectively posed barriers to obtaining comprehensive data for the sub-key elements in question.

Conversely, in contrast to the challenges faced with the other sub- elements, the investigation yielded a different outcome for the sub- element related to the payment for market goods and services. In this case, the information showed existing data, which had been gathered from pilot leads and other companies participating in the pilot activities. The data availability provided some insights into the market revenues for the activities and services within the pilots.

However, it is important to note that this information was accessible for only two pilots: BE and DK. These two pilots provided data on financial revenues including market prices and OWF production (for both BE and DK). For BE, there was also data on potential market prices for aquaculture, while for DK, information on revenues from tourism activities was available.

Similarly to the other two key elements, the availability of information on market goods and services was also limited, and there were notable challenges encountered in acquiring this data. These challenges predominantly stemmed from either the lack of data or the fact that the sectors under consideration were relatively new, making data collection more complex.

3.2.5. Economic costs

For this key element, information was investigated across three distinct sub- elements: one-off cost, ongoing cost, and cost of negative environmental externalities.

The investigation unveiled a noticeable absence of data for the final two sub- elements. This data gap can be attributed to several challenges, primarily associated with the research-oriented nature of the pilots and the relatively new status of the sectors involved. Consequently, real-life data that would offer a comprehensive understanding of the ongoing costs and negative externalities of the various activities was not readily available.

Conversely, some data pertaining to ongoing costs within the pilot initiatives were accessible. Nevertheless, this information was exclusively accessible for two of the pilots, BE and DK. These data were obtained from partners operating the offshore wind farms (OWF) and were supplemented by relevant literature, enabling comparisons with similar projects. The data provided insights into investment costs for OWF in DK and BE, as well as investment costs for aquaculture activities in BE.

However, for the other two pilots, DE and EL, only qualitative and, where feasible, quantitative information sourced from literature was provided. It is crucial to note that this information was extracted from different contexts and was not specific to the context of the pilot projects.

3.2.6. Comparison of options

The key element assessed the methodology followed for the comparison of different options of the economic analysis. The assessment revealed that the same methodology to compare the different options was carried out for all pilots. The methodology consisted of giving qualitative information on the impacts of each scenario and the multi-use impact size and whether they are positive or negative.

The main challenge was related to the lack of quantitative information. This gap can be attributed to several challenges, primarily associated with the research-oriented nature of the pilots and the relatively new status of the sectors involved. As a result, the analysis primarily relied on qualitative information for comparing different options, and when feasible, it incorporated quantitative data to provide illustrative examples of the scale of the impact.

3.3. Lessons learnt on the evaluation of the economic assessment of multi-use.

Three key messages from the above assessment:

1. Diversity in the level of information across pilots: One key finding from the investigation is the diversity in the level of information available across the pilots. While the analysis showed a same methodology followed, what varied significantly was the level of information collected. This was because of the complexity of data collection and analysis, influenced by the unique characteristics and contexts of each pilot. For instance, on socio-economic data, the analysis showed two level of information available: for two pilots (BE and DK) data were available at the pilot level, whereas for the other two pilots, estimations were needed to be done from the literature, and often not disaggregated to the pilot context.
2. Challenges in Data Collection: Data collection challenges were prevalent across the pilots and can be attributed to several key factors. One of the key factors is the research-oriented nature of the pilots, that made it difficult to access relevant and real-world data. In addition, the novelty of the sectors being studied (e.g. seaweed and aquaculture) and the confidential nature of some of the information presented additional challenges. As a result, comprehensive data collection remained a significant challenge, highlighting the need for new strategies to overcome these barriers in future projects.
3. Ex-ante and Ex-post Economic Analysis: A key point of discussion revolves around the difficulties encountered in conducting ex-ante economic analyses, especially for pilot projects that were not yet fully operational and in their commercial phase. The complex and evolving nature of the pilots made it challenging to predict their future economic outcomes with precision. Consequently, the study suggests that additional ex-post investigations are needed to gain a comprehensive understanding of the overall economic costs and benefits of the pilots. This is particularly important for assessing the environmental benefits of the pilots, as their full impact may only become evident over time.

Indeed, despite the reported disparities, the economic analysis framework demonstrated its efficacy in capturing socio-economic data. For instance, in the case of two pilots (BE and DK), they were able to provide certain socio-economic data, particularly related to market revenues and costs. However, due to the research nature of these pilots, it was challenging to collect comprehensive data. This does not put in question the methodology employed, but rather the timing of the analysis. As previously mentioned in the third key point (see above), performing an

ex-ante economic assessment was proven to be challenging due to the evolving research-oriented of the projects. Consequently, an ex-post economic assessment may be more appropriate allowing to evaluate the economic impacts once the pilots have advanced further in their development and operational stages.

4. EVALUATION OF THE BUSINESS ANALYSIS FRAMEWORK

4.1. Applying the evaluation grid

The evaluation of the business analysis framework was conducted by evaluating the information presented in the business analysis deliverable (Deliverable 1.3 of the project).

The methodology involved a critical review and analysis of the various steps of the UNITED Business Analysis Framework (BAF), which was carried out in accordance with the steps outlined in the business analysis guidance document. Subsequently, the evaluation involved four key aspects:

1) Investigating the methodology employed in each of the different steps, with a particular focus on the information source mobilized;
2) Examining the information and data collected to determine its suitability, within the given context and its ability to provide insights into the pilot activities;
3) Identifying and addressing any challenges encountered during the analysis process; and
4) Pinpointing any gaps in the analysis that were identified during the assessment process.

The critical analysis was conducted for the different steps of the business analysis process. Subsequently, the relevant information was extracted and stored into the two evaluation grids (see section 3 above).

The subsequent sub-sections present the results of the assessment for the two evaluation grids.

4.2. Results and discussion

4.2.1. Business model evaluation grid

The assessment of the business model relied on the Business Model Canvas (BMC) matrix provided in the various business analysis of the pilots. It is important to note that while the BMC comprises nine building blocks, this assessment focused solely on four specific building blocks: targeted segment, cost-structure, revenue stream, and value proposition (see section 2 above). The primary goal was to highlight the similarities and differences in the depth of information available for these four building blocks (from here on key elements). The extracted information was organized and stored within the evaluation grid (see Appendix II).

The assessment revealed that a consistent methodology was employed across all five pilots for collecting data and information about the business model. This methodology consisted of conducting interviews with the different pilot leads, and partners who were involved in the pilot activities, as per the recommendation outlined in the BAF guidance document. Consequently, the methodology followed facilitated the acquisition of all the requisite information for the four specific key elements.

4.2.2. Business analysis evaluation grid

The evaluation of the business analysis relied on two distinct sections of the business analysis (the SWOT and PESTEL analysis) that, for the purpose of this evaluation, were merged into a single evaluation grid. The purpose of this merger is to assess the internal and external factors (from here on key elements) that had an influence on the pilots' activities. The key elements assessed were determined based on the information reported in the Business Analysis (Deliverable 1.3) and were divided into four distinct categories (see section 3 above).

The investigation of the methodology applied revealed that the same methodology was applied across all five pilot for collecting data and information about the internal and external factors influencing pilots' activities. The methodology was based on interviews with different pilot leads and project partners involved in the different activities

of the pilots (see Deliverable 1.3). As a result, the methodology followed facilitated the acquisition of all needed information and required for this assessment.

The assessment revealed no challenges or gaps in the methodology and the information collected. However, it showed disparities in the information reported for each key element in the different pilots.

For instance,

- Regarding internal factors, an examination of key elements related to strengths revealed that only three of the five pilots (BE, DE, and EL) acknowledged synergies between their activities as a strength, while the remaining two pilots did not recognize this aspect. Furthermore, just one pilot (DE) identified social acceptance as a strength. In contrast, when assessing weaknesses, none of the pilots regarded low synergies between activities as a weakness. However, key elements indicated that three pilots (BE, DE, and NL) considered high operational and investment costs as weaknesses.
- On the external factors, the examination of key elements related to the opportunities revealed that the primary opportunities for advancing the pilot activities were consistently linked to political support at both national and EU levels, an information shared by all the pilots. Furthermore, four of the pilots (BE, DE, DK, and NL) identified opportunities in the form of expanding markets within aquaculture and renewable energy sectors. Additional opportunities, such as social acceptance, preferences for locally produced goods, and fostering an innovative environment, were also reported in the analysis. In contrast, the threats perceived by the pilots were not as uniform. The most prevalent threat among them was the ambiguity in regulatory requirements and difficulties associated with permit acquisition, a concern raised by four of the pilots (BE, DE, EL, and NL).

4.3. Lessons learnt on the evaluation of the business analysis framework of multi-use.

The evaluation of the business analysis framework showed a consistent methodology for the application of the business analysis and data collection and analysis have been applied across the different pilots. Further, the methodology applied did not reveal any challenges in data collection, but rather a disparity in the level of information collected per pilot.

The disparity in the level of information can be related to various factors such as:

- **Context differences**: The context differences are related to the socio-economic and political contexts that exist in each Member State (MS). The differences in the contexts create diverse environments in which the pilots are situated. For example, each MS may have unique regulatory frameworks, market conditions, and levels of political support. These variations can significantly affect the internal and external factors influencing the pilots and, therefore, influencing the level of information reported for each pilot.
- **Research nature of the pilots**: The research nature of the pilot projects plays a crucial role in the understanding of the differences in the information that is reported. Because of their research-oriented nature, the pilots do not always have the same objectives or the same depth of analysis as a fully operational and commercial platform. Consequently, the level of information reported on the different key elements may vary across the different pilots resulting in differences in the level of information reported.

Even though the evaluation revealed disparities in the level of information, the methodology proved effective in gathering all the necessary information on the pilots' internal and external factors and business models.

5. SOCIAL IMPACTS AND ACCEPTABILITY

5.1. Identifying the social impacts and conditions for acceptability of each pilot

5.1.1. German Pilot

The German pilot started to rank the categories of social impacts with a group of stakeholders during an online socioeconomic workshop taking place in November 2022. This group included several representatives of the offshore wind energy sector, the regional Agriculture office, the DG for Maritime Affairs and Fisheries European of the Commission, and researchers in various fields (marine ecology, food technology, engineering)

The results of this first round of discussion on social impacts have then been completed by a group of partners meeting in person during the consortium's General Assembly in February 2023.

