Offshore Low-trophic Aquaculture in Multi-Use Scenario Realisation

Grant agreement number: 101094065

Topic: HORIZON-MISS-2021-OCEAN-04-01

Starting date: 1 January 2023

Duration: 48 months

D9.3

Title: Minutes of GC meeting year 1

Date of delivery: 29 February 2024

Organization name of lead participant for this deliverable:

Havforskningsinstituttet (IMR)

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Dissemination level		
PU	Public, fully open	
Sen	Sensitive, limited under the conditions of the grant agreement (only for members of the consortium, incl the Commission Services)	x

Deliverable number:	D9.3
Deliverable title:	Minutes of GC meeting year 1
Work package:	9
Lead participant:	IMR

Authors		
Name	Organisation	E-mail
Anita Jacobsen*	IMR	anita.jacobsen@hi.no
Øivind Bergh	IMR	oeivind.bergh@hi.no
Turid Loddengaard	IMR	turid.loddengaard@hi.no

*corresponding authors

Keywords
minutes, annual meeting, year 1, Copenhagen, status

Executive Summary
Deliverable 9.3 represents the minutes of the meeting. The OLAMUR annual partner meeting year 1 was organized by the coordinator (IMR) and Beneficiary 4, Aarhus University (AU) 08 – 11 of January 2024 in Copenhagen, Denmark. Altogether 57 participants attended the meeting (see List of Participants in Appendix 2), representing most of the OLAMUR beneficiaries, members of the Advisory Board and three invited speakers. The main aim of the meeting was to catch up on the status progress of the project, to learn what everyone is doing and plan the work for the coming year. A day trip to pilot B, Kriegers Flak, and a visit to Vattenfalls location at Møn was also performed.

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Table of Contents

MEETING MINUTES 3
Introduction 3
Work package presentations 4
Invited speakers 6
Governing Council 6
Advisory Board 6
APPENDIXES 7

MEETING MINUTES

All presentations and work scheduled in the agenda (see Appendix 1) were implemented as planned.

Introduction

In total 57 persons participated, 53 were present in person and 4 digital. Three invited speakers were present on the 10th of January of which 2 were present digital. All partners were represented except for Beneficiary 10 Skarv Technologies AS, Beneficiary 15 Redstorm OU and Beneficiary 18 Ösel Aquafarms OU (Appendix 2).
Four Advisory Board (AB) members were present at the kick-off meeting; Ann-Lisbeth Agnalt (ICES/IMR), Bo Fyring Sørensen (Foga Aps, Foga Consult ApS), Ute Brönner (Sintef Ocean) and Paul Dobbins (WWF).
The annual partner meeting was opened with a welcome speech by the Coordinator Øivind Bergh (IMR) (Appendix 1 and 3). The first day of the meeting was devoted to status updates on achievements within the first year of the project from WP1 to WP6 by the respective WP-leads and co-leads. A day trip to visit the pilot site B, Danish Kriegers Flak and Møns Klint, was organised on the 9th of January (Appendix 1). The meeting was continued by reviewing the status of achievements from WP7 to WP9 by the respective WP-leads and co-leads on the 10th of January. After lunch there were presentations from three invited speakers: The OLAMUR sister project ULTFARMS was introduced and possible collaboration discussed (Loreta Cornacchia, Deltares). The Chair of the ICES Science Committee introduced potential overlap with OLAMUR (Jörn Smith, ICES) and Professor Jacob Nabe-Nielsen (Leader of Center for Green Transition and Marine Ecology, Aarhus University). The workplan for the next 12 months was discussed, the Governing Council meeting was performed, and the day was ended

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by feedback from the Advisory Board (Appendix 3). The last day of the meeting (11th of January) was devoted to separate workshops.

