MERMAID

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1. Introduction

1.1 Background information of the MERMAID project

The MERMAID project[1] has as aim to develop concepts for the next generation of offshore activities for multi-use of ocean space. The project does not envisage to actually implement these activities, but it examines new design concepts for combining offshore activities like energy extraction, aquaculture and platform related transport at various areas in the ocean. The combination of these activities is referred to as a Multi-Use Platform (MUP).

In order to achieve this, the MERMAID project puts the integration of technical, economic, ecological, spatial and social aspects at the heart of the development of MUPs in two ways. First, by analysing and integrating all these aspects in the design and second, by involving all stakeholders in the entire design process. For the latter, a participatory design process is developed that focusses on involving all relevant stakeholders in the design process (see D2.2 Rasenberg et al., 2013).

The focus of the participatory design process is to work together with the users and other relevant stakeholders throughout the design and development process. For this purpose, a participation process is executed throughout the MERMAID project that focusses on a cyclical, iterative and participatory process of scoping, envisioning and learning through which a shared interpretation of MUPs is developed and applied in an integrated manner.

1.2 Objectives of the report

This report aims to provide input for the final draft MUP designs in the four MERMAID case studies. The report focusses on providing input from the stakeholders to the designers in the MERMAID project. The design concepts are developed by the site managers and their team in workpackage 7 of the project: innovative platform plan and design[1]. The information of the input is based on the discussion and results from group interviews (round table) following the participatory design.

This report summarises the results of the second step in the participatory design process and is a follow up of deliverable 2.2 which gave input for the draft design options based on the first round of the participatory approach. In the final chapter, both the results from D2.2 and this report are combined in recommendations to the designers. In three of the four case studies, the methodology (see chapter 2) was followed. At the Baltic site this was however, not done (see chapter 2).

[1] http://www.mermaidproject.eu/

1.3 Outline of the report

Chapter 2 describes the methodology of the work which has been executed. Both the overall methodology of the participatory interactive design process is described as well as the applied methodology of the round table session. Chapter 3 describes the results of the round tables that were held in the different case studies. Chapter 4 gives recommendations to the designers based on this report and D2.2.

2. Methodology

2.1 MERMAID interactive participatory design

The participatory design is developed to involve stakeholders in the process of designing the MUP.

Two principles underlie this approach:

a) The principle of non-linear knowledge generation. This principle acknowledges that knowledge is developed in a complex, interactive process of co-production with a range of stakeholders involved (Gibbons et al., 1994; Rip, 2000).
b) The principle of social learning. This principle states that all one can do in complex and uncertain search processes for sustainable designs with no ready-made solutions at hand, is to experiment and learn from these experiments in a social environment through interaction with other actors and learn from each other's behaviour (Bandura, 1971).

The first step that was executed during the MERMAID participatory design process which consisted of defining the views and needs of relevant stakeholders in four different case studies. These four case studies were chosen during the first phase of the MERMAID project and are:

1. The Baltic Sea - a typical estuarine area with fresh water from rivers and salt water.
2. The transboundary area of the North Sea & Wadden Sea - a typical active morphology site
3. The Atlantic Ocean - a typical exposed deep water site
4. The Mediterranean Sea - a typical sheltered deep water site.

Figure 2.1 gives an overview of the participatory design process which is applied in these four case studies in the MERMAID project. The design process of MUPs in the four cases is organised in three steps:

1. Prepare the designs by identifying the views and needs of all stakeholders with interviews (Result: D2.2; Rasenberg et al., 2013)
2. Designing the MUP by organising a round table session involving all stakeholders (result D2.3; this report)
3. Evaluate the design by organising a round table session with all stakeholders (result D2.4)

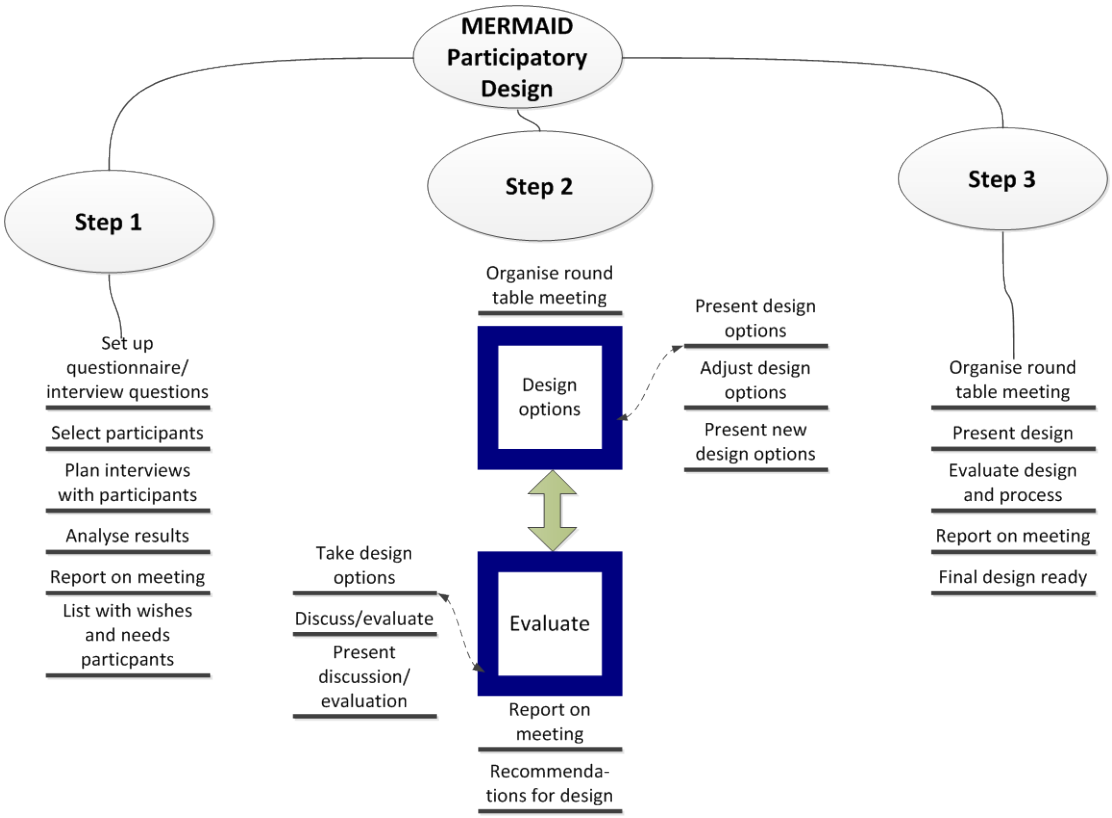


Figure 2.1 Overview of the MERMAID participatory design process

The work that is performed in the participatory process is not to make the final design, but to organise the input of the stakeholders that can be used to make the final design. The final design is the responsibility of the site managers (each of the sites has a site manager) for the different case studies in workpackage 7 of the MERMAID project. The site managers also play a crucial role in organising the three steps of the participatory design.

Central in this approach are the interviews in step 1 with all the stakeholders and the two so-called round table sessions in steps 2 and 3. Steps 2 and 3 have a cyclical, iterative nature. In these round table sessions, the design will be discussed and adapted according to the wishes of all stakeholders involved. Given the cyclical, iterative and participatory nature of the work a sequence of steps can be envisaged, which may be repeated. A group of representatives of all major types of stakeholders are invited for the interviews and round table sessions, where six stakeholder categories were identified:

- Governing bodies/policy makers such as regional, national and European officers
- End users of the MUP, e.g. energy companies and aquaculture entrepreneurs
- Suppliers of the MUP such as cable companies and construction businesses
- Representatives of other offshore activities such as fisheries, shipping, and mining sectors
- Discourse community, including e.g. (environmental) NGO's, local citizens
- Universities and research institutes

Step 1 took place in 2012 and the results of step 1 are reported in Rasenberg et al. (2013). In step 1, interviews were held with representatives of a wide range of stakeholders. Step 1 focussed on identifying different views on ecological, economic and social objectives of MUPs, challenges and technical, social-economic and ecological constraints faced. Equipped with a resulting wish list from this step, designers started working on developing the first MUP design options. These design options are discussed later in step 2, an interactive round table session involving all relevant stakeholders.

