



## WP 5: Technical and non-technical challenges, regional and sectoral

Deliverable 5.5

### Toolkits and Guidelines

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## About MARIBE

MARIBE is a Horizon 2020 project that aims to unlock the potential of multi-use of space in the offshore economy (also referred to as Blue Economy). This forms part of the long-term Blue Growth (BG) strategy to support sustainable growth in the marine and maritime sectors as a whole; something which is at the heart of the Integrated Maritime Policy, the EU Innovation Union, and the Europe 2020 strategy for smart, sustainable growth.

Within the Blue Economy, there are new and emerging sectors comprising technologies that are early stage and novel. These are referred to as Blue Growth sectors and they have developed independently for the most part without pursuing cooperation opportunities with other sectors. MARIBE investigates cooperation opportunities (partnerships, joint ventures etc.) for companies within the four key BG sectors in order to develop these companies and their sectors and to promote the multi-use of space in the offshore economy. The sectors are Marine Renewable Energy, Aquaculture, Marine Biotechnology and Seabed Mining. MARIBE links and cross-cuts with the Transatlantic Ocean Research Alliance and the Galway Statement by reviewing the three European basins (Atlantic, Mediterranean, and Baltic) as well as the Caribbean Basin.

### Project coordinator



### MARIBE project partners



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## Concepts used

The most used concepts in the Work Package are explained in this section, so it could be used as a dictionary to understand better the deliverables.

### Sectors

- Aquaculture: Aquaculture, also known as aquafarming, refers to the farming of aquatic (freshwater or saltwater) organisms, such as fish, molluscs, crustaceans and plants, for human use or consumption and/or as input for other processes, under controlled conditions. Aquaculture implies some form of intervention in the natural rearing process to enhance production, including regular stocking, feeding and protection from predators. Farming also implies individual or corporate ownership of, or contractual rights to, the stock being cultivated. (European Commission)
- Biotechnology: Blue biotechnology is concerned with the exploration and exploitation of the resulting diverse marine organisms in order to develop new products. Exploration of the sea biodiversity could enable us to develop new pharmaceuticals or industrial enzymes that can withstand extreme conditions, and which consequently have high economic value. In the long term, it is expected that the sector will offer high-skilled employment and significant downstream opportunities. (European Commission)
- Fisheries: It refers to activities leading to harvesting of fish, involving capture of wild fish.
- Oil and Gas: It refers to the development of oil fields and natural gas deposits under the ocean.
- Seabed Mining: Seabed mining is concerned with the retrieval of minerals occupying the ocean floor to ensure security of supply and fill a gap in the market where either recycling is not possible or adequate, or the burden on terrestrial mines is too great. (European Commission)
- Shipping: It refers both the sector involved in the construction of new ships and in the sector related to the transport of passengers and goods along waterways.
- Tidal energy: It refers to the use of tide mills to generate electricity converting the potential energy of the tides.
- Tourism: It refers to the social, cultural and economic phenomenon which entails the movement of people to countries or places outside their usual environment for personal or business/professional purposes. These people are called visitors (which may be



either tourists or excursionists; residents or non-residents) and tourism has to do with their activities, some of which involve tourism expenditure (United Nations World Tourism Organization, UNWTO)

Leisure industry is the segment of business focused on entertainment, recreation, sports and tourism related products and services. Some examples of marine activities include sailing, diving, surfing or fishing.

- Wave energy: It refers to the use of mechanical devices to generate electricity typically transforming oscillatory vertical movement of water into electrical energy.
- Wind energy: It refers to the use of wind turbines to generate electricity by the use of a turbine that transforms wind's force into energy.

## Basins

- Atlantic basin comprises the Atlantic Ocean area situated between the southern coasts of the Canary Islands (Spain) to the northern part of United Kingdom territories, including the Gulf of Biscay and the Celtic Sea.
- Baltic basin includes Baltic Sea and North Sea.
- Caribbean basin includes the Caribbean Sea, the Gulf of Mexico, and the Atlantic Ocean area colliding with the former.
- Mediterranean basin comprises Mediterranean Sea, Black Sea, Adriatic Sea and Ionian Sea.

## Technical Limitations Classification

- Activity required for technology readiness refers to how much work will be necessary to get to TRL8 stage.
- Combination specific system fundamental design issues is related to those specific limitations for which additional technology is required.
- Regional/site specific fundamental design issues talks about limitations linked with depth, wave climate, temperature, grid availability, ports/vessels, etc.
- O&M issues refers to those that affect in a specific way to operations and maintenance, including decommissioning and problems with connection to grid.



- Combination of sectors conflicts is related to planning, logistics, safety and insurance issues.