Work package presentations

Status progress of each work package was presented by their respective WP-leads and co-leads. All presentations are available in Appendix 3 and on the projects SharePoint-site (WP9/meetings).
In general, all is mainly running according to plan, only minor delays that will not have an impact on other activities in some WPs.
Below are the WPs summarized in addition to some minor comments:

WP1 Multi-use Pilot Farms: Organisation, Implementation and Operation.
Presented by Wolf Isbert (AWI), Annette Bruhn (AU) and Martin Georg (UT), see presentation in Appendix 3.
All is running OK. Permits are now nearly finalized for Case study A (Germany). The Federal Maritime and Hydrographic Agency (BSH) seems positive, incl. evaluation by Federal Armed Forces and General Directorate for Waterways and Shipping (GDWS). Case study A will begin in early May, while Case study B (Denmark) and Case study C (Estonia) have started.
Deliverable D1.4 (Data on site and systems specific CAPEX and OPEX of LTA operations) with due date 31 Dec 2024 will be postponed due to lack of data, because the first harvest will be in spring 2025.
Responsible partner (UTARTU) and WP-lead will make justifications to be used for an amendment.

WP2 Optimal siting for multi-purpose use of marine space.
Presented by WP-lead Prof. Marie Maar (AU) and task leads Ian Overton (GCF), Asbjørn Christensen (DTU) and Merli Rätsep (UT), see presentation in Appendix 3.
All is running according to plan.

WP3 Low trophic aquaculture performance
Presented by WP-lead Dr. Antonio Aguera (IMR), see presentation in Appendix 3.
Work has started on models.
MS3.3 and D3.4 will most likely be delayed. Current status depending on LT activity at pilots (OWF). Mussels and macroalgae in those pilots will not be ready for sampling until spring 2025.
MS3.3 Samples of seaweeds and mussels received from T1.4 for composition analysis (AU & AWI | December 2024), new due date will be in June 2025. This is because case study B, Kriegers Flak, will have the first harvest in spring 2025.
D3.4 Report on protocol for food and feed safety (Lead: IMR | December 2025) is therefore also likely to be delayed based on LT species sampling timeline in MS3.3.

WP4 Environmental monitoring, forecasting and assessment.
Presented by WP-lead Dr. Jun She (DMI), see presentation in Appendix 3.

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All is running according to plan, except for a minor delay in task 4.1. Sea trials with Maritime Robotics and Skarv Technology are delayed, will be conducted in Q1 2024 in Trondheim.

WP5 Data-based service system

Presented by WP co-lead Dr. Giulia Dapueto (ETT spa), see presentation in Appendix 3.

All is running according to plan. Partners have started to upload data.

Information needed:

1. FTP + ERDDAP & GeoServer – all
2. ERDDAP & GeoServer – Accessibility – WP1 and WP6
3. Metadata - EDMO code – KLU

WP6 Sustainability - viable concepts for carbon neutral seafood production and market projections

Presented by WP-lead Prof. Marianne Thomsen (UCPH), see presentation in Appendix 3.

All is running according to plan.

Discovered that WP6 operates with two different names in the Do A. This needs to be amended. Sustainability -*viable concepts on policy and marketing* and Sustainability-*viable concepts for carbon neutral seafood production and market projections.*

WP6 and 7 – The triple layer business model workshop.

Presented by WP6-lead Prof. Marianne Thomsen (UCPH) and WP7-lead Dr. Dorothy Dankel (SO), see presentation in Appendix 3.

WP7 Governance of integrated socio-ecological technical system

Presented by WP-lead Dr. Dorothy Dankel (SO), and Emily Cowan (SO), see presentation in Appendix 3.

All is running according to plan.

WP8 Communication, Dissemination & Exploitation

Presented by WP-lead David Basset (EATiP) and Pamela Ernstberger (EATiP), see presentation in Appendix 3.

All is running according to plan. All partners must remember DEC responsibilities to WP8.

A social media mapping exercise will be re-run. Please reply!

DEC logs are needed for the continuous report and for D8.3. Template for log will soon be on SharePoint for everybody to complete.

WP9 Management and coordination

Presented by co-lead Dr. Anita Jacobsen (IMR), Financial manager Turid Loddengaard (IMR) and Data manager Rocio C. Primo (IMR) see presentation in Appendix 3.

All is running according to plan. The first periodic report is approaching (M18). The call for Associated regions will be published 1 February 2024.