Steps 2 constitutes of an iterative cycle where draft design options are presented and developed. The information provides valuable input to the designers that are responsible for the final design. This report describes the results of step 2, in which the design options were discussed with stakeholders. Based on the discussions in the round table sessions on these design options with regard to ecological, economic, social, technical and governance aspects, the design options are translated into a final design concept.

Step 3 constitutes of a round table session where the final design concept is evaluated with the participating stakeholders. This ultimately leads to a design concept which is thoroughly analysed, technically feasible and preferably supported by all the stakeholders represented at the round table.

2.2 Implementation of step 2: round table session methodology

After step 1, the designers of each of the case studies made one or more design options based on technical feasibility and the earlier wishes expressed by the stakeholders. These options for design(s) were discussed with the stakeholders in step 2 of the participatory approach: the round table. Below, information can be found on the methodology that is used in each of the round tables. Note that the process was not identically applied in all four case studies.

The main objective of this round table is to involve stakeholders in the design process of multi-use platforms and to receive input from the stakeholders for the final draft MUP designs in the four MERMAID case studies. Involving stakeholders in the design process aims at reaching agreement on the most feasible design in each of the case studies. Besides, by involving stakeholders' knowledge, the design is developed on the technical, economic, ecological, spatial and social possibilities in a complex, interactive process.

The results of the round table session in each of the sites can be found in chapter 3. To get a clear overview of all the input from the stakeholders, the information from the first step will also be taken into account in the final recommendations (chapter 4).

Baltic Sea site

In the Baltic Sea, the site of Kriegers Flak has been proposed as the location for a MUP design. The round table that took place had a different character than that proposed by the participative methodology. Instead, the site manager and the MERMAID scientists presented their design to the MERMAID industry partners involved and together they reflected on this design. The reason that the Baltic site has a different approach is due to the fact that their process has reached further down the innovation path. It reflects a real business case and the actors involved were gathered to develop this business case. Relevant stakeholders were selected based on their interest in a multi-use platform in the Baltic Sea. A total of 19 stakeholders from 10 different organisations were invited to the meeting and 16 stakeholders from 7 different organisations attended the meeting (see Annex 1).

The round table meeting took place on 17 Januari 2014 and was held in Danish. The meeting was facilitated by the overall MERMAID project leader and notes were made by the site manager. On forehand, an agenda was made which was followed during the round table meeting. The agenda of the meeting was:

- General introduction on the MERMAID project by MERMAID project leader
- Review of Danish actions in the various working groups
    - WP 2 – Assessment of policy, planning and management strategies
    - WP 3 - Development of renewable energy conversion from wind and waves
    - WP 4 - Systems for sustainable aquaculture and ecologically based design
    - WP 5 - Interaction of platform with hydrodynamic conditions and seabed
    - WP 6 - Transport and optimization of installation, operation, and maintenance
    - WP 7 - Innovative platform plan and design
- Discussion and follow-up actions

The outcomes of this discussion are recommended to the designers and will be used for the final draft design (Chapter 4).

North Sea site

Relevant stakeholders for the round table session in the North Sea were selected based on their interest in a multi-use platform in the North Sea. This list of stakeholders was discussed in a selective group of MERMAID project participants involved in the North Sea case study (Deltares and Stichting DLO). All selected stakeholders received an invitation to join the round table session. In total, 26 stakeholders were invited to attend the round table session, and 12 stakeholders confirmed their attendance. Finally, 9 stakeholders attended the meeting. In addition, 5 persons from the MERMAID project were present and brought in their expertise into the round table discussion (see Annex 1).

The meeting was held in Dutch and took place on 12 March 2014. The meeting was facilitated by the site manager and notes were made by one of the colleagues of the site manager. Before the meeting, the agenda was set and sent to all invited participants. The agenda of the round table meeting was:

- Welcome by the site manager of the North Sea site
- Introduction round: introduction of the stakeholders and their expectations of the meeting
- General introduction on the MERMAID project and North Sea site by the site manager
- Presentation on the different possible multi-use functions by a participant of the North Sea site in the MERMAID project
- Interactive sessions in four groups were the user functions are discussed
- Plenary session where each group gives feedback on their conclusions
- Conclusion of the day

The outcomes of the discussions are recommended to the designers and will be used for the final draft design (chapter 4).

Atlantic Ocean site

Relevant stakeholders for the round table session in the Atlantic Ocean were selected based on their possible interest in a multi-use platform. The list was discussed in a selective group of MERMAID project participants involved in the North Sea case study. All these stakeholders received an invitation for the meeting including the agenda. A total of 24 stakeholders were invited to participate in the roundtable and 15 stakeholders confirmed their attendance. Finally, 9 stakeholders attended the meeting (see Annex 1).

The round table meeting took place on 19 September 2013 in Santander. The round table session was held in Spanish. The meeting was facilitated by the site manager and notes were made by one of the colleagues of the site manager. An agenda was set prior to the meeting and the program was as follows:

- Welcome by the site manager
- Introduction to the MERMAID project by the site manager
- Introduction of the MUP designs by the site manager
- Round table (facilitated by the site manager and four colleagues) to discuss different MUP alternatives and the criteria that affect the design of a MUP installed at the Atlantic Site
- Final conclusions by the site manager

The outcomes of the discussions are recommended to the designers and will be used for the final draft design (chapter 4).

Mediterranean Sea site

Relevant stakeholders for the round table session in Italy were selected based on their interest in a multi-use platform in the Mediterranean Sea. A list of stakeholders was discussed in a selective group of MERMAID participants involved in this case study. In total, 18 selected stakeholders received an invitation to participate in the round table session. Finally, 6 stakeholders attended the meeting (see Annex 1).

The round table session in Venice took place on 14 January 2014 and was held in Italian. The meeting was facilitated by the site manager and notes were made by one of the colleagues. The agenda of the meeting was mostly based getting information on the (technical, ecological, social and economic) feasibility of the different user functions in the Mediterranean Sea. The following issues were presented and discussed at the round table session:

- Welcome and introduction of the MERMAID project by the site manager
- Presentation on the Mediterranean Sea site and possible design options by different MERMAID representatives
- Simulations about shore impacts of the functions by different MERMAID representatives
- Presentation of the feasibility assessment tool and its use (used in workpackage 8)
- Economic procedures to be implemented to estimate social and economic impacts
- Draft designs of multi-use platforms (Wave Energy Converters, Fish Farms and Wind)

The outcomes of the discussions are recommended to the designers and will be used for the final draft design (chapter 4).

2.3 Analysis of input from stakeholders for recommendations

This paragraph will describe the method that is used to analyse the discussions and results of the stakeholder interactions that took place. In chapter 4, an overview of the recommendations from the stakeholders for each of the four sites is given. These recommendations are based both on the discussions and results of step 1 (Rasenberg et al., 2013) and step 2 (this report). Note that chapter 4 only gives the opinion of the stakeholders that were either interviewed or present at the round table session.

These materials are analysed following the outline of the assessment tool of workpackage 8 to address the topics relevant on basis of an assessment for design. In the assessment tool the following criteria are relevant:

A. Technical Feasibility Assessment (TFA)
B. Environmental Impact Assessment (EIA)
C. Financial and Economic Assessment (FEA)
D. Social Cost Benefit Analysis (SCBA)

We specify these four categories with the following questions in mind.

