A Summary of the SOMOS Project

MAKING MULTI-USE AT SEA SAFE

SOMOS
Safe production Of Marine plants and use of Ocean Space

Safe production of Marine plants and use of Ocean Space:
Technical Standards for Safe Production of Food and Feed from Marine plants and Safe Use of Ocean Space

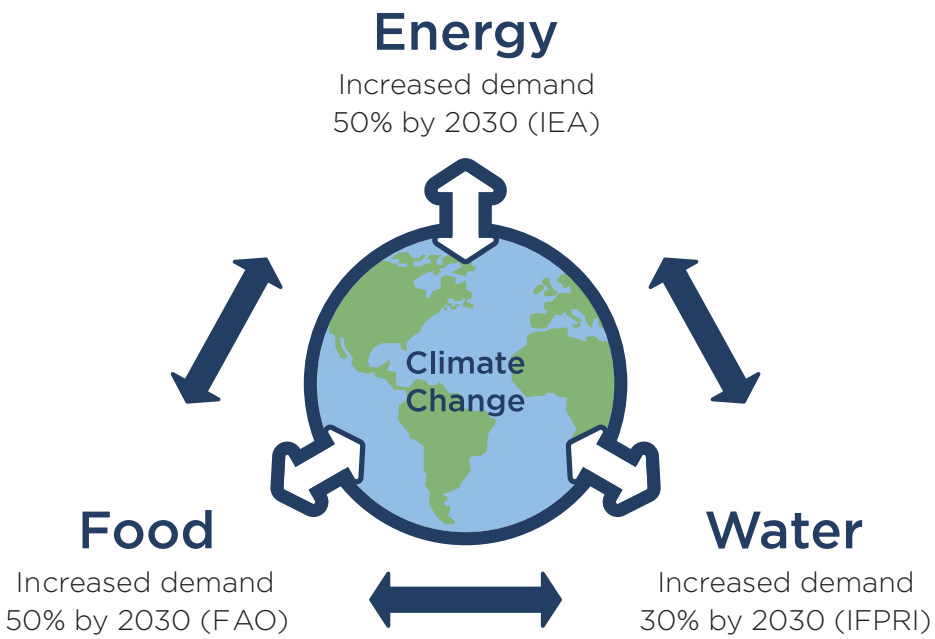
Contents

Why this project?

By 2050, an estimated 10 billion people will inhabit our planet. We will need safe food, drinking water and sustainable energy. This means for example that in the coming decades, food and energy production needs to increase by 50% to be able to meet our population needs.

As our seas and oceans cover 71% of Earth, we should use this area and its resources efficiently to tackle this challenge. Activities at sea can help free up scarce land, while initiatives that make use of salt water can reduce the pressure on our already limited fresh water resources.

Next to more traditional activities such as transport, fisheries, and oil and gas exploitation, today we also increasingly find activities like renewable energy production in wind farms, aquaculture production of fish and shellfish, and the production of seaweed. We also find activities like gravel extraction, mineral harvesting, tourism, coastal defence, nature conservation and building and living at sea on artificial islands.



All these activities make it crowded at sea and this can cause competition for available space and resources. Especially when looking at the North Sea, the most heavily used piece of ocean in the world, competition for available space and resources is rising. This competition is especially fierce in the coastal zone, which is close to port so production facilities can be easily reached and costs for transporting energy among other commodities are kept low.

To use sea space more effectively, one could wonder: can we not combine activities in a single place? For example, by growing seaweed in between the pylons of a wind farm? Then the question arises: can you safely combine activities of a different nature in a single place?

The SOMOS project seeks to answer this question about safety in a multi-use of the ocean!