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Invited speakers

Three speakers were invited: Dr. Loreta Cornacchia (Deltares) to present the ULTFARMS project. Chair of ICES Science Committee Jörn Smith (ICES) presenting ICES and aquaculture, including different working groups and the advice process. Professor Jacob Nabe-Nielsen (Leader of Center for Green Transition and Marine Ecology, Aarhus University) presenting the GTM, expansion of OW and the need for new approach. See presentations in Appendix 3.

Governing Council

The Governing Council (GC) meeting was held on the 10th January (see Appendix 1).
All partners were present except for Beneficiaries 7, 8, 10, 15, 18, 23 and 24.
GC is the overall decision-making body in the consortium and takes decisions on content, finances, IPR and evolution of the consortium (according to the CA).
No issues/agenda items were reported within the deadline (10/12/23).
An amendment will most probably be needed to correct some typos in the DoA and postpone some due dates of some deliverables. It was agreed that the coordinator will send an amendment request to correct this.
It was also agreed by all that the next annual partner meeting will be held in Estonia (Saaremaa, Kuresaarae) near the pilot site C in week 12 2025.

Advisory Board

The AB contribution to the project is to provide independent advice and comments on OLAMUR outputs and to support progress. The AB will be involved at the annual meetings and respond to requests from the project, if any.
The AB gave their feedback to the consortium in plenum at the end of the 10th of January when all presentations had been held.
Positive things they commented on:

- Project is on track and things are going well
- Good progress, should be proud of our self
- Things are in water
- The partners are open minded and collaborative
- Engaging industry partners (e.g. Lerøy and others)

Negative:

- Lack of vision – what do you want in the future?
- Could not see why you are doing this – where will you be in the end?
- The WPs could be more integrated, exchange of data – would like to see more of that.

Other things to consider:

- An outcome could be to provide a roadmap in the end
    - What to consider
    - Permits – what is needed – can be different from area to area
    - Insurance – similar to permits – who is taking the risk?
- The voice of the farmers is invisible, should see their voice and how does the work relate to the farmers.
- Regarding budgets – prices have gone up since the project was initially budgeted. This can be a problem in the future.

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Improvements to next meeting:

- Bring down status and look forward (not so much looking backwards). Where are we now and what will we do. Set results in perspective.
- At the next annual meeting the AB could give a quick strategic input from their respective areas.

Group picture from the OLAMUR annual partner meeting at Vattenfalls location at Møn. Photo by: Annette Bruhn (AU).

APPENDIXES

Appendix 1. Agenda
Appendix 2. List of participants
Appendix 3. Presentations

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Appendix 1.

Agenda

OLAMUR Annual partner meeting 8-11 January

8 January

09:00-12:00 WP6 and 7 separate meeting - synergies and sustainability assessment

11:30 – 12:30 lunch at hotel

13:00 – 13:15 Welcome and practicalities (Coordinator)

Status WPs

13:15 – 13:45 WP1

13:45 – 14:15 WP3

14:15-14:45 WP4

14:45-15:15 Break

15:45-16:15 WP2

16:15-16:45 WP5

16:45-17:15 WP6

Social project dinner at hotel (paid by project)

9 January

Daytrip to Møn (see own agenda, bring practical clothes)

Bus from hotel. Leaves at: 07:45

Dinner in town - https://www.rizraz.dk/ (paid individually)

10 January

09:00-09:30 WP7

09:30-10:00 WP8

10:00-10:30 WP9 – status + upcoming PR1

11:30 – 12:30 Lunch

Session invited speakers

12:30-13:00 Ultfarms

13:00-13:30 Chair ICES science committee - Jörn Schmith

13:30-14:00 Center for Green Transition and Marine Ecology, Professor Jacob Nabe-Nielsen

14:00-14:30 Questions and discussions

14:30-15:00 Break

15:00–15:30 Workplan next 12M what's in the pipeline – plans and deliverables

15:30–16:00 Governing council (1 rep from all partners present) formal meeting on any legal, financial or scientific changes, or other matters that need a decision.