## Non-technical Limitations Classification

- Infrastructure stands for those barriers that derives from the non-existence or non-availability when existing and lack of capacity. These barriers will be perceived as lack of essential support services in the system
- Environmental barriers refers to those derived from the lack of environmental adequate resources or conditions, or the non-access availability to resources currently assigned to other competing users. It also refers to the effects as environmental impacts of the activity.
- Regulatory barriers are the ones derived from the regulatory environment of the resources, and from uncertainty on the future operation conditions. Are essentially policy induced barriers and cover access to resource, subsidies and legal conditions for supply either from blue growth or competitors.
- Financial Barriers: Those are restrictions derived from the lack of access to financial markets or the prime risk levied on of the funding due to the specific conditions of the business. They are essentially derived from the inability of the model to match investors' requirements.
- Political: under this group the barriers derived from political decision system procedures, the lack of a well-defined decision system, or derived from the delay in the creation of a political consensus about involving issues are included. Discussions on priorities when different uses or are involved fall in this area.



## Work Package tasks

In this section a short description of the works developed in each task is presented, so the process followed to obtain the final outputs can be understood and so the deliverables itself.

### Deliverable D5.1

The aim of this deliverable is to assess key projects that focus on multi-use of space and multi-purpose platforms to ensure maximum use of their outputs, contacts, excellence, recommendations and information. The four projects selected for this analysis were “Marina Platform”, “H2Ocean”, “Tropos” and “Mermaid”.

To achieve this, several work tasks were developed:

1. All project websites were revised searching for all available deliverables and information.
2. When a deliverable was not available and it was considered important for the analysis, a request for it was made.
3. A search for scientific papers or other outputs from the projects was also carried out.
4. All this information was reviewed in order to obtain the most important facts and data for the deliverable structure.
5. Finally the report was written.

### Deliverables D5.2-D5.3

These two deliverables focus on the identification of the past, present and expected technical and non-technical challenges facing multi-use of space and multi-purpose platforms projects and technologies. To achieve this goal, an Excel spreadsheet with all the information was prepared following these stages:

1. An Excel spreadsheet was prepared with a structure that allows to capture, classify and find the different limitations that can appear for a specific combination of sectors.
2. Once the process of selection of sectors combinations were finally finished, the previous Excel file was shared between the sector leaders of the project to capture their knowledge about the possible limitations that could appear in each combination.
3. All the information received from partners were collated into one single file and processed further by removing duplicate entries by different partners and to ensure that all the information is relevant and backed by references.



Prior to these steps of identifying and classifying the limitations that arose, the selection of the relevant combinations of Blue Growth and Blue Economy sectors took place. For this process all MARIBE partners were asked to participate, following these steps:

1. An Excel spreadsheet was prepared with a matrix in which all sectors were crossed.

BLUE GROWTH SECTORS	BLUE ECONOMY SECTORS	VALUE ADD SECTORS/APPLICATIONS
<b>Aquaculture</b>	<b>Offshore Fixed Terminal/Shipping</b>	<b>Desalination</b>
<b>Tidal Energy</b>	<b>Tourism &amp; Leisure</b>	<b>Solar Energy (PV &amp; Thermal)</b>
<b>Wave Energy</b>	<b>Oil and Gas</b>	
<b>Wind Energy (fixed and floating)</b>	<b>Fisheries</b>	
<b>Biotechnology/Blue Life Sciences</b>		
<b>Seabed mining</b>		

2. Different spreadsheets were prepared for all four basins.
3. Sector leaders were asked to rate, in a 0-5 scale, the technical, socioeconomic, financial, environmental and short/long term commercial viability and potential of each combination (allowed combinations: BG+BG, BG+BE; disallowed combinations: BE+BE; value add sectors/applications were also to be used if clear added value could be demonstrated).
4. A final score for each combination were calculated as the sum of all previous ratings.
5. In meetings that took place between sector-leaders of the combined sectors a common rating for each combination was reached following deliberations.
6. Finally, the six combinations with the highest ratings were chosen for each basin, resulting in the shortlisting of 24 final combinations.

In addition to the above process a separate exercise was carried out to appraise the sector combinations which resulted from the three “Oceans for Tomorrow” projects (Tropos, H2Ocean & Mermaid) as well as one FP7 project (Marine). These were assessed in Deliverable D5.1.

## Deliverable D5.4

This deliverable respond to the objective stated in MARIBE work package description as a continuation of previous deliverables: identify solutions utilised and proposed, and recommend research and technical agendas where either no solutions exist/ proposed or are inadequate.

To gather this, an analysis of the limitations spreadsheet (D5.2-D5.3) was made considering different factors:

- Basin: the different limitations were analysed by basin, trying to find those commons to each basin and finding differences between them.



- Combination: In this section the analysis was carried out in order to know if there are common limitations that affect one combination, with no consideration of basins for the deployment.
- Sector: Finally, the limitations were analysed by sector, with no consideration of basins or combinations.



## Deliverable D5.1

### Information to be found

For each of the three “Oceans of Tomorrow” projects (Tropos, H2Ocean & Mermaid) and one FP7 project (Marina Platform) analysed the following information was obtained:

- Main description (title, initial and final date, total cost, EU contribution).
- List of members and partners.
- Main objectives.
- Project structure (work packages).
- Deliverables summary, classified into technical, environmental, socio-economic or financial.
- Developed concepts summary, with:
  - Concepts description.
  - Full technical specifications.
  - Socio-economic results.
  - Environmental analysis.
  - Economic results.