Technical recommendations

What recommendations did the stakeholders express concerning the technical aspects regarding the site? Choose from:

- Is placement possible?
    - Legal Considerations
    - Technically Considerations
- Possibilities for combined use
- Possibilities for technological upgrades
- Definition of project time horizon

What did the stakeholders mention concerning risks?

- Technical uncertainty
- Impact diffusion (correlated risks between functions)
- Political uncertainty
- Unclear definition of property rights

Environmental recommendations

What recommendations did the stakeholders express concerning the environmental aspects regarding the site? Choose from:

- Significant negative environmental impact (local, regional, global)
- Significant positive environmental impact (local, regional, global)
- Do they mention or express the need for an EIA available?

What did the stakeholders mention concerning risks?
- Uncertainty about climate change and other environmental parameters
- Non-linear environmental effects & threshold identification
- Irreversible environmental effects

Financial and economic recommendations

What recommendations did the stakeholders express concerning the financial and economic aspects regarding the site? Choose from:
- Estimated financial costs: capital, O&M, administrative
- Estimated financial revenues
- Efficiency gains from combined use
- Regulatory/Institutional restrictions
- Sustainable Business Plan
- Calculation of efficiency prices for the inputs and outputs of the investment
- Determination of indirect and induced effects (creation of jobs, increased economic activity, increased incomes, etc.)

What did the stakeholders mention concerning risks?
- Sensitivity to changes of output/input prices
- Difficulty in time horizon and interest rate definition

Socio-economic recommendations

What recommendations did the stakeholders express concerning the socio-economic aspects regarding the site? Choose from:
- Environmental externalities
- Health and other (e.g. educational or safety) externalities
- Local accessibility effects
- Perceived stakeholders' fairness of distribution of costs and benefits (between income groups; spatial; intergenerational)

What did the stakeholders mention concerning risks?
- Uncertainty and missing information in estimation of external effects
- Uncertainty and missing information in perception formation

3. Results

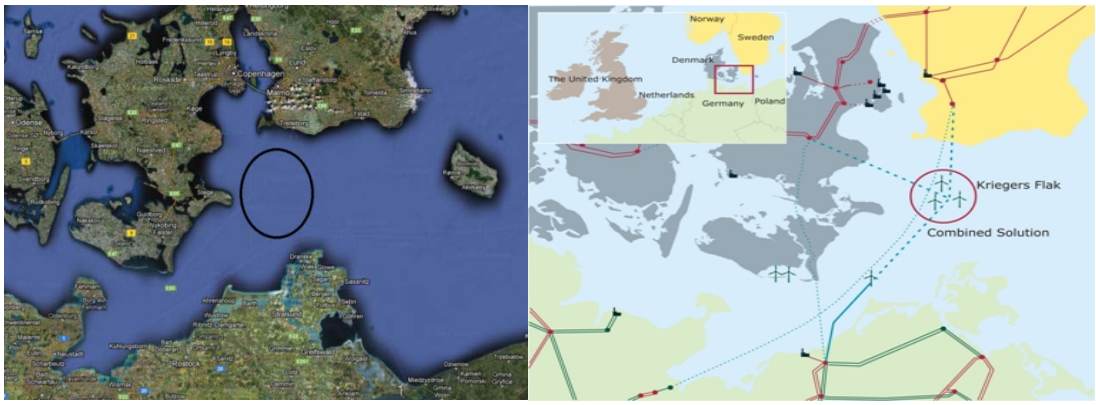
This chapter describes the results of the four round table sessions in each of the sites. The outcomes of the discussions are divided in four categories: technical feasibility, ecological impacts, financial & economic impacts, and socio-economic impacts. These categories are chosen because this division is typically used in other MERMAID products (see chapter 2.3).

3.1 Baltic Sea site

Introduction

The site of the Baltic Sea is located near Kriegers Flak. A wind farm with 600 MW will be installed on the Danish part of Kriegers Flak by 2020 at the latest. On the German side, the wind farm Baltic II with 288 MW is under development. On the Swedish side, project plans are on hold. If these plans will be implemented, this would provide a substantial annual energy production[2]. The challenge of Kriegers Flak is to plan a multi-use platform with the combination of wind turbines and offshore aquaculture. The preliminary MUP design suggestion is to combine wind turbines and floating fish cages with trout/salmon production.

Kriegers Flak is located at the intersect of Danish, German and Swedish exclusive economic zones, 30 – 40 km offshore. The distance does not seem to be a problem for the transport and maintenance of both the wind- and fish farm structures. Kriegers Flak has good conditions for fish farm activities: a water depth between 17-40 metres and a stable seabed. A shallow water depth is also important for the construction of windfarms, such that construction costs remain low. The wind velocity at Kriegers Flak is high and uniform, and can generate a large amount of energy[2]. Furthermore, it is located in the flow-path for deep water renewal of the Baltic Sea and thus, located on the main path for nutrient transport out of the Baltic.



The location of Kriegers Flak (Source: Google maps)

[2] www.vattenfall.se/kriegersflak

Stakeholders present

A total of 16 stakeholders from 7 different organisations were present at the meeting on the Baltic case study. All these 7 organisations participate in the MERMAID project. They can be categorized as follows:

Type of stakeholder	# organisations present
Governing bodies/regulators/policy makers as regional, national and European officers	0
End users of the MUP, e.g. energy companies and aquaculture entrepreneurs	2
Suppliers of the MUP such as cable companies and construction businesses	0
Stakeholders from other offshore activities such as fisheries, shipping & mining sectors	1
Discourse community, including e.g. (environmental) NGO's, local citizens	3
Universities and research institutes	1

Outcomes of the round table session

Technical feasibility

At present, the technical feasibility of the MUPs is analysed within the different work packages of the MERMAID project. At Kriegers Flak, it is suggested to focus on a combination of gravity or jacket based wind turbines and offshore aquaculture.

The MUP is located at intersect of the Danish, German, Swedish exclusive economic zones. Important conditions include:

- Land proximity
- Shallow water, stable seabed
- Moderate metocean conditions
- Cold water located on main nutrient transport path

Environmental impacts

During this session, no considerations were made on the environmental impacts. However, some environmental considerations were discussed. It was concluded that the MUP needs to have the following characteristics for environmental reasons:

- Located on the path for deep water renewal of the Baltic
- Located on the main path for nutrient transport out of the Baltic

The next steps needed to fully investigate environmental impacts are:

- Establishment of a site-specific database with metocean conditions
- Database with climate variations and extreme events

Financial and economic impacts
The financial and economic impacts will be discussed during the last round table session with a wider group of stakeholders.

Socio-economic impacts
The socio-economic impacts will be discussed during the last round table session with a wider group of stakeholders.

Conclusion

It was concluded that the Kriegers Flak is suitable for multi-use. The general picture is that wind energy in combination with aquaculture is considered to be the most viable option, generating the highest benefits.

3.2 North Sea site

Introduction

The North Sea site is an area with typical active morphology. The Dutch MERMAID partners have unanimously concluded that the most interesting test study area lies above the Wadden Sea Islands in the North of the Netherlands.

The location of the Gemini site (Source: Google maps)

In this area, the Dutch authorities (Rijkswaterstaat) awarded 3 permits for larger offshore wind farms, the so-called Gemini project[3]. These 3 projects are named Buitengaats (300MW), Clearcamp (275MW) and ZeeEnergie (300MW) and fully acquired by Typhoon Offshore in July 2011. Two projects, Buitengaats and ZeeEnergie, were granted a subsidy in May 2010 and were brought to financial close (spring 2014). The next step is to start with the construction process for these two projects. The third project, Clearcamp is still without subsidy and may serve as a future test field for new offshore wind technologies. This means that for the Gemini site already on going impact studies are conducted regarding safety and stability of mono-pole and jacket constructions, as well as for the environmental impacts[4].