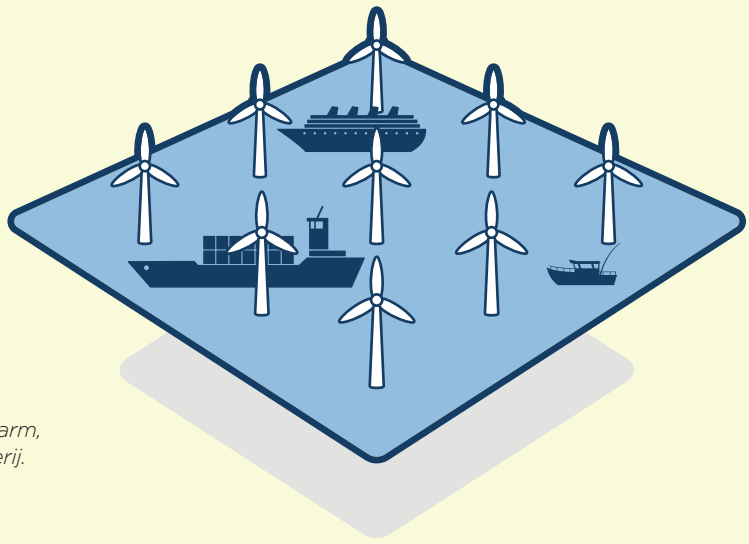
Our Case

As of today, there are no real-life examples of seaweed cultivation inside a wind farm. Given the rapid development of offshore wind energy in the North Sea and resultant spatial claims, there is a growing interest in combining these two activities to produce seaweed for food and feed.

Liability and risks are often mentioned as show-stoppers to multi-use. Therefore, we created a virtual case study based on two actual developments: The Egmond Wind Farm, located off the coast of Egmond in the Netherlands, and the Experimental Zeewierboerderij, located off the coast of Scheveningen. Findings from the case-study were used to refine the framework.

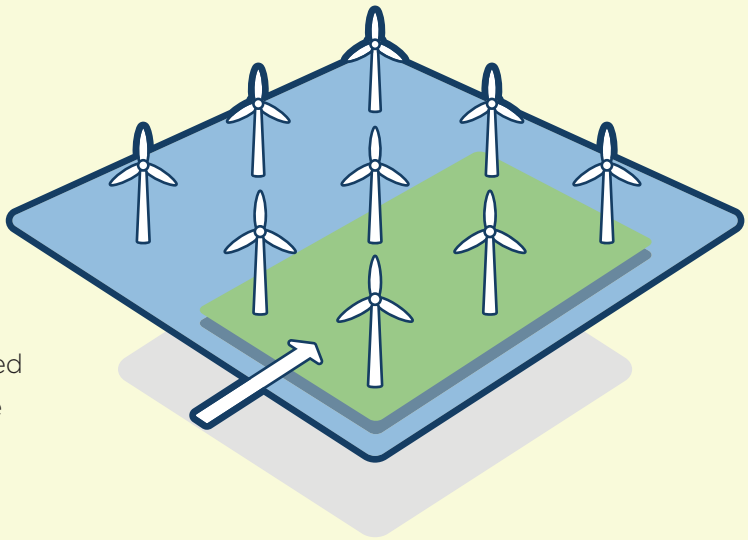
THE EGMOND OFFSHORE WIND PARK

The Egmond offshore wind park (OWEZ) is the first large-scale offshore wind farm built off the Dutch North Sea coast. It is located between 10 and 18 km off the coast of Egmond aan Zee, the Netherlands. The size of the farm is a projected 27 km^2. The OWEZ has 36 wind turbines (Vestas V90-3.0 MV Offshore) with each a capacity of 3 MW, together supplying 100,000 households with sustainable energy. The turbines have a total height of 115 m, a hub height of 70 m, and a rotor diameter of 90 m founded on a grounded monopole with a 4.6 m diameter.



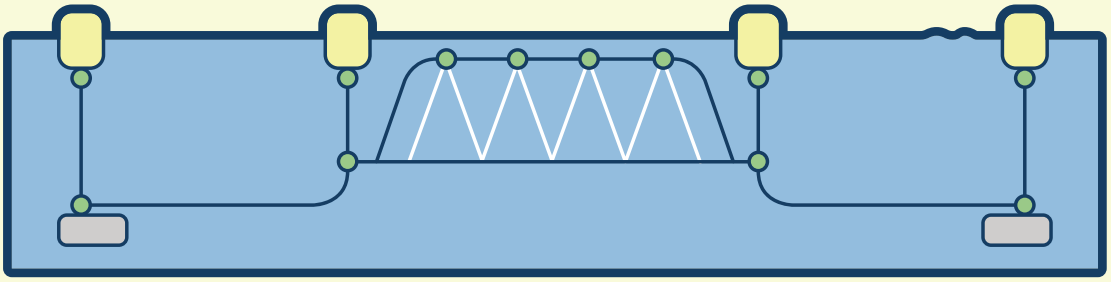
In the north the location of the Egmond windfarm, in the south the location of the Zeewierboerderij.