Table 6 : Social impacts identified for the German Pilot

Social impacts identified by the participants	Level of importance of this impact	Level of acceptability of this impact
Impact: Alternative income for fishers Type(s) of stakeholders impacted: Fishers being phased out	medium/low	High – positive impact, desired outcome
Impact: new processing facilities, meaning new local jobs Type(s) of stakeholders impacted: local potential employees	medium	High – positive impact, desired outcome
Impact: Additional employment, training, re-skilling in the region Type(s) of stakeholders impacted: local population (e.g up to 20km from the landing port)	high	High – positive impact, desired outcome
Impact: Additional training and education facilities (currently 3), meaning more people (trainers, employees) coming to the area Type(s) of stakeholders impacted: locals, professionals	medium	High – positive impact, desired outcome
Impact: Automated shipping for operations offshore (upskilling current workers, bringing in new professionals) Type(s) of stakeholders impacted: existing professionals offshore, students	medium	High – positive impact, desired outcome
Exclusion of other uses (in case the government would like to allow other uses in the wind farm, they could not operate due to the aquaculture)	medium	Low – negative impact, undesired outcome

Type(s) of stakeholders impacted: stakeholders from the shipping and fishing activities		
Impact: Increased risk of accidents offshore, due to multiple teams operating in parallel Type(s) of stakeholders impacted: offshore workers	Medium/high	Low – negative impact, undesired outcome

The results show that, according to the stakeholder consulted and the pilot partners, the main positive social impacts of the upscaled pilot would be additional employment, training and re-skilling for locals, and alternative sources of income for local fishermen. The main negative impacts would be an increase of the risk of accidents for offshore workers, due to multiple teams operating in parallel.

The final findings are summarized in the following table (Table 7):

5.1.2. Dutch Pilot

The Dutch pilot started to explore its social impacts during a working group of partners meeting in person during the consortium's General Assembly in February 2023.

The preliminary results are summarized in the following table (Table 8):

Table 7 : Social impacts identified for the Dutch Pilot

Social impacts identified by the participants	Level of acceptability of this impact
New jobs, on different levels (direct, supply chain): opportunities for fisheries and the local community and Increased wealth locally	High – positive impact, desired outcome
Energy security: adding solar to wind result in a more balanced energy production system,	High – positive impact, desired outcome
Increase of food security Production of healthy food	High – positive impact, desired outcome
Reduction of occupied space by combining the activities, to avoid using nature sensitive areas (Natura 2000)	High – positive impact, desired outcome
Relief of political stress, because of the increased security of local production for both energy and food (less dependency on other countries)	High – positive impact, desired outcome
Efficiency: Using the same electricity grid for both solar and wind energy allow to use it at its full capacity. This means more money for other projects, which increases the acceptance of the multiuse option in comparison with single use wind farm.	High – positive impact, desired outcome
Education: the more offshore activities develop, the more education on the topic and awareness raising about the offshore/ the sea.	High – positive impact, desired outcome
Fishers and sailors are now not able to navigate through the windfarm (which decreases its acceptance amongst those stakeholders). This impact could be mitigated by a better design of the pilot	Low – negative impact, undesired outcome

5.1.3. Belgian Pilot

The exploration of the social impacts of the Belgian Pilot has been done during a one-day workshop specifically organized to discuss the socioeconomics of multiuse with local stakeholders, taking place the 7 of December 2022 at De Cierk Ostende (Belgium).

The workshop gathered 23 participants, from diverse fields and institutions:

- **Research:** Flemish Marine institute, Flanders Research Institute for Agriculture, Fisheries and Food.
- **Business:** Antwerp Science Park, Ostend Science Park, BLUeBridge/Blue Cluster (Flemish spearhead cluster for blue economy), DEME (infrastructure engineering), Otary (wind farm operator), IMDC (environmental consultant).
- **Public organization at different levels:** Ostend Municipality, Federal Public Service for Health, Food chain safety and Environment.
- **Fisheries:** Visaktua (local trade magazine), OVIS (funding organization for innovative fishery)
- **Tourism:** Nieuwpoort leisure sailing port, Ostend Tourism Office, MeetInOostende (local event planner), Festival Ostend at Anchor (largest maritime festival at the North Sea, taking place in June).

The participants were asked to reflect on the potential social impacts of 4 upscaling scenarios presented to them beforehand:

- Combining windfarms with seaweed culture
- Combining windfarms with oyster aquaculture
- Combining windfarms with oysters' restoration
- Combining all three activities in the windfarms

Mitigation measures were only developed for some impacts because of time constraints. The participants had to select the impacts they wanted to mitigate (for negative impacts) or optimize (for positive impacts). These mitigation and optimization measures are related to impacts in bold and marked with an * in the tables and are detailed underneath the tables.

The comparison of the potential social impacts of the 4 upscaling scenarios (table 10) shows that the scenario with the less foreseen negative social impacts is the combination of all activities (wind farm + seaweed culture, aquaculture and oysters' reef restoration) in regard to its foreseen social benefits. The scenario with only restoration in the wind farms has a lot of potential social benefits, but with uncertainties about the financing and the environmental impact. The scenario presenting the more negative social impacts in regard to its benefits according to the stakeholders is the wind farm + aquaculture combination.

The detailed results are presented for each scenario in the tables below (Tables 9, 10, 11, and 12):

FIRST SCENARIO – WINDFARM AND SEAWEED CULTURE

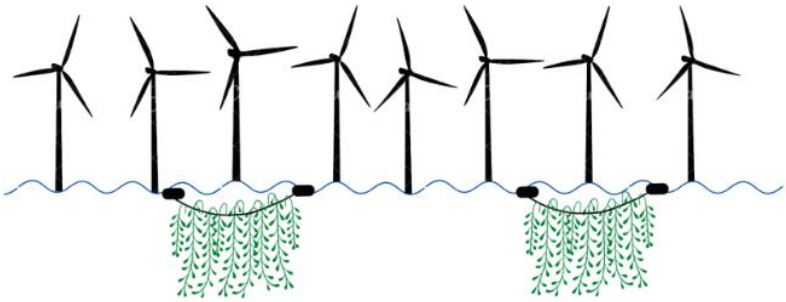

Table 8 : Social impacts identified for the Belgian Pilot in a windfarm and seaweed scenario

Social impacts identified by the participants	Level of importance of this impact	Level of acceptability of this impact
Nature/biodiversity restoration	Low	High – positive impact, desired outcome
Development of a new culinary experience*	Medium	High – positive impact, desired outcome
Maintenance costs	Medium	Low – negative impact, undesired outcome
Risky job	Medium	Low – negative impact, undesired outcome
Research, knowledge building	High	High – positive impact, desired outcome
Job creation	High	High – positive impact, desired outcome
Sustainable food production	High	High – positive impact, desired outcome
Unfair competition, small vs large players, national vs international	High	Low – negative impact, undesired outcome
Optimalisation of the OWF	High	High – positive impact, desired outcome

*Optimisation of the development of a new culinary experience

- Degustation events around seaweed products
- Get famous Chefs involved
- Publish a cooking book for cooking with seaweed
- Develop ways and forms to include seaweed in meals

SECOND SCENARIO - WINDFARM AND OYSTERS CULTURE

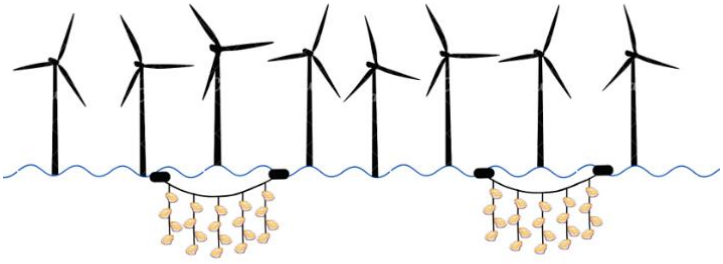

Table 9 : Social impacts identified for the Belgian Pilot in a windfarm and oysters culture scenario

Social impacts identified by the participants	Level of importance of this impact	Level of acceptability of this impact
Revalorisation of old/traditional activities, bringing back old jobs/crafts.	Low	High - positive impact, desired outcome

Increased visibility of the offshore 'universe', of the activities at sea.	Low	High - positive impact, desired outcome
Increase of activities in the harbour	Low	High – positive impact, desired outcome
Pride in making food locally and maintaining a short supply chain*	Medium	High - positive impact, desired outcome
Cultural heritage that can attract tourism.	Medium	High - positive impact, desired outcome
Local oysters = luxury product.	High	Ambiguous - both good (local oyster culture is a costly activity that deserves appropriate compensation) and bad (not accessible to everybody of expensive)
Public perception of aquaculture is negative, project could be not well received by general public.	Low	Low – negative impact, undesired outcome
Small fisheries could suffer from aquaculture activities.	Medium	Low - negative impact, undesired outcome
Increased boat traffic in wind parks, could give a bad image of the wind park because of too many activities offshore.	High	Low – negative impact, undesired outcome
Increased costs of windfarms' activities due to obstacle to avoid in the parks*	High	Low – negative impact, undesired outcome
Increased costs of aquaculture' activities due to being offshore in the wind parks*	High	Low – negative impact, undesired outcome

*Mitigation of higher costs

- Electric fleet
  - Lower functioning costs if no fossil fuel
  - Use of land wind production to charge the electric batteries of the electric fleet
  - Infrastructure installation in Ostend to accommodate the electric fleet (sources to charge the batteries in the harbour)
- Hydrogen fleet – lower functioning costs if no fossil fuel
- Sharing of the fleet with other users (functional economy or renting) to minimise the costs of owning and maintaining the vessels
  - Design and conception of modular ships, that can be used for a diversity of uses
- Rental of the infrastructure, material, etc. to allow for 'smaller' users to develop their own activities
  - Develop the concept of 'mariparc' where several users can conduct their own activities

*Optimisation of embarking local population in being proud of their region and local food production

- Advertise the history of the area.
- Raise consumers' awareness with Chefs advertising the products.
- Create a 'oysters garden' where people can learn how to cultivate oysters, the benefits they bring to their environment (by filtering water, especially important in eutrophic environment), where they can bond with aquaculture and marine activities.