The challenge of the Gemini wind farm is to combine the farm with offshore aquaculture, fisheries and tourism. The site (54.036 degrees centre latitude, 5.964 degrees centre longitude) is situated near a fishery harbour, Lauwersoog, and a shipping & offshore harbour, Eemshaven. The distance from shore is approximately 85 km, which is out of sight from the shore.

[3] http://www.typhoonoffshore.eu/projects/gemini/
[4] http://www.rvo.nl/subsidies-regelingen/windpark-gemini-fase-1

Stakeholders present

A total of 9 stakeholders were present at the roundtable. These can be categorised as follows:

Type of stakeholder	# organisations present
Governing bodies/regulators/policy makers as regional, national and European officers	2
End users of the MUP, e.g. energy companies and aquaculture entrepreneurs	3
Suppliers of the MUP such as cable companies and construction businesses	0
Stakeholders from other offshore activities such as fisheries, shipping & mining sectors	1
Discourse community, including e.g. (environmental) NGO's, local citizens	1
Universities and research institutes	2

Outcomes of the round table session

Technical feasibility
Maintenance on the wind farm and cables must be possible on all circumstances.

Environmental impacts
It was discussed that the environmental impact of multi-use must be low. An environmental assessment must take place before multi-use is implemented.

Financial and economic feasibility
It is important that the location that is chosen will generate economic benefits for all user functions. It was questioned whether the Gemini area is the best suitable option for either mussel or seaweed farming. A representative of a seaweed culture companies mentioned that he would only start seaweed culture on the best places in the North Sea. It was suggested to look at the critical success factors for each of the different user functions and see in which area this could best be achieved. For both the culture of mussel and seaweed it is important to have nutrient rich and clear water. If other places in the North Sea are more suitable, then it is likely that mussel and seaweed farming will take place there or the added value for synergies of a MUP must be very large.

There was a general consensus that companies will only start looking for synergies after their business is operationalized and they are in the process of making the business more efficient. Synergies must lead to an economic benefit. Besides, the risk assessment is of major

importance for the wind farm owners/managers. The Dutch wind farms companies use experiences from abroad to see how multi-use is done there (especially looking at Denmark). One of the suggestions was made to make multi-use obligatory in the licensing procedure by the government.

One of the present policy advisors also mentioned that the Gemini location was chosen because of the heavy winds but also because of the low interference with other users. It was concluded that when you want to start multi-use in the North Sea, the business models of the different user function must overlap.

Socio-economic feasibility

The location of the park is far offshore (85 km) and might therefore not be a suitable location to generate extra jobs for tourism or labour intensive aquaculture.

One of the most evident problems might be the insurance of the activities. The stakeholders think it might be very difficult to insure multi-use wind farms. Besides, multi-use must also be safe and safety and rescue (SAR) procedures must be possible in the wind farm.

Conclusion

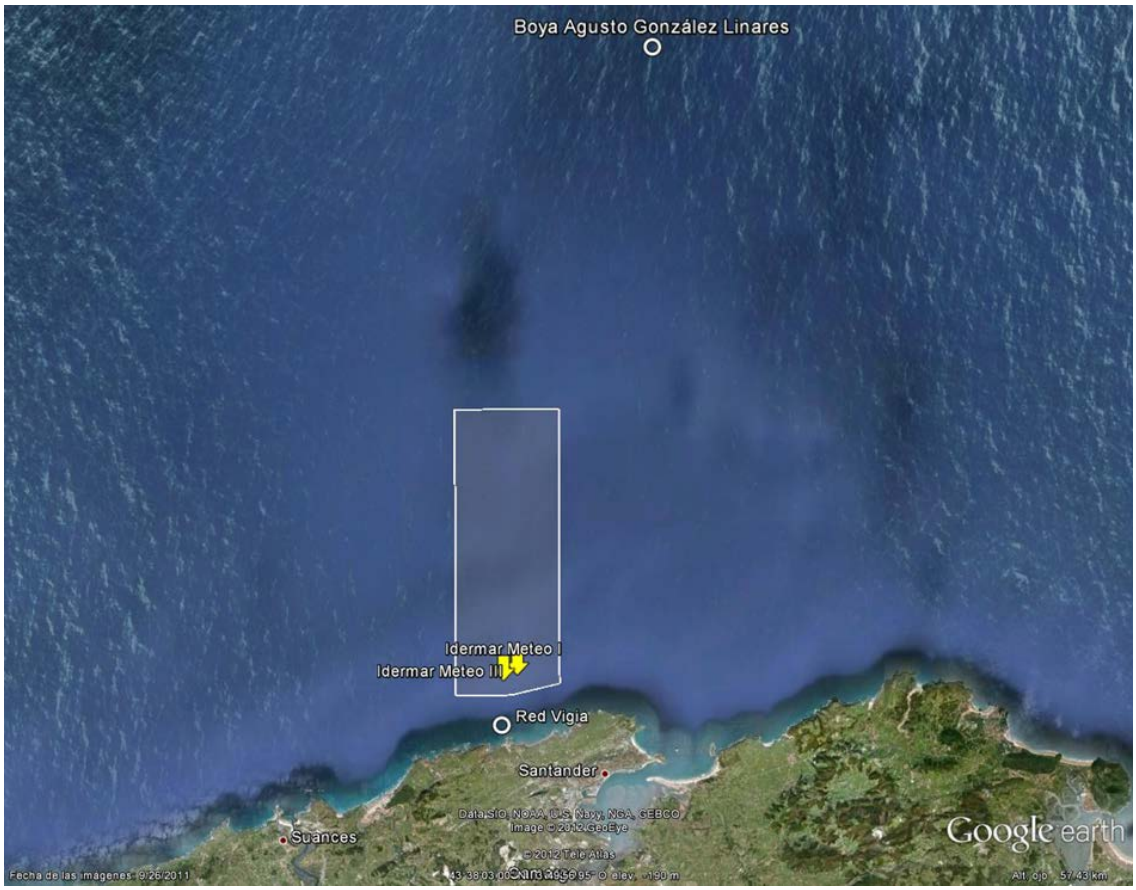
It was concluded that the Gemini park might not be as suitable for multi-use as was expected. When starting multi-use, it is important that the location is suitable for other user functions as well. It must be further researched whether the Gemini location is suitable for other functions.

It was concluded that the best way to start multi-use at sea was to look at the different business models of the different user functions and see where they overlap. The location where overlap occurs might be the best suited location for multi-use. This is a new way of looking at multi-use instead of trying hard to add activities/new functions to already existing activities/platforms.

3.3 Atlantic site

Introduction

The Cantabrian Offshore site was discussed in the interviews and the round table session with stakeholders. This site is located in Spain, off shore the region of Cantabria. It is able to accommodate floating wind turbines and wave energy generators as well. These can be deployed reducing interaction and wake effects between them. A meteorological mast installed by the R&D Company IDERMAR (June 2009 and October 2011) will monitor the metocean conditions.



The location of the Ubiarco site (Source: Google maps)

The site will be fully monitored by the existing operational systems for wind, waves and currents. The floating platforms open up the opportunity of installing wind farms in deep waters because they do not need anchorage, something especially important in Spain, where the continental shelf is narrow. Aquaculture experiences from other deep water sites will be used as a basis for analysing the potential at this site. The site is in particular challenged with very harsh wave conditions, potentially a large problem for aquaculture equipment.

Stakeholders present

A total of 9 stakeholders were present at the roundtable. These can be categorised as follows:

Type of stakeholder	# organisations present
Governing bodies/regulators/policy makers as regional, national and European officers	2
End users of the MUP, e.g. energy companies and aquaculture entrepreneurs	1
Suppliers of the MUP such as cable companies and construction businesses	3
Stakeholders from other offshore activities such as fisheries, shipping & mining sectors	0
Discourse community, including e.g. (environmental) NGO's, local citizens	1
Universities and research institutes	2

Three MUPs alternatives presented

In the introduction of MUP designs, the following three alternatives were presented:

1. Alternative 1: Wave energy generation in combination with aquaculture. For this alternative, a wave energy converter has been selected that could be combined with an aquaculture cage.
2. Alternative 2: Wind energy generation in combination with aquaculture. This alternative combines a wind energy converter and aquaculture production.
3. Alternative 3: Wind and wave energy generation, in combination with aquaculture. This alternative combines both wave and wind energy with aquaculture.