In order to analyse safety aspects of multi-use, we constructed a virtual case in which, with the characteristics of the Noordzee Boerderij, we projected seaweed production in between the pylons of the Egmond Wind Farm.



THE SEAWEED FARM 'NOORDZEE BOERDERIJ'

The seaweed farm 'Noordzee Boerderij,' is located about 15 km off the coast of Scheveningen, the Netherlands. It is growing a brown seaweed, Saccharina latissima, more commonly known as sugar kelp, sea belt, or Devil's apron, from autumn to spring. In the North Sea, coastal waters nutrients are available in excess. This especially relates to the formation of spring blooms of micro-algae that profit from high winter nutrient concentrations. Therefore, seaweeds produced during winter could benefit from, and mitigate the problems caused by these high nutrient concentrations. Two times a year the seaweed can be harvested using harvesting boats, which share the location with the other users. Currently operating on experimental scale, expected production levels are set at 25 ha, producing 20 ton DM per hectare per year.



Floats and anchors and main lines in which in between the long production line is mounted.

What did we do?

We developed a framework for multi-use safety assessment. This framework helps actors to assess hazards and evaluate control measures to ensure safe multi-use at sea.

The framework consists of 6 phases with safety aspects looked at from three perspectives: food and feed, people and equipment, and environment and cumulative aspects. Each phase defines actions, describes the information actors need, and identifies tools that can be of help. The ultimate goal of the framework is to help ensure safe operations when combining two or more activities at the same time at the same location at sea.

The framework was validated in a case study. The case study focussed on cultivating seaweed inside a windfarm. We obtained information through a series of interviews, discussions, literature reviews, and workshops. In general, the framework structure is applicable to all cases where different operators try to co-locate activities.

In each step of the framework, we describe what you should do, who you should involve, and which tools could be helpful to get through the step.

The framework is “work in progress”. We hope that many will use it and provide us with their feedback so we can improve our work.