- Develop the storytelling, use sustainable materials to implement aquaculture and advertise it.
- Advertise the benefits on employment – how many people in Ostend work in this sector for example.
- Develop meals and recipes with the oysters' products

THIRD SCENARIO – WINDFARMS AND OYSTER REEFS' RESTORATION

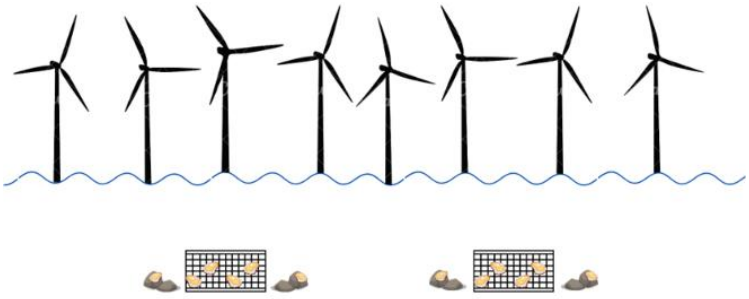

Table 10 : Social impacts identified for the Belgian Pilot in a windfarm and oyster reefs' restoration scenario

Social impacts identified by the participants	Level of importance of this impact	Level of acceptability of this impact
Provides storytelling to develop ecotourism at the Belgian coast.	Low	High – positive impact, desired outcome
Knowledge transfer thanks to installation and monitoring of oysters' tables for restoration.	Medium	High – positive impact, desired outcome
Creation of jobs and knowledge about oyster's restoration.	Medium	High – positive impact, desired outcome
Education, cultural awareness of the sea and the need to protect/restore it*	Medium	High – positive impact, desired outcome
Belgium would be a pioneer in using windfarms for nature restoration	Medium	High – positive impact, desired outcome
Increased social acceptance of wind parks because of combination with nature restoration (wind parks tend to be negatively perceived because they are seen as ruining the landscape, hurting birds, marine mammals and sharks and rays).	High	High – positive impact, desired outcome
Increased resilience to climate thanks to restoration of oyster reefs	High	High – positive impact, desired outcome
Increase in safety risks for activities in the windfarms due to additional activities for restoration	Medium	Low – negative impact, undesired outcome
Potential introduction of sickness, parasites, pathogens from introducing oysters. Both in the food product and in the environment.	Medium	Low – negative impact, undesired outcome

Potential introduction of harmful materials in the environment (structure, maintenance, decommissioning, etc.)	High	Low – negative impact, undesired outcome
Uncertainty as to who will absorb the additional costs: public or private money?	High	Low – additional costs are undesired. Acceptability depends on who absorbs them.

*Optimisation of raising awareness about the importance of developing a more resilient ecosystem

- Communication: scientific communication and development of a story around the project
- Development of citizen science
- Elaboration of a story about climate
- Education about benefits from protected areas and restoration measures (spill-over effect, ecosystem services provided by conservation/restoration to highlight potential benefits for all sea users, including fishermen

FOURTH SCENARIO – ALL ACTIVITIES COMBINED IN WINDFARMS

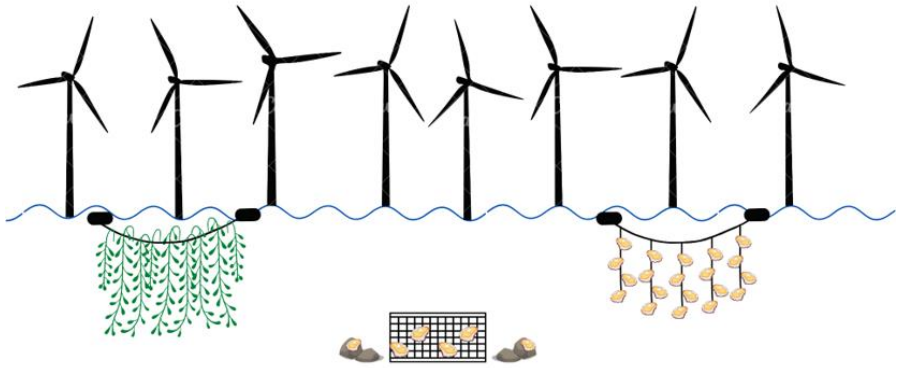

Table 11 : Social impacts identified for the Belgian Pilot in an all activities combined scenario

Social impacts identified by the participants	Level of importance of this impact	Level of acceptability of this impact
Attraction/development of new form of tourism: local food production, sustainable use of the marine environment	Low	High: positive impact, desired outcome
Increase in employment in several sectors: direct maintenance in the wind parks but also product packaging, selling, advertisement, etc.*	Medium	High: positive impact, desired outcome
Creation of local new jobs with possibility of having 'social jobs' developed (good working conditions/packages) that would help with the current high unemployment in Ostend and at the Belgian coast.	Medium	High: positive impact, desired outcome

New food source	Medium	High: positive impact, desired outcome
Reduction of conflict of uses, especially sailing area will be free if activities such as aquaculture happen in the windfarm	High	High: positive impact, desired outcome
Knowledge development from the combination of activities will have benefits on the international scene	High	High: positive impact, desired outcome
Privatisation of part of the sea disadvantages smaller companies/users of the sea	Low	Low: negative impact, undesired outcome
Selling prices of the products are likely to be high	Medium	Low: negative impact, undesired outcome
Current lack of capacities to bring this project to a bigger commercial scale	Medium	Low: negative impact, undesired outcome

*Optimisation of increase in employment

- Reconversion process: develop easy ways for people to reconvert in this sector.
- Offer new trainings/education programs to develop required skills and expertise. Have them easily accessible for people who are already working in the marine sectors. For example, fishermen that can add an easy extra training to shift to the aquaculture sector.
- Valorise technical jobs and function because technicians are needed. Add these specific skills in an already existing formation, so that it is affordable for the schools to develop this new expertise.
- Provide trainings in existing jobs.

SUMMARY OF THE MOST IMPORTANT SOCIAL IMPACTS IDENTIFIED FOR EACH UPSCALING SCENARIO OF THE BELGIAN PILOT:

In bold: impacts ranked as "important" by the stakeholders/ In standard fond, the impact ranked as "medium".

The impacts ranked with a low degree of importance are not reported in the following table (Table 13):

Table 12 : Comparison of the impacts of the 4 upscaling scenarios of the Belgium Pilot

Windfarms combined with seaweed culture		Windfarms combined with oyster aquaculture	
Positive impacts Research, knowledge building Job creation Sustainable food production Optimization of the offshore windfarm Development of a new culinary experience	Negative impacts Unfair competition, small vs large players, national vs international. Maintenance costs. Additional risks for workers.	"Ambiguous" effect Local oysters are considered a luxury product: both good (local oyster culture is a costly activity that deserves appropriate compensation) and bad (not accessible to everybody of expensive). Positive impacts	Negative impacts Increased boat traffic in wind parks Increased costs of windfarms' activities due to obstacle to avoid in the parks. Increased costs of aquaculture' activities due to being offshore in the wind parks

		Pride in making food locally and maintaining a short supply chain. Cultural heritage that can attract tourism.	Small fisheries could suffer from aquaculture activities.
Windfarms combined with oysters' restoration		All three activities combined in the windfarm	
Positive impacts	Negative impacts	Positive impacts	Negative impacts
Increased social acceptance of wind parks because of combination with nature restoration. Increased resilience to climate thanks to restoration of oyster reefs. Knowledge transfer thanks to installation and monitoring of oysters' tables for restoration. Creation of jobs and knowledge about oyster's restoration. Education, cultural awareness of the sea and the need to protect/restore it. Belgium would be a pioneer in using windfarms for nature restoration.	Potential introduction of harmful materials in the environment. Uncertainty as to who will absorb the additional costs: public or private money? Increase in safety risks for activities in the windfarms due to additional activities for restoration. Potential introduction of sickness, parasites, pathogens from introducing oysters. Both in the food product and in the environment.	Reduction of conflict of uses, especially sailing area will be free if activities such as aquaculture happen in the windfarm. Knowledge development from the combination of activities will have benefits on the international scene. Increase in employment in several sectors; Possibility of having 'social jobs' developed. New food source	Selling prices of the products are likely to be high. Current lack of capacities to bring this project to a bigger commercial scale.

5.1.4. Danish Pilot

The Danish Pilot Dutch pilot started to explore its social impacts during a working group of partners meeting in person during the consortium's General Assembly in February 2023.

The results show that the main positive social impacts of the Danish pilot are related to job creation for local guides and boat operators, and awareness raising among new publics. The main negative social impacts are the increased risks for boat drivers and visitors.

The results are summarized in the following table (Table 14):

Table 13 : Social impacts identified for the Danish Pilot

Social impacts identified by the participants	Level of importance of this impact	Level of acceptability of this impact
Impact: Job creation for guides, boat operations Type of stakeholders impacted: guides, boat operators	High impact locally, low at national scale	High: positive impact, desired outcome
Impact: Raising awareness about wind energy among new publics. Possible integrated offer with other interested sustainable tourism organizations. Type of stakeholders impacted: mostly foreign tourists and visitors (professionals, students)	High	High: positive impact, desired outcome
Impact: decrease of the energy production (the turbine must be stopped for 1h for each group of 18 people). There have been 75 visits in 2022 (from April to November), which means 75*1,5h less energy production) Type of stakeholders impacted: the wind park	High	Low: negative impact, undesired outcome
Impact: Additional risk for boat company operators when approaching the turbine Type of stakeholders impacted: boat drivers (1 to 2 crew members on each boat)	High	Low: negative impact, undesired outcome
Impact: Additional risk for the tourists and workers due to the current absence of emergency medical car on the boat and the turbine Type of stakeholders impacted: visitors and boat drivers	High	Low: negative impact, undesired outcome

5.1.5. Greek Pilot

The Greek Pilot started to explore its social impacts during a working group of partners meeting in person during the consortium's General Assembly in February 2023.