Outcomes of the round table session

Respondents were asked to evaluate these alternatives on various criteria. Next to the three alternatives, respondents were given a "blank" option where they could introduce and discuss their own MUP combination. This "blank" option was only used by one respondent and is therefore left out of the following analysis.

Following the discussion during the roundtable, a fourth alternative was introduced in which no activities are undertaken at all (no MUP). Below, the outcomes of the discussion on each of the three criteria are presented.

Technical feasibility
The stakeholders mentioned that there is a high risk on geotechnical failure and failure with land connections. These risks are expected to be highest on alternative 3.

Environmental impacts
Of the environmental impacts, the biggest impact - across all alternatives - is expected on visual impact, underwater sound, and birdlife. Alternative 1 is expected to have the lowest impact on environment. The following impacts were mentioned: visual impact and impact on birdlife. Alternatives 2 and 3 have higher expected impacts on visual impact and birdlife than alternative 1. Beside it was mentioned that all MUPs have a risk regarding a risk regarding sea bed disruption (through mooring).

It was also mentioned that alternative 1 is expected to deliver more environmental benefits than the other two alternatives.

Financial and economic feasibility
Concerning costs, a number of aspects were discussed that determine the costs for the alternative systems. In general, high costs are expected for the equipment, decommissioning and operation & maintenance (O&M) of the platform. Alternative 1 is expected to have the lowest costs, on both equipment and power extraction systems, compared to the other alternatives. Alternative 3 is expected to have the highest costs on almost all of the criteria, suggesting it is a costly alternative.

Socio-economic feasibility
Besides costs, MUP also have some related benefits. All options are expected to have an increase in temporary employment, benefits for industry and benefits for existing businesses. We also observed that alternative 1 is expected to provide access to new markets.

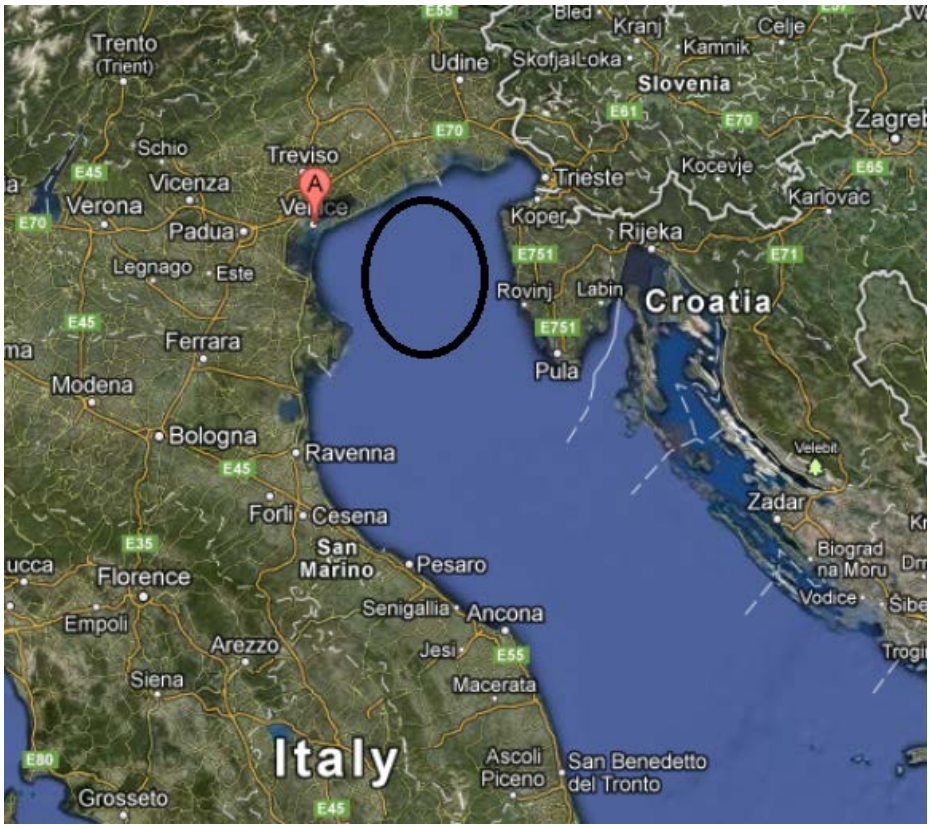
Conclusion

The general picture that emerges from the discussion is that alternative 1 (wave energy in combination with aquaculture) is considered to have the lowest environmental impact, lowest risks and lowest costs. It is also expected to have the highest benefits. This reflects the local environmental conditions: harsh environmental conditions lead stakeholders to question the feasibility of offshore wind energy (can the structures withstand the conditions?). High waves offer potential for wave energy. While there is a lot of research on offshore wind energy, local businesses and academia focus on development of wave energy and mooring systems. Consequently, the expected local benefits of wind energy are considered low, whereas wave energy development is believed to strengthen local business.

3.4 Mediterranean site

Introduction

The Mediterranean Sea site is a sheltered water site with a depth of 16 m. The suggested site for multi-use is the Acqua Alta platform. It is a research platform held by CNR (Centro Nazionale Delle Ricerche = National Research Centre) about 12 km from the coastline of Venice.



The location of the Acqua Alta platform (Source: Google maps)

The challenge of this research platform is to combine the research activities at the existing platform with energy generating activities and offshore aquaculture. The site has moderate wind and wave energy potential, but the research platform could be combined with multiple energy converters, i.e. wind and waves. After interaction with stakeholders it was decided that a tailored wave energy converter should be designed, to be installed around this platform, although the precise location is a decision variable. Next to this, there is also a potential for combining research and wave energy with the cultivation of microalgae or fish.

Stakeholders present

A total of 6 stakeholders were present at the roundtable. These can be categorised as follows:

Type of stakeholder	# organisations present
Governing bodies/regulators/policy makers as regional, national and European officers	2
End users of the MUP, e.g. energy companies and aquaculture entrepreneurs	1
Suppliers of the MUP such as cable companies and construction businesses	1
Stakeholders from other offshore activities such as fisheries, shipping & mining sectors	0
Discourse community, including e.g. (environmental) NGO's, local citizens	1
Universities and research institutes	1

Outcomes of the round table session

The focus of the discussions is on the combination of energy production (wind and wave) in combination with fish aquaculture. The general picture that emerges from the discussion is that environmental aspects do not exclude any MUP options, while they should mould all options. The localisation of the chosen platform should be kept as a decision variable, consistently with requirements by fish and energy farming, by moving away from the research platform held by CNR. The financial and economic issues do not exclude any MUP options, although they should be crucial in evaluating the chosen and detailed options. Unsatisfactory financial aspects do not exclude any MUP options, although they should be crucial in evaluating the chosen and detailed options. The social-economic issues do not exclude any MUP options, although they should be crucial in evaluating the chosen and detailed options as well. The stakeholders were mostly concerned about the environmental impacts and social-economic feasibility.

Technical feasibility

The stakeholders are concerned about possible anchorage problems nearby the platform. Besides, they mentioned potential problems with day/night distribution of energy production of the platform. Potential synergies between wave and fish farms linked to a reduction of structural risk for cages. For wave energy, there is a need for strong waves, while strong waves increase the risk of damaged of lost fish cages. Stakeholders wonder how these two options link technically.

Environmental impacts:
Stakeholders are concerned about water quality issues in and out the fish farm as there could be a loss of feed. Impact might even be higher with the simulation of currents where these currents take the water further.