16:00-17:00 Feedback from Advisory Board and discussions

11 January – dedicated to separate WP meetings.

08:30-11:30 WP1 – case studies

WP2, 3 and 4 - how to implement different components into models:

- Seaweed model
- Mussel model
- IMTA
- LTA effects on HD and ecology
- OWF effects on HD and ecology
- Ecosystem services (CNP removal, water clarity)
- Input to MSP in WP2 (what data layers can we provide?)
-

WP6 and WP7 – Synergies and sustainability assessment

WP8 and 9 – OLAMUR open call for Associated Regions

11:30 – 12:00 End of meeting – closing remarks by coordinator

12:00 -13:00 Lunch

Site visit to OLAMUR pilot site B, Danish Kriegers Flak, and Møns Klint

Tuesday the 9th of January 2024 (Contact: Annette Bruhn, anbr@ecos.au.dk, +45 2963 8034).

07:45: Departure from ParkInn Hotel, Copenhagen, by bus

10: Arrival at GeoCenter Møns Klint (UNESCO world heritage)

10-11:30: Guided tour at Møns Klint by Director Nils Natorp

11:30: Departure for Hotel Møen, Stege

12-13: Lunch at Hotel Møen

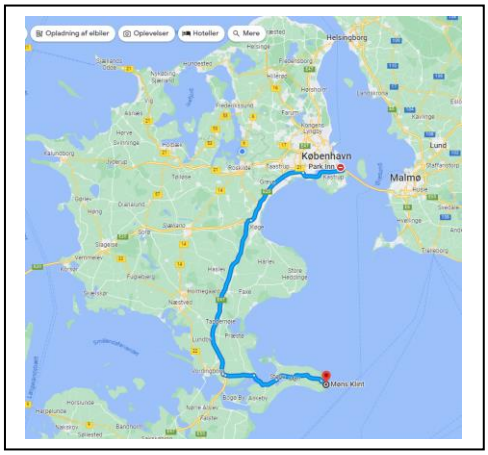
13: Departure from Hotel Møen for Klintholm Harbour

13:30-15: Guided tour of Vattenfall DKF by Morten Skouboe (Site manager) and Arne Rahbek (Community and Stakeholder manager)