The result show that the main positive social impact is to provide divers with a better diving experience (principally for non-local tourists in the current situation of the pilot). The revenue generated for the local population and the educational aspects have been considered of medium importance by the participants to the workshop. The main negative social impact identified by the participants is the production of aquaculture fish, which is unpopular among Greek consumers.

The results are summarized in the following table (Table 15):

Table 14 : Social impacts identified for the Greek Pilot

Social impacts identified by the participants	Level of importance of this impact	Level of acceptability of this impact
Impact: More revenues for the local population Aquaculture attracts dolphins, which attract visitors. This results in the development of diving activities, restaurants, hotels, etc. which create more revenue for the local population and helps increasing the quality of life locally without the negative impact of a mass tourism activity (16 visitors maximum per day at the aquaculture). Type(s) of stakeholders impacted: local population	medium	High: positive impact, desired outcome
Impact: Increased education and awareness of the environmental protection of the area Type(s) of stakeholders impacted: tourists	medium	High: positive impact, desired outcome
Impact: Increased transparency about the fish farming conditions (because of videos, testimonies…) Type(s) of stakeholders impacted: divers, tourists, local population	medium	High: positive impact, desired outcome
Impact: Improved diving experience Type(s) of stakeholders impacted: divers, clients of the diving company	high	High: positive impact, desired outcome
Impact: Production of aquaculture fish, which are not favoured by the Greek consumers (negative attitude towards aquaculture, preference for wild caught fish over aquaculture fish) Type(s) of stakeholders impacted: Greek consumers	high	Low: negative impact, undesired outcome
Impact: increased tourism locally, not always appreciated by the local population Type(s) of stakeholders impacted: a small part of the local population	low	Low: negative impact, undesired outcome

5.2. Lessons learnt on the social impacts of multi-use sites

The exploration of the foreseen social impacts of the upscaled pilots allows to draw a first picture of what these impacts might be. Some of these impacts concern the local economic fabric: creation of local jobs directly on the multiuse site or indirectly (by increasing the number of workers or visitors in the area, or creating needs for new industrial activities, such as food processing in the German pilot), alternative to other economic activities or limitation of those (for instance for navigation and fisheries), improvement of the energy and food security, etc. Another important aspect are the working conditions: while working offshore is already considered at high risk for workers, the complexity of the multiuse installations and the different teams and professions operating in the same space can create new hazards. This leads to the necessity of upskilling or reskilling part of the workforce of

the platforms, creating potential opportunities for individual growth (as a more specific expertise is required), but also uncertainty and potential exclusion.

The educational aspect of UNITED's pilots is an important outcome of the multi-use combinations, especially by raising awareness about ocean preservation and sustainable use of the sea. The North Sea pilots seems to have a more local effect on awareness raising, while the two pilots with a tourism activity target mainly a non-local audience: mainly foreigners in Denmark, certified divers for Greece with an international network of travel agencies and diving centers. By bringing visitors closer to windfarms and aquacultures, the Danish and Greek combinations could also raise interest to those activities and have an impact on their overall trust and acceptability of those, creating new habits and behaviours that might be more sustainable (for instance, by giving more transparency about aquaculture, convince more Greek consumers to buy aquaculture fish instead of wild one).

In several pilots, the multiuse site is considered an opportunity to develop a sustainable local tourism, which could be a way to mitigate the negative effects of single use activities on locals (especially for the windfarms and aquacultures) and increase the acceptability of the ocean use. The characteristics of such tourism activity are the following: small-scale (in opposition to mass tourism), educational and behaviour-change oriented (on environmental aspects, sustainable energy and food production), and linked to the local culture in relation to the sea (for instance the revalorisation of traditional activities and crafts in the oyster production in the North Sea, within a multiuse context).

6. CONCLUSION

The primary objective of this report is to conduct a socio-economic assessment aimed at understanding the unique aspects of the economic and social acceptability of multi-use projects. This involves two main components :

(i) The first part consisting of evaluating the economic analysis carried out for the different pilots of the project;

(ii) The second part consisting of assessing the social acceptability and impacts of the five UNITED pilots.

In addition to the socio-economic assessment, the report also focused on evaluating the Business Analysis Framework.

Each of these evaluations follows a specific methodology/approach, detailed in the preceding chapters. The developed approaches outline the various steps to be undertaken to facilitate the evaluation process, along with the diverse information sources and stakeholders mobilized. It is key to note that through the execution of this work, that regarding the social acceptance, the information was obtained through workshops which is a limitation that the finding and conclusions are based on these. Therefore, no concrete quantifications in terms of hard metrics could be generated and assessed, however, the generalised outcomes resulting from engagement with multiple actors in the workshops and the responses form project members and interactions they underwent with various entities are formulated within this report to provide a qualitative summary of the efforts and actions.

This conclusion discusses the key findings from the different evaluations.

Key findings for the evaluation of the economic assessment

The evaluation of the economic assessment is done by following a two-step approach. The first step consisted of the creation of an evaluation grid designed to assess the critical aspects of applying the economic analysis and to make comparison across all pilots. The evaluation grid included seven key elements derived from the economic analysis guidance document.
The second step investigated the strengths and weaknesses of applying the economic assessment framework by critically reviewing the results of the economic analysis reported in Deliverable 3.3 of the project. All information was extracted and stored in the evaluation grid. Subsequently, the extracted information was analyzed, leading to the identification of key lessons, which are summarized below:

- Diversity in the level of information across pilots: despite a consistent methodology, there is significant diversity in the level of information across pilots. The complexity of data collection and analysis, influenced by the unique characteristics of each pilot, led to varied levels of information.
- Challenges in data collection: these challenges were widespread across all pilots. The research-oriented and novelty in the studied sectors made accessing relevant real-world data challenging.
- Ex-ante and Ex-post Economic analysis: the complex and evolving nature of the pilots made predicting future economic outcomes challenging. Additional ex-post investigations to comprehensively understand the overall economic costs and benefits of the pilots are needed.

The economic analysis framework used in UNITED demonstrated its efficacy in capturing relevant the socioeconomic dimensions of MUCL projects. Challenges encountered, particularly due to the research nature of the pilots, does not put in question the methodology employed, but rather the timing of the analysis: an ex-post economic assessment may be more appropriate than the ex-ante economic assessment performed in the pilots, allowing to evaluate the economic impacts once the pilots have advanced further in their development and operational stages.

Key findings for the evaluation of the Business Analysis Framework

Similarly to the evaluation of the economic assessment, the evaluation of the Business Analysis Framework is done by following a two-step approach. The first step consisted of the creation of two evaluation grids targeting the business model of the pilots and the internal and external factors influencing the pilots activities.

The second step investigated the strengths and weaknesses of applying the business analysis framework by critically reviewing the results of the business analysis reported in Deliverable 1.3 of the project. All information was extracted and stored in the evaluation grids.

Subsequently, the assessment of the business models of the pilots showed a consistent methodology for the application of the business analysis and data collection and analysis across all pilots. Further, the methodology applied did not reveal any challenges in data collection (the methodology proved effective in gathering all the necessary information on the pilots' internal and external factors and business models), but rather a disparity in the level of information collected per pilot related to many factors such as:

- Context differences related to the socio-economic and political contexts that exist in each MS creating diverse environments in which the pilots are situated; and
- Research nature of the pilots that plays a crucial role in the understanding of the differences in the information that is reported.

Key findings for the assessment of social impacts

The assessment of the social impacts was performed as a participatory and exploratory exercise, with the twofold ambition of developing a specific understanding of the social impact of multiuse sites and co-develop a method for the assessment of social impact in the pilots with the pilot partners. This approach led to disparities in the level of detail of the assessment between the pilots but ensured an appropriation of the concept of social impact by the pilots' partners and, in the Belgian and German pilots, of external stakeholders. Therefore, the process of conducting the assessment collectively is an added-value in itself as it raised awareness among the participants about the social impacts and how to assess them in a context of multiuse.

The social impact assessment of the upscaled pilot showed that some of these impacts concern the local economic fabric (creation of local jobs directly on the multiuse site or indirectly, alternative to other economic activities or limitation of those, improvement of the energy and food security, etc). The working conditions of multiuse site employees were identified as an important factor, with potential new risks and a necessity of upskilling/reskilling that might generate both opportunities and exclusion for some categories of workers.

The educational aspect of UNITED's pilots is an important outcome of the multi-use combinations, especially by raising awareness about ocean preservation and sustainable use of the sea. The North Sea pilots seems to have a more local effect on awareness raising, while the two pilots with a tourism activity target mainly a non-local audience. By bringing visitors closer to windfarms and aquacultures, multiuse could raise interest to those activities and have an impact on their overall trust and acceptability of those, creating new habits and behaviours that might be more sustainable. In several pilots, the multiuse site is considered an opportunity to develop a sustainable local tourism, which could be a way to mitigate the negative effects of single use activities on local communities. More generally, multiuse is seen as an opportunity of a more sensitive approach to economic activities at sea, and a better conciliation and integration of the interest of different categories of stakeholders, including the local communities.

REFERENCES

Araujo A.; Lago M.; McDonald H.; Röschel L.; Stelljes N.; Van Duinen R.; Zaiter Y (2021) Assessment Framework to Determine Economic Feasibility of Multi-Use Platforms. UNITED Deliverable 3.2.

Araujo A.; Lago M.; Stelljes N.; Seeger I.; Kögel, N.S.; Zaiter Y.; Van Duinen R.; Barlow J.; Ziemba A. (2023) Assessment of the Added Value of Marine Multi-use within UNITED pilots. UNITED Deliverable 3.3.

Vanclay, F., Esteves, A.M., Aucamp, I. & Franks, D., 2015, *Social Impact Assessment: Guidance for assessing and managing the social impacts of projects.* Fargo ND: International Association for Impact Assessment.

Van Duinen R.; Stelljes N.; Aroujo A.; Lago M. (2020) Current Economic Assessment and Status of Pilots. UNITED Deliverable 3.1.