Stakeholders also mentioned the potential visual problems from Piazza S. Marco in Venice. The MUP could interfere the landscape from the piazza and also have an effect on tourism and the economic situation.

Financial and economic feasibility
Stakeholders are concerned that fish farms away from the coast line might be unprofitable as the MUP is located 12 km offshore. The stakeholders are also concerned about potential conflicts with the all existing activities in the region, namely with the mussel production and with the routes of recreational navigation from Venice to Rovigno. It is important to examine the economic feasibility of a MUP. In particular, opening a sea bass or sea bream market could rely on a local demand, by reducing transport costs and avoiding monopolistic conditions prevailing in the local market for mussels. Moreover, the off-shore energy consumption of a fish farm (i.e. around 140 kWh for each fish farm unit) does not justify a MUP), since packaging is performed on land. Besides, a lack of knowledge and experience on off-shore fish farming at 12 km from the coastline requires a fish farm to be combined with an energy farm, in order to protect fishery cages from extreme events by energy structures.

Socio-economic feasibility
A potential change in subsidisation policy for renewable energy by the Italian government in the near and distant future could both have a positive or negative impact on the realisation of the MUP. This depends on the change of the subsidisation policy.

Conclusion

The stakeholder do not exclude any MUP options in the discussions, however they do find it important that all options must be clearly examined. It is important to especially check the environmental impacts and the socio-economic feasibility. The localisation of the chosen platform should be kept as a decision variable, consistently with requirements by fish and energy farming, by moving away from the research platform held by CNR.

4. Recommendations per site

This chapter gives an overview of the recommendations from the stakeholders for each of the four sites. These recommendations are both based on the results of step 1 (Rasenberg et al., 2013) and step 2 (this report). The recommendations are divided in technical, environmental, financial & economic, and socio-economic recommendations.

4.1 Baltic Sea

Introduction

Based on the discussion during the second stakeholder meeting, the combination of wind energy with aquaculture appears to offer the most potential for MUPs in the Baltic region. It is considered to have the lowest environmental impact, lowest risks and lowest costs. It is also expected to have the highest benefits. However, it might be more practical and economically efficient to divide the area in the sea and separate some of the physical installations, for example the cages and wind turbines, and then combine others, such as feeding stations and the maintenance ships. The following recommendations are formulated.

Technical recommendations

The participants express the need to quantify potential risks. When a wind farm and fish farm are combined, more ships will enter the area, which means more traffic and higher risks of accidents for the people and technology involved. First, shipping routes that pass Kriegers Flak need to be changed. Second, when fish cages are located between the wind turbines this means that transportation is more restricted. Good guidelines and rules need to be endorsed to ensure the safety for the people, the vessels, the cages and the wind turbines involved. Third, there is the potential risk of internal damages, for example if the anchors of the fish farm are drifting into the cables of power supply, or if the fish cages are damaged by the wind turbine construction. In order to reduce the risks, the MUP should be clearly marked out and armed with technical monitoring equipment.

- It is recommended to execute a risk analysis to identify and quantify the risks of MUP

Environmental recommendations

Participants from nature organisations and R&D centres want to increase a better combination of production and nature values and decrease the negative impacts on the ecosystem. They want to develop a MUP to understand what ecological gains can be pursued and they want to test and analyse how ecological impacts can be minimised, or whether there can be ecological gains achieved. The energy business and fish farm find environmental and ecological issues of big importance, as they acknowledge that they need a licence to produce from authorities.

Part of the seabed area will be taken up by the foundations of the wind turbines and part of the sea will be destined for the fish cages. This will have an effect on the habitats in their living environment. But the foundation and scour protection of wind turbines have proved to become an artificial reef in which algae and invertebrates appear to do well. The foundations are quickly colonized and create entire communities of marine life[5]. Potentially, there are possibilities for improving sea life and ecological conditions that need to be explored.

- It is recommended to examine possible ecological gains from the MUP

There should be no impact on the environment and the ecological conditions of the seawater and seabed. One condition involves the preservation of the artificial reefs that are located under the surface. Potential scour protection around foundations may act as artificial reefs. Disturbance of these habitats can be avoided when the fish farms are placed far away from the artificial reefs themselves. In the positioning of the fish cages, one should take this into consideration.

- It is recommended to execute an environmental impact assessment

Financial and economic recommendations

The challenge is to combine the production of fish and energy in such a way that costs are reduced more effectively. One example is not to lose energy, but use the energy for the production of fish in confined cages. Hydrogen can be used for energy storage and possible a by-product is oxygen that can be used for the production of fish. Other ways to reduce costs is to use the same ships for transport and maintenance. Fish farms have big vessels for feed and these can possibly be used by the energy businesses as well. Another option is to build a platform for use where both crewmembers can work and the feeding of the fish can be done.

- It is recommended to examine possible cost reductions

It is very important to build trust between the parties involved concerning the financial aspects of building a MUP. One important aspect is to work out clear roles and contracts on logistics and risks. Some energy businesses and fish farms feel the need to make an agreement for dealing with logistics and risks for combined transportation and access for monitoring and maintenance. Therefore, an analysis is needed for combined use in which the position of the cabling and the use of shipping are included to prevent risks of damage and accidents. An important aspect in this respect is whether there are insurance companies that are willing to insure against the risks involved.

- It is recommended to perform an analysis regarding possible agreements and contracts

[5] www.vattenfall.se/kriegersflak

Participants feel an urgent need for developing clear procedures for stakeholder involvement among the countries involved. It is recommended that the different claims that stakeholders make on the sea (e.g. nature conservation as well as economic activities and present shipping and transport lines) are articulated and integrated in a special Marine Spatial Plan for Kriegers Flak.

- Developing a cross-boundary Marine Spatial Plan that includes the zoning of Kriegers Flak for different multi-use purposes is a necessary step.

It is an obstacle for the fish farm companies on how to get the right permits for the economic exploitation of the sea. For instance, coastal authorities need to be involved more intensively in the process as they are responsible for giving permissions to constructions at sea. Their job will change when MUPs are developed.

- It is recommended to develop new guidelines for the administration of the sea territory within relevant authorities

Socio-economic recommendations

Developing a MUP can create social acceptance but also opposition for developing more intensive economic activities at sea and therefore all relevant parties should have a say in the process. One of the goals of developing a MUP is therefore to involve society in the development of economic solutions that make benefits for society. Others suggest to leave options open and make the design in such a way that also for instance tourism and energy storage is possible. Others warn that there should not be overriding conflicts between the economic activities and that the sky is not the limit. In the future there could be totally new designs needed that have spatial effects.

- It is recommended to involve a broad range of stakeholders in the development of the MUP

A MUP will affect the landscape to a greater or lesser extent. In the view of the participants, there should not be any effect on views from the shore. However some of the wind turbine towers at Kriegers Flak would be below the horizon, since the wind turbines are located around 30 km off shore. Depending on the weather conditions, the farm will seldom be clearly visible from the coast.

- It is recommended to examine and illustrate if and how the MUP is visible from the shore

Perceptions of the public and the image of wind turbines and fish farms are variable. Fish farms and aquaculture at sea are less accepted by the public than wind farms. However, public images can change. There is a debate that argues that aquaculture is not polluting and produces healthy food in an environmentally very efficient and correct way.

- It is recommended to involve the public debate in the discussion

Participation should take place with all countries involved as well as the stakeholders that want to develop activities. It is very important that trust between the stakeholders is built. Competing claims between the stakeholders in terms of economy and ecology need to be tackled in a mutual process and should result in new guidelines for the exploitation of the sea.

- It is recommended to involve all relevant stakeholders in the development of the design

4.2 North Sea

Introduction
The North Sea case study focusses on combining wind energy with mussel and/or seaweed aquaculture.