15-16: Small walk, coffee and cake at Klintholm Harbour

16: Departure from Vattenfall, Klintholm Harbour

18: Arrival back at ParkInn Hotel



Appendix 2. List of participants

Entry #	Name - First	Name - Last	Organisation	Email	08.01.2024	09.01.2024	10.01.2024	11.01.2024
1	Mads	Hecter	Kerteminde Seafarm	mads@seafarmer.dk			digital	
2	Jens	Murawski	DMI	jmu@dmi.dk	x	x	x	x
3	Vilnis	Frishfelds	DMI	vifr@dmi.dk	x	x	x	x
4	Jun	She	DMI	js@dmi.dk	x	x	x	x
5	Axel	Nybakken	Univ of Århus	axny11@gmail.com	x	x	x	x
6	Yvonne	Grünewald	yg mytilus	yg@mytilus-maritime.com	x			digital
7	David	de Leeuw	yg mytilus	yg@mytilus-maritime.com	x			
8	Johannes	Pein	Hereon	johannes.pein@hereon.de	x	x	x	x
9	Ute	Brönner	SINTEF Ocean	ute.broenner@sintef.no	x	x	x	x
10	Joanna	Staneva	Hereon	joanna.staneva@hereon.de			x	x
11	Ragnhild Beck	Hestness	Lerøy Seafood Group ASA	ragnhild.hestness@leroy.no	x	x	x	x
12	Holger	Huhn	WindMW Service GmbH	holger.huhn@windmw.de	x	x	x	x
13	Matthieu	Povidis Delefosse	Vattenfall	matthieu.povidis-delefosse@vattenfall.com	x	x		
14	Antonio	Aguera	IMR	antonio.aguera@hi.no	x	x	x	x
15	Kristina	Tiivel	Estonian Marine Institute, University of Tartu	kristina.tiivel@ut.ee	x	x	x	x
16	Øivind	Strand	Institute of Marine Research	oivinds@hi.no	x	x	x	x
17	Turid Stamnesfet	Loddengaard	Havforskningsinstituttet	turid.loddengaard@hi.no	x	x	x	x
18	Bo	Fyhring Sørensen	Foga ApS	bfs@foga.dk	x	x	x	x
19	Jochen	Hinkel	Global Climate Forum, e.V.	hinkel@globalclimateforum.org	x	x	x	x
20	Janus	Larsen	Aarhus Universitet	janus@ecos.au.dk	x	x	x	x
21	Jack	Hall	Estonian Marine Institute, Universtiy of Tartu	jack.hall@ut.ee	x	x	x	x
22	Marianne	Thomsen	University of Copenhagen	mth@food.ku.dk	x	x	x	x
23	David	Bassett	EATiP	david@eatip.eu	x	x	x	x
24	Henning	Wehde	IMR	henningw@hi.no			x	x
25	Merli	Rätsep	University of Tartu	merli.ratsep@ut.ee	x	x	x	x
26	Mihhail	Fetissov	Estonian Marine Institute University of Tartu	mihhail.fetissov@ut.ee	x	x	x	x
27	Rocio	Castano Primo	IMR	rocio.castano.primo@hi.no	x	x	x	x
28	Andreas	Holbach	Aarhus Univeristy	anho@ecos.au.dk	x	x	x	x
29	Asbjørn	Christensen	DTU Aqua	asc@aqua.dtu.dk	x	x	x	x
30	Beatrice Maddalena	Scotto	ETT S.p.A.	beatrice.scotto@grupposcai.it	x	x	x	x
31	Giulia	Dapueto	ETT S.p.A.	giulia.dapueto@grupposcai.it	x	x	x	x
32	Ann Lisbeth	Agnalt	Institute of marine research	ann-lisbeth.agnalt@hi.no	x	x	x	x
33	Seyed Taleb	Hosseini	Helmholtz-Zentrum Hereon	seyed.hosseini@hereon.de	x	x	x	x
34	Paul	Dobbins	World Wildlife Fund	paul.dobbins@wwfus.org	x	x	x	x
35	Stephan	Durst	AWI	stephan.durst@awi.de	x	x	x	x
36	Tim	Wilms	Vattenfall	tim.wilms@vattenfall.com	x		x	x
37	Ian	Overton	Global Climate Forum, e.V.	ian.overton@globalclimateforum.org	x	x	x	x
38	Øivind	Bergh	Institute of Marine Research	oeivind.bergh@hi.no	x	x	x	x
39	Georg	Martin	University of Tartu	Georg.martin@ut.ee	x	x	x	x
40	Pamela	Ernstberger	EATiP	communication@eatip.eu	x	x	x	x
42	Sofie	Laage Christiansen	Algecenter Danmark	slc@kattegatcentret.dk	x	x	x	x
43	Wolf	Isbert	Alfred Wegener Institute Helmholtz-Centre for Polar and Marine Research (AWI)	wolf.isbert@awi.de	x	x	x	x
44	Marie	Maar	Aarhus Universitet, ECOSCIENCE	mam@ecos.au.dk	x	x	x	x
45	Annette	Bruhn	Aarhus Universitet, Ecoscience	anbr@ecos.au.dk	x	x	x	x
46	Harald	Sveier	Lerøy Seafood Group ASA	harald.sveier@leroy.no	x	x	x	x
47	Emily	Cowan	SINTEF Ocean	Emily.cowan@sintef.no	x	x	x	x
48	Anita	Jacobsen	Havforskningsinstituttet	anita.jacobsen@hi.no	x	x	x	x
49	Cordula	Göke	Aarhus Universitet, ECOSCIENCE	cog@au.dk	x	x	x	x
50	Edvinas	Tiškus	Klaipeda University	edvinas.tiskus@ku.lt	x	x	x	x
51	Martynas	Bučas	Klaipeda University	martynas.bucas@ku.lt	x	x	x	x
52	Teis	Boderskov	Aarhus Universitet, ECOSCIENCE	tebo@ecos.au.dk				x
53	Dorothy	Dankel	SINTEF Ocean, Climate & Environment	dorothy.dankel@sintef.no	x	x	x	
54	Carlotte	Clubley	Aarhus Universitet	charlotte.clubley@postgrad.plymouth.ac.uk	digital		digital	
55	Anna	Willstrand Wranne	VOTO	anna.wranne@voiceofthеocean.org	digital		digital	
56	Sarah	Loftus	NOAA	sarah.loftus@ee.doe.gov	digital			
57	Ivan	Kingman	Marine Robotics	ivan@maritimerobotics.com	digital			
Invited speakers								
	Loreta	Cornacchia	ULTFARMS	loreta.cornacchia@deltares.nl			digital	
	Jacob	Nabe-Nielsen	Aarhus Universitet, ECOSCIENCE	jnn@ecos.au.dk			digital	
	Jörn	Smith	ICES	joern.schmidt@ices.dk			x	

Appendix 3.