Zaiter Y.; Van Duinen R.; Lago M.; Stelljes N.; Seeger I.; McDonald H.; Aroujo A.; Chouchane H.; Van Den Burg S.; Ziemba A.; Dekorte E. (2023) Business Analysis of UNITED Pilots. UNITED Deliverable 1.3.

ANNEX I – ECONOMIC ASSESSMENT EVALUATION GRID

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
Environmental, social, and economic characterization of marine use/s	The key element ascertains whether the economic analysis has effectively provided a description of the pilot characterization. The key element investigates whether the different aspects of the pilot: legal framework, environmental conditions and ecosystem services, socio-economic, as well as the different key actors	*Definition of the pilot area*	The definition of the pilot area was carried out based on a desk based research (e.g. collecting information from past deliverables of the UNITED project). The information provided information on the pilot location, as well as on (i) the objective of the pilot; (ii) the different economic activities carried out in this location (e.g. OWF, aquaculture	The analysis of the pilot mentioned that the analysis is based on a hypothetical pilot combining aquaculture and OWF located close to a research platform used for the purposes of the UNITED project. The definition of the pilot area was carried out based on a desk based research through collecting information on the location of the pilot from past deliverables. The information collected	The definition of the pilot area was out based on a desk based research through collecting information on the pilot location, activities, and target segments from past deliverables of the UNITED project. The pilot description provided a complete and full understanding of the pilot context and combined activities.	The definition of the pilot area was carried out based on desk research through the extraction of information from past deliverables of the project. The pilot description provided a full description on the location of the pilot, the combined activities, as well as the companies operating the different activities.		All the case studies followed the same approach to define the pilot area. The definition of the pilots area was based on research carried out under other (past) deliverables of the project. The economic analysis used this information to define the pilots area. No challenges were reported.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
	involved in the pilot have been accounted for in the economic analysis (e.g. defining the area of marine space area, identifying the adjacent land area, developing the socio-economic storyline, etc.). Also, the key element sheds the light on any challenges encountered during the context characterization.		production and seaweed cultivation); and (iii) the targeted market segments of the pilot. The pilot description provided a complete and full understanding of the pilot context and combined activities. No challenges were reported in data collection.	included a description of the objective of the pilot, as well as the areas to focus on in the analysis. No challenges were reported in data collection.				

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
		Legal	The legal characteristics of the BE pilot has been carried out through a desk research mobilizing the past deliverables of the UNITED project, as recommended by the economic analysis guidance. The legal characteristics provided a clear description on the allocation of property rights in the Belgian context and the permits/authorization required from other	The legal characteristics of the pilot has been carried out by collecting information on the legal framework of the country from past deliverables of the UNITED project. The legal characteristics provided a description on the permits requirements for the installation of OWF and aquaculture farms. The pilot legal characterisation provided a complete and full understanding of the pilot legal context. No	The analysis provided information on the legal characterization of the pilot. The analysis was based on a desk research based on information extracted from past deliverables of the UNITED project. The legal characteristics provided a description on the property rights and the authorisations and permits required for a multi-use activity. No challenges	The legal characterization of the pilot was done by extracting information from previous deliverables of the project. The characterization also investigated the legal conditions for the establishment of multiuse (uncoherent national regulatory framework, EU support for researching multi-use, etc.) and the legal barriers for multi-use establishment (difficult to obtain permits, lack of an integrative marine spatial planning framework, etc.).	n/a	The legal characterization of the pilots was carried out through desk based research through the extraction of information from past deliverables, notably deliverables of WP6. The information extracted reported all the needed information. Nevertheless, the level of information reported was not the same across all pilots. For instance, the BE pilot reported on the banned activities in the area, whereas the other pilots did not mention such information.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
			multi-use activities from the concession holder. The information provided in the legal characterisation covered the (i) uncertainities regarding the legal requirements for each permit; (ii) the forbidden activities in an OWF space (e.g. vessel traffic, fisheries); (iii) the permitting process (e.g. scientific projects have experienced swift procurement of	challenges were reported in data collection.	were reported in data collection. Moreover, the legal characterization covered the insurance issues due to multi-use.	No challenges were reported in data collection.		

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
			necessary agreements, while commercial projects require additional permits and certificates from various administrations); and (iv) insurance issues (e.g. the concession holder needed to have additional insurance to cover third-party liability). The pilot legal characterisation provided a complete and full understanding of the pilot legal					

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
			context. No challenges were reported in data collection.					

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
		Environmental	The environmental characterisation focused on providing a brief description of current environmental conditions in the pilot. The information were extracted from past deliverables of UNITED. Although a brief description was provided, however the description covered the positive and negative impacts of the installed activities on the	The environmental characterisation focused on providing a description of current environmental conditions of the pilot and the ecosystem services of the pilot location. The environmental characterisation also included environmental conditions that might impact pilot activities. All the inforamtion were extracted from past UNITED deliverables. No gaps were	The environmental characterisation focused on provided a brief description of the environmental conditions in the pilot. The information was extracted from past deliverables of UNITED, that was based on the Environmental Impact Assessment conducted in 1999 for the OWF. The description covered the environmental impacts (positive and	The environmental characterization was done by extracting information from past deliverables of UNITED. The characterization mentioned the different environmental impacts (positive or negative) of the pilot activities on the marine environment. No gaps were reported in this section.	n/a	The environmental characterization was based on desk based research extracting the information reported in other deliverables on the environmental impacts (positive and negative) of the pilot activities on the marine environment. The information extracted provided for some of the pilots (BE and DE) a small description on the ecosystem services, whereas for the others it only focused on providing a brief description of the environmental characterization and the impacts of the pilot activities.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	**DE**	**DK**	**EL**	**NL**	
			biodiversity (e.g. creation of habitat for different marine species, increase the risk of collisions with birds, etc.). The description also covered the potential ecosystem services that could be provided from one of the activities (e.g. enhanced water quality, increased fish production, etc.). No gaps were reported in this section.	reported in this section.	negative) of the pilot activities (OWF and tourism) on the marine environment. No gaps were reported in this section.			

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
		Socio-economic	The socio-economic characterization was conducted by leveraging various data sources, including previous UNITED deliverables, literature (e.g. scientific, and grey) and data repositories (e.g. EU database on algae). The section dedicated to socio-economic characterization presented a storyline outlining the significance of various activities from socio-	The socio-economic characterization was conducted through the collection of different data from various sources (such as literature: scientific and grey, national databases, etc.). The socio-economic characterization presented a storyline outlining the importance of each sector (OWF and aquaculture) in the country. The focus was on providing, as much as possible, socio-economic	The socio-economic characterization was conducted through the collection of various information from various data sources including previous UNITED deliverables, literature (e.g. scientific, and grey) and data repositories. The socio-economic characterization presented a storyline outlining the significance of the pilot activities (OWF and tourism) when	The socio-economic characterization was conducted through collecting various information from various sources including previous UNITED deliverables, literature, and data bases. The characterization presented a storyline outlining the significance of the two activities. This narrative included details (whenever it was possible) about the economic added value of the sectors/activities, production capabilities, employment, and	n/a	The same approach to collect socio-economic data of the pilot activities was followed across all pilots. The methodology consisted on extracting socio-economic information from various sources: literature (scientific and grey), past deliverables of the project, and other data repositories. Differences exist in the aggregation level of the data and the activities considered. For instance, the BE pilot provided as much as possible information on the activities of the pilot on national level, but also on pilot level providing as much as possible quantitative and qualitative information on the added

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
			economic perspective. This narrative included details (whenever it was possible) about the economic added value of the sectors/activities, production capabilities, employment, and anticipated future trends. However, the data collection process was not without challenges. A primary challenge encountered was the absence of information, particularly in	information for each sector (added value, production, employment, etc.). However, the focus was mainly on national level and not on pilot level. This could be explained by the fact that the analysis is based on a hypothetical pilot and not an already existing pilot. Additional information showing/estimating the socio-economic potential for installing an OWF and aquaculture at this location could	compared on the country level. The analysis also included socio-economic information for other activities surrounding the pilot and that might be influenced by the pilot activities, namely: the Copenhagen harbor, and fishing activity. This narrative included details (whenever it was possible) about the economic added value of the	anticipated future trends. However, the importance of the activities was provided on national level and not on pilot level making difficult to compare the socio-economic importance of the pilot activities. This is because of the different challenges to collect socio-economic data on the pilot activities. Additional information is needed to characterize the socio-economic importance of the pilot activities.		value, production, and employment of the BE pilot. On the other hands, other pilots (DE and ER) only provided information on national level. Moreover, the DK pilot provided information on pilot level, and provided additional information on other activities in the surrounding area. The difference in information reported is related to the challenges in collecting data. All the pilots reported challenges in collecting data. This challenge is related to two main issues: (1) data availability, for instance some new sectors considered in the pilot activities are still relatively new and no data