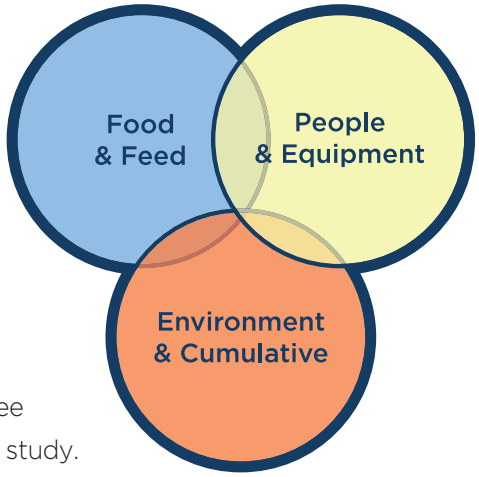
The framework

STEP	WHAT DO YOU DO?	WHO DO YOU INVOLVE?	TOOLS YOU MAY USE
Exploring	Identify the multi-use activities planned or taking place Identify relevant actors Describe the multi-use system	Stakeholders can provide data, information and evidence on crucial steps in the multi-use system	Policy Analysis Stakeholder Mapping Stakeholder Analysis
Understanding	Identify opportunities and threats (hazards) to the multi-use system Identify ambiguities and uncertainties in the multi-use system Implement a Formal and Participatory Risk Assessment Identify control options, mitigation measures and coping strategies	Stakeholders assist in developing a shared identification of hazards and risks	Event and fault trees Probability estimations Bayesian Networks
Appraising	Assess hazards, risks, consequences under different scenarios and events, given the current level of knowledge and understanding Appraise risk management options	Stakeholders provide norms and values to be included in the appraisal of scenarios, likelihoods and consequences and in the development of acceptance criteria for mitigating measures.	Identification critical hazards Cost-Benefit Analysis Multi-criteria Analysis Societal Cost-Benefit analysis
Deciding	Decide on actions to be taken	Stakeholders are involved in the process via co-decision	Bayesian networks
Implementing	Implement actions on safety recommendation	Actors implement the mitigating measures	Policy implementation
Evaluating & Communicating	Review the safety concerns and actions that were taken Determine if additional measures need to be included Communicate the findings of each step to all stakeholders involved and to the outside world	Stakeholders are involved in the analysis of the results	Participatory Evaluation Techniques Efficiency & effectiveness Evaluation

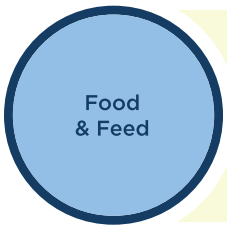
Three lenses

When operating a seaweed farm inside a windfarm, there are safety aspects related to the production of food and feed, safety aspects of man and equipment operating in the area, and ecosystem aspects either local in your area, or elsewhere, and these effects may well accumulate over time.

Of course, the specific risks involved depend on a lot of the characteristics of the operation. For example, the type of seaweed grown, when and how the seaweed is harvested, the frequency of vessels entering the area either for maintenance activities of the windmills, or for attending to the seaweed culture. Also, the spacing of the wind farm pylons and the size and speeds of the vessels operating within the park determine risks.



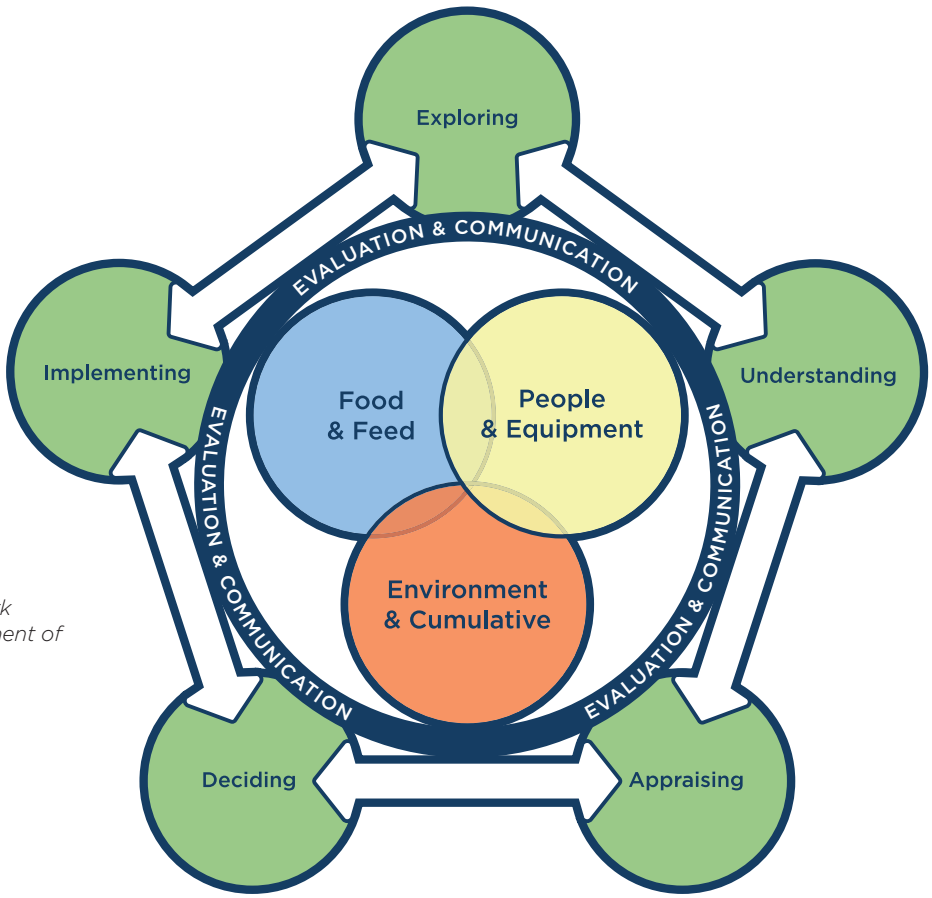
In order to grasp the safety concerns given multi-use, these three lenses were used when evaluating the framework with the case study.