Presentations from the OLAMUR annual partner meeting 8-11 January 2024.

Demonstrating Open Ocean Multi-Use – OLAMUR

(Offshore Low-Trophic Aquaculture in Multi-Use Scenario Realisation)

Opening remarks, Copenhagen meeting Jan 8-11. 2023

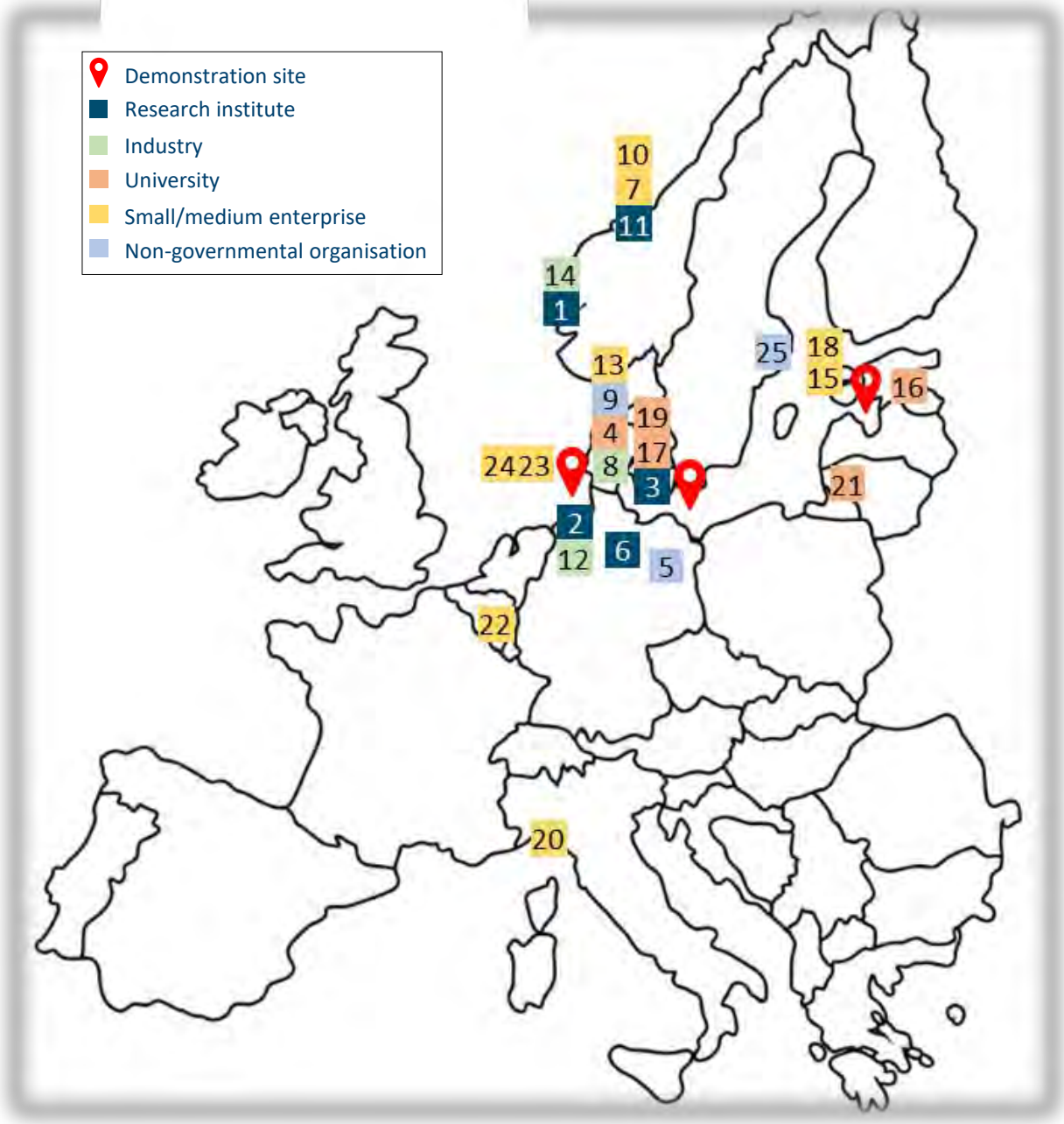
Øivind Bergh

EU grant 101094065
1st Jan **2023** – 31st Dec **2026**

Photo: Vattenfall

25 partners from research, organisations and industry

1 Havforskningsinstituttet , Norway
2 Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research , Germany
3 Danmarks Meteorologiske Institut , Danmark
4 Aarhus Universitet , Danmark
5 GCF - Global Climate Forum EV , Germany
6 Helmholtz-Zentrum Hereon , Germany
7 Maritime Robotics AS , Norway
8 Vattenfall Europe Windkraft AS , Danmark
9 Kattegatcentrets Driftsfond , Danmark
10 Skarv Technologies AS , Norway