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	**DE**	**DK**	**EL**	**NL**	
			cases where the activity was relatively new and lacked readily accessible data (such as data on seaweed and oysters).	have provided a clearer vision on the pilot socio-economic importance.	sectors/activities, production capabilities, employment, and anticipated future trends. No challenges were reported for the socio-economic characterization.			base or information is produced like for example for seaweed and aquaculture activities; and (2) confidentiality of information.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
		Key actors	Information about the various key actors in the pilot and their responsibilities were provided in the key actors characterization section. Additional information regarding these key actors was also included in an annex of the economic analysis. The key actors mapping was carried out in collaboration with other project partners (e.g. WP5 and pilot leads).	The analysis included information about the different key actors and their responsibilities and interest in the pilot activities. The key actors mapping was carried out in collaboration with other project partners (e.g. WP5 and pilot leads).	No information was provided on the key actors. The primary challenge to obtaining this information stemmed from the confidentiality of information regarding the different actors/stakeholders involved or may be involved in pilot activities.	The analysis presented the different key actors of the pilot and distinguished between the local key actors (e.g. local authorities, diving clubs, fish farm operators, etc.) and national level key actors (e.g. regulators and policymakers, research organisations, etc.). The information on key actors were obtained through collaboration with other partners on other WPs (e.g. WP5, and pilot leads).	n/a	Most of the pilots were able to identify the key actors/stakeholders involved in the different activities (BE, DE, and EL). The process was carried out with collaboration of other partners under WP5 of the pilot. While the key actors were identified, only one pilot provided information on the key actors at national and local levels (EL). Only one pilot (DK) did not provide information on the key actors, this was due to challenges and confidentiality of information.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
Definition of baseline and alternatives	The focus of the key element is to examine if the definition of the baseline and alternative options have been provided. The key element investigates whether the time-frame for the analysis of different scenarios have been considered in the design of the baseline and alternative options	*Baseline and alternative options*	The economic analysis defined both, the baseline and alternative scenarios for study and investigation. However, it is important to note that the process of identifying these scenarios did not consider the work conducted in other WPs, particularly the work made under the environmental pillar of the project. This is because the information needed was not readily	The economic analysis defined both, the baseline and alternative scenarios for study and investigation. However, it is important to note that the process of identifying these scenarios did not consider the work conducted in other WPs, particularly the work made under the environmental pillar of the project. This is because the information needed was not readily available. The primary challenge	The analysis provided information on both, the baseline and alternative scenarios to be investigated. The process of identifying these scenarios did not consider the work conducted in other WPs, particularly the work made under the environmental pillar of the project. This is because the information needed was not readily available. The primary	The process of identifying baseline and scenarios did not take into account the work done in other WPs, particularly the work done under the environmental pillar of UNITED. This is because the information needed was not readily available. The primary challenge encountered was the scarcity of information on the environmental baseline and potential evolution in ecosystem services in the pilot site. Consequently, the baseline scenario	n/a	The identification of the baseline and alternatives was carried out using the same methodology for all pilots. Moreover, the same challenge was reported across the different pilots: the non-availability of information concerning the ecosystem services. Moreover, the same baseline and alternative were considered for pilots with similar activities. For instance, the pilots combining OWF and aquaculture (BE and DE) reported the same baseline and alternative to be studied.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
			available. The primary challenge encountered was the scarcity of information on the environmental baseline and potential evolution in ecosystem services in the pilot site. Consequently, the baseline scenario did not include information on the ecosystem services, but rather information on the existing activities in the area and the potential synergies	encountered was the scarcity of information on the environmental baseline and potential evolution in ecosystem services in the pilot site. Consequently, the baseline scenario did not include information on the ecosystem services, but rather information on the existing activities in the area and the potential synergies and benefits that could arise from combining them in one location	challenge encountered was the scarcity of information on the environmental baseline and potential evolution in ecosystem services in the pilot site. Consequently, the baseline scenario did not include information on the ecosystem services, but rather considered the pilot activities in their current condition (OWF + tourism) and for the alternative scenario an	considered was a single use of the site by aquaculture, and the alternative an increase in the diving/tourism activity.		

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	**DE**	**DK**	**EL**	**NL**	
			and benefits that could arise from combining them in one location (for the alternative scenario).	(for the alternative scenario).	increase in the tourism activity was considered. The gaps: the scenarios considered did not take into account the ecosystem services and their evolution in time, and therefore not allowing to capture the environmental benefits.			
		Time-frame	No time frame was provided.	No time frame was provided.	No time frame was provided.	No time frame was provided.	n/a	No time frame was provided.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
Identification of environmental impacts	The aim of the key element is to investigate whether environmental impacts of the pilots have been accounted for in the economic analysis, as well as the main gaps and challenges encountered in assessing environmental impacts.		Aside from the environmental characterization information presented in a preceding section, the analysis did not offer any additional insights into the identification of environmental impacts. The analysis included only a restricted amount of information concerning the environmental impacts, both positive and negative, associated with the various	Aside from the environmental characterization information presented in a preceding section, the analysis did not offer any additional insights into the identification of environmental impacts. The analysis included only a restricted amount of information concerning the environmental impacts, both positive and negative, associated with the various activities. However, this information is	Aside from the environmental characterization information presented in a preceding section, the analysis did not offer any additional insights into the identification of environmental impacts. The analysis included only a restricted amount of information concerning the environmental impacts, both positive and negative, associated with the various	Aside from the environmental characterization information presented in a preceding section, the analysis did not offer any additional insights into the identification of environmental impacts. The analysis included only a restricted amount of information concerning the environmental impacts, both positive and negative, associated with the various activities. However, this information is regarded as superficial and insufficient. There is a	n/a	All pilots reported that the analysis only included a restricted amount of of information concerning the environmental impacts, both positive and negative, associated with the various activities. However, this information is regarded as superficial and insufficient. There is a clear need for additional data to comprehensively assess these impacts. The primary challenge faced here is the lack of information related to the environmental baseline, which makes it difficult to identify the environmental impacts of the pilot.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
			activities. However, this information is regarded as superficial and insufficient. There is a clear need for additional data to comprehensively assess these impacts. The primary challenge faced here is the lack of information related to the environmental baseline, which makes it difficult to identify the environmental impacts of the pilot.	regarded as superficial and insufficient. There is a clear need for additional data to comprehensively assess these impacts. The primary challenge faced here is the lack of information related to the environmental baseline, which makes it difficult to identify the environmental impacts of the pilot.	activities. However, this information is regarded as superficial and insufficient. There is a clear need for additional data to comprehensively assess these impacts. The primary challenge faced here is the lack of information related to the environmental baseline, which makes it difficult to identify the environmental impacts of the pilot.	clear need for additional data to comprehensively assess these impacts. The primary challenge faced here is the lack of information related to the environmental baseline, which makes it difficult to identify the environmental impacts of the pilot.		

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
Identification and prioritization of impacts (environmental, economic, and social)	The main objective of the key element is to investigate the different methods applied in the economic analysis to identify and prioritize impacts. The key element investigates the methodology followed, the information mobilized, and the gaps in information.		The process for selecting and prioritizing the impacts to be studied in the economic analysis consisted of two steps. First, the impacts of the different activities were identified based on the available literature and past deliverables of the UNITED project. Second, the importance of each identified impact and their scale effects were evaluated through a workshop	The process for selecting and prioritizing impacts was carried out through a workshop with pilot stakeholders. The workshop included an interactive part where the participants were asked about their opinion about the potential socio-economic impacts of the multi-use pilot. The stakeholders were asked to complete the list of impacts (already identified through desk research) and then	The process for selecting and prioritizing the impacts consisted of two steps. First, impacts of multi-use activities were identified based on the available information (literature and past deliverables). Second, the impacts were classified from most important to least important through carrying out a meeting with the pilot leads. No stakeholders were	While the analysis showed the different impacts considered and to be investigated, no information was presented on the process for selecting the impacts. The analysis only showed the different impacts considered.	n/a	The identification and prioritization of impacts was done differently across the pilots. A first methodology consisted on identifying the impacts from literature and carrying out a stakeholder workshop allowing them to identify additional impacts and to prioritize the impacts from most to least important. This methodology was done for two pilots: BE and DE. The economic assessment for DK pilot followed another approach. While the identification of the impacts was done based on literature, no stakeholder workshop was done. The pilot leads were the ones who

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
			involving stakeholders. No challenges and gaps were reported in this section.	to prioritize the impacts from most important to least important. Moreover, the stakeholders classified the impacts on a geographical scale.	involved with the prioritization and identification of impacts. In fact, it was challenging to organize a workshop with the different stakeholders.			prioritized the impacts from most to least important.
Quantification and monetization of benefits (environmental, economic, and social)	The objective of the key element is to investigate whether the different impacts (environmental, economic, and social) have been captured, quantified, and monetized. The key element	*Payment for market goods and services*	The economic analysis provided an estimation of the expected revenues of the OWF from selling electricity on the market and an estimation on the revenue for the oyster activity. Both data sources were provided from	The economic analysis did not provide any estimation on the pilot activities. However, it provided information coming from the literature on the potential market revenues of aquaculture and OWF activities. Additional estimates on the	The economic analysis provided an estimation of the expected revenues of the OWF from selling electricity on the market and the potential increase in revenues due to increase in price of electricity. Moreover,	The analysis only provided information on the increase in revenue for one activity. However, no additional information on the quantification and monetization of benefits was provided.	n/a	The economic analysis carried out for the four pilots showed distinct infomraiton concerning market revenues. At the first hand, two analysis provided information on the market revenues of the pilot activities. The information was provided from pilot leads. On the other hand, no information on market revenues was provided for the other two pilots. Only information and

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
	examines the methodology used to quantify and monetize the impacts, as well as the different information mobilized, and information gaps. It also explores the obstacles and complexities associated with monetizing these benefits when no such monetization has taken place.		project partners (pilot lead, and OWF operator).	potential revenues of pilot activities is needed allowing to have a clearer vision on the market revenues of both activities.	information on the revenues of the boat activities was also provided. For both activities the information was provided by the pilot leads.			estimations coming from literature. However, the estimations were not adapted to the context.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
		Payment for non-market goods and services	No information.	No information.	No information.	No information.	n/a	No information
		Broader economic externalities					n/a	No information

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
Economic costs	The key element investigates whether the different economic costs of each pilot were captured and monetized. Moreover, the key element investigates the challenges encountered in collecting information/data on the different cost categories (e.g. one-off cost, ongoing cost).	*One-off cost*	The investment cost for OWF and aquaculture activities was provided in the economic analysis. For the OWF, the information was provided based on a compilation of information from different sources. On the contrary, for the aquaculture activities, the information on investment cost was provided by the pilot leads. One of the main challenges	The economic analysis did not provide any estimation on the investment cost of the pilot activities. However, it provided information coming from the literature on the investment cost of aquaculture and OWF activities. Additional estimates on the potential cost of pilot activities is needed.	The investment cost for OWF activity was provided in the economic analysis. The information was extracted from the literature. No information was provided for the investment cost for the tourism activity due to confidentiality of information.	The analysis provided qualitative information on the cost of both activities. However, no quantification of these costs have been provided. The main challenge in collecting such information is the existing of data and confidentiality of information. Further investigation is still needed.	n/a	The information on investment cost was provided for only two pilots. The information was mostly coming from literature and was related to the pilot activities. Only some information on seaweed and aquaculture activities for BE pilot was provided from the pilot leads. For the other pilots, only quantitative and qualitative estimates of the pilot investment cost was provided from literature and not related to the pilot context. The main challenges is the confidentiality and non readily available of information for new sectors.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	**DE**	**DK**	**EL**	**NL**	
			encountered for the economic costs was the confidentiality of information.					
		Ongoing cost	No information.	No information.	No information.	No information.	n/a	No information