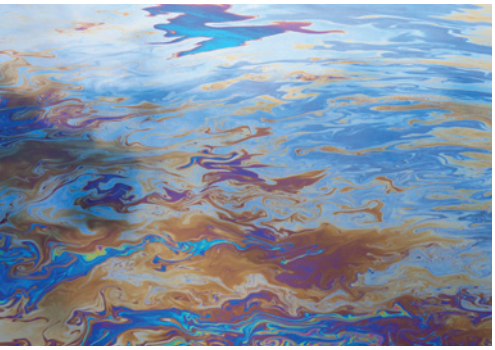
Food & Feed: Looks at identifying relevant feed/food safety hazards with marine production, as well as potential control options for the identified hazards. It also identifies public and private standards for food and feed safety that are relevant for marine production in multi-use settings, and evaluates the applicability of these standards.

People & Equipment: Looks at identifying hazards to people and the equipment they operate. It looks at hazards and actions that can be taken to reduce risks and impacts.

Environment & Cumulative: Looks at identifying the possible risks and opportunities arising in the marine environment from the combination of (novel) maritime activities, competition between alternative uses and the cumulative pollution aspects of all activities combined. It looks at balancing ecological, economic and societal goals.



SOMOS framework for safety assessment of multi-use.



Examples of what can happen

- Collision of a vessel with one of the wind pylons.
- Spilling of oil in the water.
- Seaweed lines get adrift.
- Birds hit rotors and end up in the seaweed.
- Theft of the seaweed.
- Ship-Ship conflicts between the two operators.
- High concentrations of mercury in seaweed.
- Fish aggregate in the seaweed and wind mill park.
- Increased growth of crustacean on the hard substrate of the pylons.
- Seaweed farm attracts more birds, birds collide with the rotors of the wind farm.

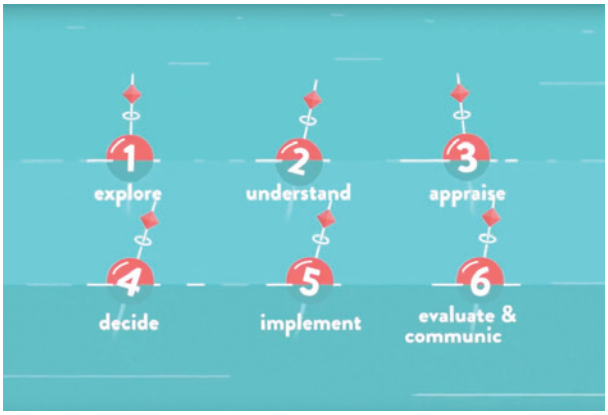
What did we find?

Combing the three perspectives in our SOMOS framework, in a multi use safety assessment:

- the framework helps actors to assess hazards and evaluate control measures to ensure safe multi-use at sea;
- you need information about specific factors which you don't need in a case of single use;
- bringing together different stakeholders, with different cultures and perspectives, and ensuring their involvement is needed is an important task;
- methods (like multi criteria analysis) and tools are available to assist you in analysing safety aspects and appraise multi-use;
- multi-use is possible, but safety given a multi-use perspective should continuously be evaluated.

More information

You can find more information on our website: www.wur.nl/en/project/SOMOS.htm
And we have a few explainer videos; just click on the links below:



- https://youtu.be/9In5BOqc5nY

- https://youtu.be/-IaP2dKfhX8

- https://youtu.be/VwkLN2mNzxw

Colophon

The SOMOS project is a cooperation between Wageningen Research (Wageningen Marine Research, Wageningen Economic Research, Wageningen Environmental Research, RIKILT) and TNO.
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Lloyd's Register Foundation

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