During the round table discussion with stakeholders, it was concluded that the chosen location of the Gemini park might not be as suitable for multi-use as was expected at the start of the MERMAID project. The main reason was that the wind farm is located too far offshore for a combination with either aquaculture and/or other activities like tourism. Based on the interviews in step 1 and round table session in step 2, the following recommendations are formulated.

Technical recommendations
The main concerns regarding possible technical impacts come from the wind energy sector. They explicitly mention that the multi-use activity should not interfere with the day-to-day operations in the wind farm. Examples are no hindrance of wind turbines, no obstacles in case of operational and maintenance (O&M) activities on both wind farms and cables. At the moment, the wind sector sees the interference of other activities as ballast. This opinion could however change when the added user function leads to cost reduction for the wind farm company.

- It is recommended to make clear agreements on how multi-use activities take place so that interference with the day-to-day operations of the wind farm is avoided

It is clear to all stakeholders that technical risks should be minimized.

- It is recommended to execute a risk analysis to identify and quantify the risks of MUP

Environmental recommendations
During the round table session not much was mentioned regarding environmental impacts. Most of the environmental issues were mentioned by various stakeholders during the individual interviews. In one of the interviews it was mentioned that wind farms have proven to have a positive effect on the existing ecosystems. Any detrimental effect caused by the transition from single to multi-use is not acceptable. It is mentioned that all activities must be managed in such a way that it contributes to the sustainable development and equity of the whole. Besides, during the round table sessions all stakeholders did agree that the risks of environmental impacts of multi-use must be low.

- It is recommended to perform an environmental impact assessment before multi-use is started and to monitor effects closely after multi-use is started

Financial and economic recommendations

All stakeholders agree that it is important that the location chosen will generate economic benefits for all user functions. It was questioned whether the Gemini location is the best suitable option for aquaculture and other activities. Especially as the Gemini park was chosen as wind farm location because of the low interference with other users. It was suggested to look at the critical success factors of the different possible user functions and see which location might be best suitable.

- It is recommended to execute an economic feasibility study for the different user functions and investigate which location would be best suitable for multi-use using the critical success factors of the individual user functions

Combining infrastructures and O&M activities of the different user functions could decrease operational costs for the individual activities. These synergies must lead to economic benefits. Furthermore, it was mentioned that companies will only start looking for synergies after their business is operationalized (running) and the company is in the process of increasing the efficiency of their work. Attractive financial arrangements would stimulate companies to invest in multi-use. It was also mentioned that the government should enforce multi-use.

- It is recommended to get insight in the possible economic benefits of the MUP

- It is recommended to develop attractive financial arrangements for multi-use investments

One of the concerns that was expressed by multiple stakeholders was the possible high insurance costs for multi-use activities.

- It was recommended to talk with insurance companies to get more insight in insuring possibilities of multi-use activities

Socio-economic recommendations

Regarding socio-economic issues it was mentioned that the location might be too far offshore and not suitable to generate extra jobs for tourism or labour intensive aquaculture.

- It is recommended to research how multi-use activities could contribute to more jobs

Another issue that was addressed multiple times was safety. When working in a wind farm a certain level of safety must be ensured and SAR procedures must be executed when needed.

- It is recommended to execute a risk assessment regarding the interference of multi-use activities with safety and SAR procedures in the wind farm

4.3 Atlantic Ocean

Introduction
Based on the discussion during the stakeholder meeting, the combination of wave energy with aquaculture appears to offer the highest potential for MUPs in the Cantabria region. This combination is considered to have the lowest environmental impact, lowest risks and lowest costs. It is also expected to have the highest benefits. Based on the discussions in step 1 and 2, the following recommendations are formulated.

Technical recommendations
The main concern among stakeholders is the robustness of the systems discussed. In some ways this concern "overrides" all other concerns; if one is sceptical on the possibility to build a MUP it becomes difficult to talk about expected impact or benefits.

- It is recommended to show the technical feasibility of building a MUP that can withstand the harsh site conditions

Harsh environmental conditions lead respondents to question the feasibility of offshore wind energy in particular (can the structures withstand the conditions?) whereas high waves offer potential for wave energy. However, wave energy is in an early stage of development and it needs to mature before large-scale commercial exploitation can be expected.

- It is recommended to improve the knowledge of wave energy through research and development

Of the identified risks, the highest expected risks, for all design options, are due to geotechnical failures, disruptions of sea bed integrity, and failures with land connections. Particularly, a combined wind, wave & aquaculture design is considered more risky than the other alternatives, e.g. with respect to structural failure and energy extraction. The general feeling is that little is still known about the actual risks.

- It is recommended to perform a risk analysis to identify and quantify the risks of MUPs

Environmental recommendations
In general, environmental impacts are considered relatively small. Site conditions are important here as well. The site is situated in a relatively sparsely used area with strong ocean currents which means that water-borne pollutions are rapidly diluted. Three environmental concerns are discussed in greater detail.

The main environmental concern is the visual impact of offshore wind turbines. The site is partly visible from shore and the placement of a MUP could have a negative impact on the landscape. In this context, respondents speak about the possibility that this coastal area in the

future will be developed into a housing area. The visual impact of offshore wind energy is considered higher than the visual impact of wave energy.

- It is recommended to examine and illustrate if and how MUPs are visible from the shore

A second concern that was discussed is the impact on birdlife. The general feeling is that this impact is rather small and therefore this is not a main concern from the stakeholders for development of MUP. Looking at the three alternatives in more detail, offshore wind is expected to have a higher negative impact on birdlife than wave energy.

- It is recommended to address impact on birdlife if offshore wind is part of the MUP design

A third concern discussed is the underwater sound. It is expected that offshore wind causes stronger underwater sounds than wave energy, but the differences between the alternatives are less distinct than with birdlife.

- It is recommended to examine if underwater sound caused by MUPs has a negative impact on the environment

Financial and economic recommendations

Concerning costs, a number of aspects were discussed that determine the final costs for the systems. In general, high costs are expected for equipment, decommissioning and operation & maintenance. The wave and aquaculture design is expected have the lowest costs, with relatively low expected costs for equipment and power extraction systems, compared to the other alternatives. However, the energy production potential for the different technologies differs: offshore wind has high energy production, whereas the energy production of wave energy is low.

- It is recommended to perform financial cost-benefit analysis for the different MUP alternatives to acquire insight in the economic feasibility

It is important that the development of a MUP does not have negative effects on existing economic sectors: preferably, it should even have positive effects. The local fishing community and leisure, particularly sailing, are mentioned.

- It is recommended to examine how development of a MUP impacts upon existing users of the sea

In the discussions about the costs of MUPs, the potential high costs for dismantling were raised. It was concluded that little is known about these costs.

- It is recommended to improve knowledge on the costs for dismantling MUPs at the end of their life-cycle

Socio-economic recommendations

When it comes to the benefits, across all alternatives, positive effects are expected on temporary employment, benefits for industry and benefits for existing businesses. While there is a lot of research on offshore wind energy, local businesses and academia focus on development of wave energy and mooring systems. Consequently, the expected local benefits of wind energy are considered low, whereas wave energy development is believed to strengthen local businesses.

- It is recommended to examine if development of wave energy can strengthen the local economy and can provide business and research institutes in Cantabria with unique knowledge and techniques

4.4 Mediterranean Sea

Introduction
The challenge of the research platform on the Mediterranean site with moderate wind and wave energy potential is to combine the research activities at the existing platform with energy generating activities and offshore aquaculture. Based on the round table session with the stakeholders, two main MUP options appear to have the largest potentials in the Mediterranean study site:

1. Fixed wave + Small scale wind farm + Fish farm
2. Floating wave + Fish farm

In particular, the following recommendations are formulated.

Technical recommendations
Apart from the technical risks highlighted by stakeholders for small scale wind and unfeasible combined uses stressed by experts, no technical recommendations arose. However, the stakeholders did have concerns.