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
		Cost of negative environmental externalities					n/a	No information
Comparison of options	The objective is to examine if the options have been compared. The key element will focus on examining the methodology followed to compare the option, the time-horizon investigated, as well as the		The analysis carried out provided information on the different scenarios considered. However, due to lack of information, the comparison was done qualitatively. Quantitative information was provided when it was possible.	The analysis carried out provided information on the different scenarios considered. However, due to lack of information, the comparison was done qualitatively. Quantitative information was provided when it was possible. The	The analysis carried out provided information on the different scenarios considered. However, due to lack of information, the comparison was done qualitatively. Quantitative information was provided when it was possible.	The analysis provided brief qualitative information on the considered baseline and alternative scenarios. The information was very limited and provided little information on the impacts considered. A summary of the analysis of the impacts have been given in a table	n/a	The same methodology to the comparison of the options was carried out for all pilots. The methodology consisted on giving qualitative information on the impacts of each scenario and the multi-use impact size (low, medium, and high), and whether they are positive (if they have beneficial effect on the environment), and negative (if they have an adverse impact on the

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
	impact of the discount rate applied on the final outcomes.		The methodology consisted on giving qualitative information on the impacts of each scenario and the multi-use impact size (low, medium, and high), and whether they are positive (if they have beneficial effect on the environment), and negative (if they have an adverse impact on the environment). A table presenting the different information, collected from	methodology consisted on giving qualitative information on the impacts of each scenario and the multi-use impact size (low, medium, and high), and whether they are positive (if they have beneficial effect on the environment), and negative (if they have an adverse impact on the environment). A table presenting the different information, collected from various sources (e.g. past deliverables, literature,	The methodology consisted on giving qualitative information on the impacts of each scenario and the multi-use impact size (low, medium, and high), and whether they are positive (if they have beneficial effect on the environment), and negative (if they have an adverse impact on the environment). A table presenting the different information, collected from	summarizing the multi-use impact size and if they are positive or negative. The main challenge is the lack and confidentiality of information. Therefore, the analysis relied only on qualitative information and did not provide any quantitative estimates on the costs and benefits of each scenario. Further investigation is needed on this subject.		environment). A table presenting the different information, collected from various sources (e.g. past deliverables, literature, interviews with stakeholders and pilot leads), was provided, summarizing all the key finding. The main challenge is the lack and confidentiality of information. Therefore, the analysis relied only on qualitative information and did not provide any quantitative estimates on the costs and benefits of each scenario. Further investigation is needed on this subject.

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
			various sources (e.g. past deliverables, literature, interviews with stakeholders and pilot leads), was provided, summarizing all the key finding. The main challenge is the lack and confidentiality of information. Therefore, the analysis relied only on qualitative information and did not provide any quantitative estimates on the costs and benefits of each scenario. Further	interviews with stakeholders and pilot leads), was provided, summarizing all the key finding. The main challenge is the lack and confidentiality of information. Therefore, the analysis relied only on qualitative information and did not provide any quantitative estimates on the costs and benefits of each scenario. Further investigation is needed on this subject.	various sources (e.g. past deliverables, literature, interviews with stakeholders and pilot leads), was provided, summarizing all the key finding. The main challenge is the lack and confidentiality of information. Therefore, the analysis relied only on qualitative information and did not provide any quantitative estimates on the costs and benefits of each scenario. Further			

Key element	Description of the key element	*Sub-element*	Pilot					Similarities and differences across pilots
			BE	DE	DK	EL	NL	
			investigation is needed on this subject.		investigation is needed on this subject.			

ANNEX II – BUSINESS MODEL EVALUATION GRID

Key element	Description of the key element	Pilot					Similarities and differences across pilots
		BE	DE	DK	EL	NL	
Targeted segment	The key element investigates whether analysis has successfully identified and defined the targeted segment or market of the pilot.	The business analysis revealed two target segments of the pilot. The first is the niche segment related to luxury products targeting industries such as pharmaceutical industry. The other is the macro segment targeting all kind of restaurants and consumers willing to buy aquaculture products and renewable energy from the electricity market. The identification of the information was done	The business analysis provided information on the customer segment of the pilot. The analysis showed that the pilot is targeting a niche market (e.g. local consumers, gastronomy) due to its small size, but scaling up could lead to targeting the macro-segment. The collect of information on the target market was done through interviews with pilot leads and following the business	The business analysis revealed the targeted segment of the pilot showing that the pilot is targeting the macro segment: all customers willing to learn and buy renewable energy. The identification of the information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	The business analysis investigated the targeted segment of the pilot and found that the pilot is targeting two segments: macro (e.g. all tourists), and niche (e.g. divers). The identification of the information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	The business analysis identified the targeted segment of the pilot. The pilot is targeting two segments: macro and niche segments depending on the demand and the need of consumers (e.g. pharmaceutical industry, biofuels, final consumer). The identification of the information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	The business analysis carried out for all pilots was able to identify all the targeted segment of the pilots. To do so, the same methodology was followed: interviews with pilot leads and partners involved in the different activities. The analysis revealed different target segments. This is in particular true for pilots combining the same activities.

		through interviews with pilot leads and followed the UNITED business analysis guidance.	analysis guidance of UNITED.				
Cost-structure	The key element examines whether the analysis has identified and included the various cost categories associated with different activities and pilots. Additionally, it evaluates whether these costs have been quantified, and it examines the methodology used for cost quantification, along with the sources of data and information mobilized.	The business analysis identified the different cost structure related to the different activities of the pilot: (i) OWF: installation cost, operation and maintenance cost, and decommissioning cost; (ii) aquaculture: installation and maintenance cost, insurance cost, concession cost, processing and packaging, etc. The	The business analysis carried out for the pilot identified the different cost component of the pilot. Overall, the cost includes (i) cost for the OWF, mainly related to installation, operation and maintenance, carrying out environmental studies, permit fees, insurance, etc.; and (ii) cost for the aquaculture installation such	The business analysis identified the different cost structure of the pilot. The costs are related to the different activities: operation and maintenance cost (OWF) and boats, and personnel costs (tourism activity). The identification of the information was done through interviews with pilot leads and	The business analysis identified the cost structure of the pilot. The costs of the pilot are related to costs of installing and operating aquaculture activity (maintenance of aquaculture, cost related to harvest, monitoring, sensors, cameras, solar panels maintenance, personnel, etc.) and costs related to scuba diving	The business analysis identified the different costs of the pilot: costs arising from the installation and operation of the OWF, and costs related to engineering and operation and maintenance of offshore seaweed activity. The identification of the information was done through interviews with pilot leads and	The business analysis identified the different cost structure and component for all UNITED pilots. This was done through following the same methodology consisting on doing interviews with pilot leads and companies involved in the pilot. The analysis showed different costs to be considered for the different activities. This is also true for pilots combining similar activities.

		identification of the information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	as installation of lines, operation and maintenance, monitoring, food quality test, transportation, etc. The identification of the information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	followed the UNITED business analysis guidance.	activity (utilities, taxes, rent, insurance personnel, ...). The identification of the information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	followed the UNITED business analysis guidance.	
Revenue Stream	The key element assesses whether the analysis has identified and included the various revenue categories associated with different activities and pilots. Additionally, it evaluates whether the revenues have been quantified, and it examines the methodology used for revenue quantification, along with the sources	The business analysis identified different revenue streams of the pilot such as selling electricity (for OWF) and selling aquaculture products (for aquaculture activities). It should be noted that according to the business	The business analysis identified the different revenue streams of the pilot. The analysis showed that the pilot has (i) revenue streams coming from the electricity production through selling electricity on the electricity	The revenue stream of the pilot was identified and is related to selling electricity (OWF) and revenues from tourism activity. The identification of the information was done through interviews with pilot leads and	The revenue streams of the pilot was identified and is related to the two activities: revenue from restaurents/selling seafood, and exporting fresh fish (aquaculture activity) and from diving training, diving excursions,	The business analysis identified the different revenue streams of the pilot. The pilot has several revenue streams from the different activities: selling electricity (from OWF) and selling of seaweed end products and	The revenue stream of the different pilots has been identified in the business analysis. This was done following the same methodology that consisted on carrying out interviews with pilot leads and different partners involved in the different activities of the pilots.

	of data and information mobilized.	analysis both activities benefit of government subsidies. The identification of the information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	market; and (ii) revenue stream coming from aquaculture activity mainly related to selling products to individual customers. The identification of the information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	followed the UNITED business analysis guidance.	rentals, sales (scuba diving activity). The identification of the information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	government subsidies (from the aquaculture). The identification of the information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	
Value Proposition	The key element assesses whether the analysis identified the value proposition of the pilot activities. The criteria evaluates whether the analysis captured the unique benefits and advantages that the pilot offers to the different stakeholders, whether they are financial,	The value proposition was identified during the business analysis: offering locally produced mussels and seaweed and production of clean green renewable energy. The identification of the information was done	The analysis identified the value proposition of the pilot activities: offering locally produced mussels and seaweed, and producing clean green renewable energy. The identification of the	The analysis identified the value proposition of the pilot is: educational tours on offshore wind/renewable energy; raising awareness, better acceptance of future OWF. The identification of the information	The analysis identified the value proposition of the pilot: sustainable local food; and offering local safe recreational activities. The identification of the information was done through	The value proposition of the pilot was provided in the analysis: production of sustainable raw materials from the North Sea and production of clean green renewable energy. The identification of the	The analysis carried out identified the different value proposition of the pilots. This was done by following the same methodology consisting on doing interviews with pilot leads and other partners involved in the different activities of the pilots.

	economic, environmental, or social	through interviews with pilot leads and followed the UNITED business analysis guidance.	information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	was done through interviews with pilot leads and followed the UNITED business analysis guidance.	interviews with pilot leads and followed the UNITED business analysis guidance.	information was done through interviews with pilot leads and followed the UNITED business analysis guidance.	