### Document structure

The deliverable structure is the following:

- 1 Introduction
- 2 MARINA Platform Project
  - 2.1 Main Description
  - 2.2 Members / Partners
  - 2.3 Main objectives
  - 2.4 Project structure
  - 2.5 Deliverables summary table
  - 2.6 Developed concepts description
- 3 H2OCEAN Project
  - 3.1 Main Description
  - 3.2 Members / Partners
  - 3.3 Main objectives
  - 3.4 Project structure
  - 3.5 Deliverables summary table
  - 3.6 Developed concepts description
- 4 TROPOS Project



4.1	Main Description
4.2	Members / Partners
4.3	Main objectives
4.4	Project structure
4.5	Deliverables summary table
4.6	Developed concepts description
5	MERMAID Project
5.1	Main Description
5.2	Members / Partners
5.3	Main objectives
5.4	Project structure
5.5	Deliverables summary table
5.6	Developed concepts description
6	Conclusions
7	References



## Deliverables D5.2-D5.3

### Information to be found

In this spreadsheet file, the list of limitations can be found classified by:

- Technical limitation.
  - Activity required for technology readiness.
  - Combination specific system fundamental design issues.
  - Regional/site specific fundamental design issues.
  - O&M issues.
  - Combination of sectors conflicts.
- Non-technical limitation.
  - Infrastructure.
  - Environmental.
  - Regulatory.
  - Political.
  - Financial.
  - Other.
- Basin.
  - Atlantic.
  - Baltic.
  - Caribbean.
  - Mediterranean and Black Sea.
- Sector.

### Document structure

The spreadsheet has three sheets:

- Guidelines.
- Technical Limitations (D5.2).
- Non-technical Limitations (D5.3).

“Guidelines” sheet has information about the document itself and how to read it. This same information is collected here.

“Technical Limitations” and “Non-technical Limitations” sheets are organised in the same way.

- In the first column, coding for each combination is stated.



- In the next two columns, the sectors are presented using a double colour coding: blue and red.
- The fourth column states the rating the combination presented in the assessment made to choose the final combinations of MARIBE.
- In the following columns, the limitations are presented according to their subcategory as previously defined (and also can be found in the “Concepts used” section of this document). The colour used for the limitation links each one barrier with the sector in which this appears.
- For each limitation, references are provided and also a rating in a 1-5 scale, denoting its importance or relevance.

Basin	Sector #1 (blue)	Sector #2 (red)	Rated Score	Subcategory	Limitation related to Sector #2 (red)
Baltic	Aquaculture	Fixed terminal/Shipping	24	TECHNICAL LIMITATIONS	Regional/site specific fundamental design issues (depth, wave climate, temperature, grid availability, ports/vessels, etc.)
BAL#1	Aquaculture	Wave	19	TECHNICAL LIMITATIONS	Survivability. This is considered to be a key limitation for aquaculture sites. A global assessment will create new environmental assessment criteria for aquaculture sites. A global assessment will create new environmental assessment criteria for aquaculture sites.
BAL#2	Aquaculture	Wave	19	TECHNICAL LIMITATIONS	Survivability. This is considered to be a key limitation for aquaculture sites. A global assessment will create new environmental assessment criteria for aquaculture sites.

Additional annotations from the image:

- Row 41: "Not known limitations (depending on depth floating farm)" - Rating: 1
- Row 42: "Main limitations for aquaculture sites: A global assessment will create new environmental assessment criteria for aquaculture sites." - Rating: 4
- Row 43: "Climate change will create new environmental assessment criteria for aquaculture sites." - Rating: 4
- Row 44: "Low priority in spatial planning assessment" - Rating: 4
- Row 45: "Distance from coast" - Rating: 4
- Row 46: "Grid connection" - Rating: 2
- Row 47: "http://www.scier.org" - Rating: 2

## PDF files

All the information of the spreadsheet is also presented in two PDF files.

- D5.2. Current and expected technical challenges.
- D5.3. Current and expected non-technical challenges.



## Deliverable D5.4

### Information to be found

The analysis of the limitations recorded in Deliverables D5.2-D5.3 have allowed to create the following information that is presented in this deliverable:

- Limitations analysis by basin.
- Limitations analysis by combination.
- Limitations analysis by sector

### Document structure

The deliverable structure is the following:

- 1 Executive Summary
- 2 Contents
- 3 Limitations analysis by basin
  - 3.1 Atlantic basin
  - 3.2 Baltic basin
  - 3.3 Caribbean basin
  - 3.4 Mediterranean and Black Sea basin
- 4 Limitations analysis by sector
  - 4.1 Aquaculture
  - 4.2 Wave energy
  - 4.3 Tidal energy
  - 4.4 Wind energy
  - 4.5 Seabed mining
  - 4.6 Biotechnology / Blue Life Sciences
  - 4.7 Offshore fixed terminal / Shipping
  - 4.8 Tourism and Leisure
  - 4.9 Oil and gas
  - 4.10 Fisheries
- 5 Limitations analysis by combination
- 6 References