During the first step, concerns were raised about the suitability of the location. The location is far offshore and might therefore be too costly. Besides, they are concerned that the suggested multi-use activities might not be possible due to the site conditions and due to some key stakeholders that were not willing to participate in a MUP. Issues that were raised during the round table session were possible anchor problems for ships near the platform and problems with day-night distribution of energy. When wave energy and aquaculture are combined, the stakeholders are concerned about the risk of losing fish farms with harsh waves. The stakeholders concluded that this is all related to a lack of knowledge.

- It is recommended to increase the knowledge level on multi-use options and risks

Environmental recommendations
Environmental concerns highlighted by both stakeholders (e.g. for large scale wind farm and fixed wave) and experts (e.g. for fish farming) can be summarised as follow: by espousing an eco-system service approach, in general, the platform should be designed to be as green as possible. The following issues were mentioned during the round table sessions: 1) Water quality problems around the fish farm, together with simulation of currents, where the fish feed may lead to eutrophication of seawater, 2) potential electro-magnetic problems in and around the wind farm.

- It is recommended to execute an environmental impact assessment that addresses the above mentioned issues

Another main environmental concern is the visual impact of offshore wave and wind turbines from the Piazza S. Marco in Venice, an important tourist attraction. Placement of MUP could have a negative impact on the landscape and view from the Piazza.

- It is recommended to examine and illustrate if and how MUPs are visible from the shore.

Financial and economic recommendations

During the first step the stakeholders were concerned about the possibility of finding companies that are willing to invest in wave energy, wind energy or aquaculture.

Furthermore, it was mentioned that the location of the site is far offshore and therefore a fish farm might not be profitable as it takes a lot of time and money to visit the farm. Besides, there are concerns about the potential conflicts of a fish farm with the nearby mussel production. The stakeholders are also concerned with the potential conflict with another economic activity, namely tourism. They express concerns about potential conflicts with routes of recreational navigation from Venice to Rovigno.

- It is recommended to research the willingness of companies to invest in multi-use and to study the economic benefits from multi-use

The financial concerns highlighted by both stakeholders and experts suggest to perform a detailed financial analysis under normal meteor-climate conditions and a comprehensive risk analysis under extreme meteo-climate conditions.

- It is recommended to perform a detailed financial analysis

Social-economic recommendations

Although non-significant differences in indirect and direct employment at the regional level are likely to arise from alternative platforms, at least to justify the discharge or the choice of a specific design, attention should be paid to impacts on GDP and employment, by considering both construction, operation and decommission periods.

- It is recommended to execute a CBA for the site

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Annex 1. Invited stakeholders per case study

A. 1.1 Atlantic site

A total of 24 stakeholders were invited to participate in this session, and 15 stakeholders confirmed their attendance. A total of 10 stakeholders were present at the roundtable session.

Stakeholders who attended the meeting in Santander

- ACCISA (Civil Works Company)
- Demarcación de Costas de Cantabria (Cantabria Coastal Authority)
- Escuela Técnica Superior de Náutica (University Of Cantabria)
- Fundación Centro Tecnológico de Componentes (Technological Centre of Components Foundation)
- Consejería de Innovación, Industria, Turismo y Comercio. Gobierno de Cantabria (Department of Innovation, Industry, Tourism and Trade. Government of Cantabria)
- CT Innova (Centre for Innovation)
- Grupo Tinamenor (Aquaculture Company)
- Instituto Español de Oceanografía (Spanish Institute of Oceanography)
- SEO/BIRDLIFE – Cantabria (nature organization)

Stakeholders who did not show up at the meeting after confirming attendance

- ARCA (nature organization)
- Área de Fomento de la Delegación del Gobierno de Cantabria (Spanish Ministry of Public Works. Cantabria Delegation)
- Autoridad Portuaria de Santander (Port Authority of Santander)
- Capitanía Marítima de Santander
- Centro Especializado de Alto Rendimiento de Vela “Príncipe Felipe” (Specialized Center of High Performance Sailing “Príncipe Felipe”)

Stakeholders who did not attend but were invited

- The port authority
- The municipality of Santander
- A wind turbine developer
- The maritime Authority
- National sailing team
- Coastal guard
- National Government regional delegate
- National Institute of Oceanography
- Green NGO

A. 1.2 Baltic Sea site

The Baltic Sea site did not follow the described methodology, but held a meeting instead to discuss real plans on developing a MUP in the Baltic Sea. A total of 19 stakeholders from 10 different organisations were invited for meeting on the Baltic Sea MUP, and 16 stakeholders were present at the meeting. These 16 stakeholders represent 7 organizations that are all involved in the MERMAID project.

Stakeholders who attended the meeting on the Baltic Sea MUP

- DTU-Aqua (governmental research organization): 5 persons attended
- DHI-group (engineering firm): 4 persons attended
- Hvalpsund (technical firm): 2 persons attended
- Bolding Burchard (engineering firm): 1 person attended
- Musholm (energy company): 1 person attended
- Danskawakultur (Aquaculture NGO): 1 person attended
- DONG (energy company): 2 persons attended

Stakeholders who did not attend but were invited

- Soefartsstyrelsen: 1 person was invited
- Fiskerikontrol øst: 1 person was invited
- Grønt Center: 1 person was invited

A. 1.3 Mediterranean site

A total of 18 stakeholders were invited for the round table session in Venice, and six stakeholders were present at the meeting. The other 12 stakeholders was asked to fill in the assessment tool separately.

Stakeholders who attended the II meeting in Venice

- Environmental Impact Assessment in Venice Municipality
- Energy Agency in Venice Municipality
- National Research Centre (CNR) in Venice
- Naval League in Venice (NGO)
- Neural Engineering SpA (Technical Consultant)
- Water Plan Office in Veneto Region

Stakeholders who did not attend but were invited

- Citizen Committee for Venice Lagoon Preservation
- Civil Engineers in Veneto Region
- Clam Producer Cooperative in Chioggia
- Consorzio Venezia Ricerche (Technical Consultant)
- eAmbiente (Environmental Consultant)
- Environmental League in Venice (NGO)
- Harbour Office in Venice
- Hotel Keeper Association in Venice
- National Environmental Agency in Veneto Region
- National Alternative Energy Agency in Veneto
- SEABREATH (producer Wave Energy Converters)
- WEMPOWER (producer Wave Energy Converters)

All disciplines involved in MERMAID were represented:
engineering, ecology, economics, energy, climatology, fishery

A. 1.4 North Sea site

In total 26 stakeholders were invited to attend the round table session and 12 stakeholders confirmed their attendance. A total of 9 stakeholders attended the meeting. Besides, 5 persons from the MERMAID project were present who also all have their own expertise to bring to the table.

Stakeholders who attended the meeting in Delft

- Groningen Seaport
- Hortimare (seaweed producer)
- Mature Development (seaweed producer)
- Ministry of economic affairs (aquaculture policy officer)
- NUON (energy company)
- N.V. Economic Impulse Zeeland (seaweed production)
- Research institute NIOZ (seaweed specialist)
- Research institute IMARES (offshore specialist)
- Rijkswaterstaat (the executive body of the Dutch Ministry of Infrastructure and the Environment, multi- use officer)

Stakeholders who did not show up at the meeting after confirming attendance

- Ministry of Infrastructure and the Environment (multi-use policy officer)
- Offshore project windfarm Zeeland
- Province of Zeeland

Stakeholders who did not attend but were invited

- Cargill
- Coast and Sea foundation (Dutch NGO)
- DC-Offshore Energy
- ECN (Energy research Centre of the Netherlands)
- Engineering works Bakker
- Fish auction Lauwersoog
- Fishery sector
- Menken van den Assem Special Foods B.V.
- Mussel sector
- North Sea foundation (Dutch NGO)
- Research institute TNO
- Siemens energy
- Typhoon (project developer Gemini wind farm)
- Van Oord Offshore Wind
- World Wide Fund