ANNEX III – BUSINESS ANALYSIS EVALUATION GRID

Key element	Description of the key element	Pilot					Similarities and differences across pilots
Internal factors		BE	DE	DK	EL	NL	
Strengths	The objective of this key element is to investigate whether the internal strength factors have been captured and included in the analysis. The factor identified several strength factors to be considered.						Among the strenghts, only three pilots identified synergies as being a strength for their activities. Whereas the other two pilots did not consider it as a strenght. Moreover, only one pilot identified the improved reputation and social acceptance as a strenght. The information was collected through interviews with pilot leads and partners involved in the pilots activities.

Synergies between different activities (e.g. cost reduction, cooperation between partners, etc.)		The analysis mentioned that synergies between different activities is one of the strength and can lead to cost reduction. No additional information on the potential cost reduction was given.	The business analysis identified that one of the core strenghts of the pilot are the existing synergies between the different activities (synergies resulting in cost savings through the development of a flexible, collective transportation scheme and sharing of high priced facilities). The information provided did not provide any quantitative estimate on the cost reduction, but rather only qualitative inforamtion. Additional		The synergies between the different activities was identified as one of the main strenghts of the pilot.		

			information on this subject is still missing and is challenging to acquire. The information was acquired through interviews carried out with pilot leads (following the UNITED business analysis framework guidance) and past deliverables of the project.				

Technical know how							

Improved reputation and social acceptance			The analysis carried out also identified that one of the pilot's strenght is the improved reputation and social acceptance of OWF and aquaculture activities. The information was collected through interviews with pilot leads (following the UNITED business analysis framework guidance) and past deliverables of the project.				

Weaknesses	The objective of this key element is to examine whether the internal weakness factors have been captured and included in the analysis. The factor identified several weakness factors to be considered.						The high operational, insurance and investment costs has been identified as a weakness for three pilots, whereas the lack of experience is a weakness for only two pilots. The analysis did not identify any weaknesses related to low synergies between activities. However, only three pilots reported the synergies as a strenght. Information collected through interviews with pilot leads and partners involved in different activities of the pilot.

High operational (e.g. transport, cultivation, etc.), insurance and investment costs		One of the weaknesses of the pilot is the high transportation, and maintenance and operation costs.	The analysis showed that one of the main weaknesses of the pilot is the need to have high investment cost at the beginning of the project allowing to install OWF and aquaculture activities, and only few sources of financing are available. One of the main challenges of the analysis was to acquire quantitative data showing the needed investment and operation and maintenance cost for the different			The analysis mentioned that one of the weaknesses of the pilot is the challenging cost of production for large scale seaweed farming and floating solar. Still, no quantitative information showing the costs was provided.	

			activities. This is due to confidentiality of information. The information was acquired through interviews with pilot leads and collecting information from past deliverables.				

Lack of experience inducing operational delays			The analysis identified that one of the weaknesses of the pilot is the lack of experience with offshore aquaculture due to the complexity of working in the offshore marine environment. The information was collected through interviews with pilot leads and collecting information from past deliverables.			The analysis mentioned that there is technological challenges for operating offshore and reducing the cost price.	

Low synergies between activities (e.g. low financial benefits, technological challenges, etc.)							

External factors							

Opportunities	The objective of this key element is to assess whether the external opportunity factors have been captured and included in the analysis. The factor identified several opportunity factors to be considered.						The analysis showed that the main opportunities for the development of the pilot activities are related to political support at national and EU level (reported by all pilots) and the growing markets for aquaculture, and renewable energy (reported by 4 pilots). Other opportunities are also identified in the analysis such as increased social acceptance and preferences for locally produced products and innovative environment. All the information was collected through interviews carried out with pilot

							leads and other partners involved in the different activities of the pi-lot.

Political support (at national and EU level) (P)		The analysis showed that there is a political support for the pilot activities through the MSP law that requires OWF to include other activities.	The analysis mentioned that there is a political support for multi-use projects at both EU and national levels. The political support is translated through support from the EU strategies (e.g. Offshore renewable energy strategy, sustainable blue economy strategy, etc.) and on national level through the national MSP that allocated 15% of the EEZ to OWF.	One of the identified opportunities of the pilot is the political support. The danish political commitment to renewable energy helped in positioning the country as wind energy exporter.	The political support is identified as one of the opportunities to provide financial support for the pilot activities.	The analysis mentioned that one of the opportunities of the pilot is the political support of the Dutch government of multi-use projects through its community of practice Nort Sea Sustainable Blue Economy. The analysis did not mention to what extent the political support is given: administrative and legal facilitations, financial incentives, etc. More information is still needed.	

Growing markets (for aquaculture, mussels, and renewable energy) (Ec)		The analysis showed that there is a growing market for aquaculture and renewable energy products. No additional information on the potential increase in market was provided.	The analysis carried out provided (partial) information on the potential growth of the aquaculture and OWF markets. No further information on the growth was provided. The analysis showed difficulties in acquiring quantitative data on the potential production, and sales of aquaculture product. This is because this activity is still considered new and no readily available information is available.	The analysis revealed that one of the main opportunities is related to the position of the country as renewable energy exporter and hence there exist a growing market. No additional information was provided on the market capacity or expansion potential.		The analysis stated that there is an increase market demand for green/clean energy and for seaweed products. No information was provided on the size of the market or the potential expansion.	

Increased social acceptance and preferences for locally produced products (S)		The analysis identified that there is an increased social acceptance and awareness of environmental issues and the need to develop more sustainable products and clean/green energy. The analysis mentioned that the pilot has high social acceptability due to the local and sustainable aspects it gives to the final consumers.		The analysis revealed an increased social acceptance of the pilot activities. This was because of continuous discussions with different stakeholders.			

Innovative environnement (e.g. positive innovation environment, new monitoring technologies) (T)		One of the opportunities identified in the analysis is the technological development, especially related to monitoring activities.		The analysis showed the presence of positive innovation environment.	The analysis revealed an opportunity for technological exchange between multi-use partners.		

Smooth regulation for tourism activities (L)							

Threats	The objective of this key element is to investigate whether the external threats factors have been captured and included in the analysis. The factor identified several threat factors to be considered.						Many threats were identified for the pilots. The threats are not always common to all pilots. The most common one is the unclear regulation requirements and difficulties in obtaining permits (identified for 4 pilots). The same methodology was followed to collect the needed information. This was done through interviews with pilot leads and other partners under UNITED that are involved in the different activities of the pilots.

Lack of regulations (P)			The analysis showed that one of the threats for the pilot development is the lack of regulatory and financial incentives. Specific support is still needed on these two levels.		The analysis mentioned that one of the threats of the pilot is the uncoherent national regulatory framework where multi-use is not included in the MSP of the country.	The analysis showed that there is a lack of regulations of multi-use in offshore wind farms. The analysis did not provide any additional information on the regulations that should be put in place to facilitate the development of multi-use projects.	

Changing political climate (P)							

Infrastructure dependance (Ec)							

Political decisions (e.g. banning travel causing losses in revenues) (Ec)							

Absence of incentives (Ec)				The business analysis identified that one of the threats of the pilot is the absence of incentives (there are no government subsidies in place from which the danish pilot can take advantage).		The analysis mentioned that one of the threats is the lack of compensating subsidy scheme for multi-use seaweed aquaculture.	

Fluctuation in electricity prices (Ec)				One of the threats captured is the electricity price volatility.			

High operation and maintenance costs (Ec)		The analysis showed that one of the threats is the high installation, operation and maintenance, insurance, and decommissioning costs. No quantitative information on the potential investment cost was provided.	The analysis identified that one of the threats of the pilot is the high insurance costs. The analysis did not provide any quantitative information on the insurance cost of the pilot activities. This is due to confidentiality constraints.			The analysis showed that the multi-use projects face high costs of maintenance, insurance, and decommissioning. Still, quantitative estimations on the potential costs of the multi-use is missing and was not provided. This is because of the confidentiality of information on the financial information.	

Difficulty to access funding (Ec)			The analysis showed that there is a lack of available funding for investments into multi-use projects.				

Lack of public awareness on multi-use benefits (S)			The analysis showed that there is a lack of public awareness on multi-use benefits. Consumers are often not aware that non-fed aquaculture is more sustainable than fed aquaculture.		The analysis showed that the activities of the pilot (especially mussel and fish aquaculture) are seen as negative by the society.	The analysis revealed that there is still lack of public awareness about the implications and benefits of multi-use.	

Lack of technical knowledge and qualified staff (T)			The analysis captures that one of the threats is the lack of technical knowledge, experience, and procedures, especially with multi-use and offshore wind and aquaculture projects.				

Short service life of infra-structure (T)			In addition to the lack of technical knowledge, one of the technological threats cap-tured is the short service life of infra-structure at off-shore location.				

Climate change risks (Env)		The analysis stated that one of the threats to the pilot is the climate change: the increase in the frequency of storms and bad weather will make it difficult to develop the pilot activities and to plan trips of maintenance and monitoring.	Climate change risks is one of the threats identified in the analysis. The increase in frequency and intensity of extreme weather events can lead to a loss of aquaculture products as well as increased difficulties in operating the mutiuse project.			The analysis did not mention any climate change risks but it did mention that there is a threat related to catastrophic environmental events.	

Toxic algae blooms (Env)			One of the threats identified in the analysis is the toxic algae blooms that can lead to contaminations of aquaculture products.				

Unclear regulation requirements and difficulties in obtaining permits (L)		The analysis mentioned that legal requirements are also a threat for the pilot. The analysis showed the difficulties in obtaining permits (from concession holder), the EIA requirements, as well as the EC directive requirements.	The analysis showed that one of the threats of the pilot is the unclear regulation requirement and lack of clarity on how to conduct EIA and obtain permits.		The analysis showed that there is a legal threat for the development of the pilot activities. The threat is related to obtaining permits, lack of an integrative MSP framework, and regulatory challenges to get aquaculture licenses.	The analysis identified that one of the threats is the unclear and fragmented regulation for multi-use projects on national and European levels.	