11 SINTEF Ocean AS , Norway
12 WindMW GmbH , Germany
13 Kerteminde Seafarm Aps , Denmark
14 Lerøy Seafood Group ASA , Norway
15 RedStorm OÜ , Estonia
16 Tartu Ulikool , Estonia
17 Danmarks Tekniske Universitet , Danmark
18 Ösel Aquafarm OÜ , Estonia
19 Københavns Universitet , Danmark
20 ETT Spa , Italy
21 Klaipedos Universitetas , Lithuania
22 Platforme Technologique et de l'innovation de l'aquaculture Europeenne ASBL , Belgium
23 Nordfriesische Seemuschel GmbH , Germany
24 Wyk 8 Muschelfischereibetrieb GmbH , Germany
25 Stiftelsen Voice of the Ocean , Sweden



OLAMUR

Photos Jack Royd Hall
University of Tartu

OLAMUR

olamur@hi.no
https://olamur.eu

Photos: Vattenfall, IMR (Erling Svensen)

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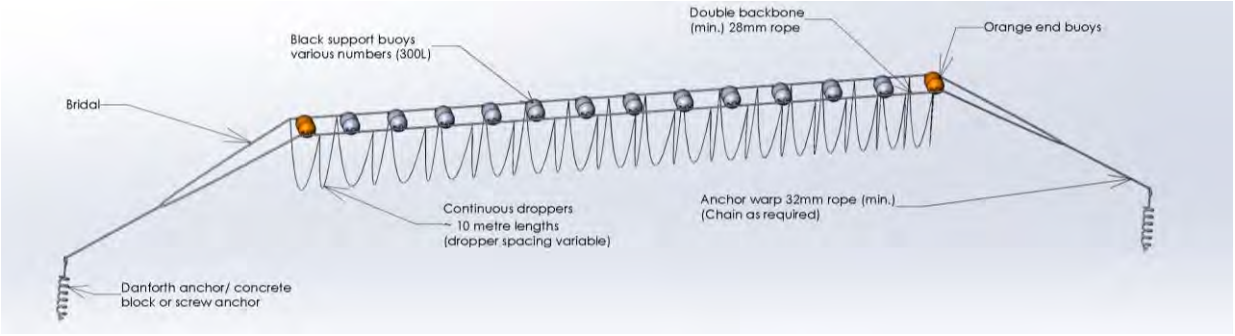
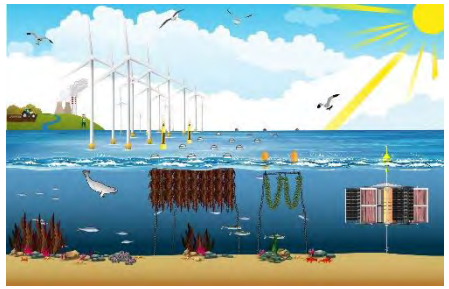




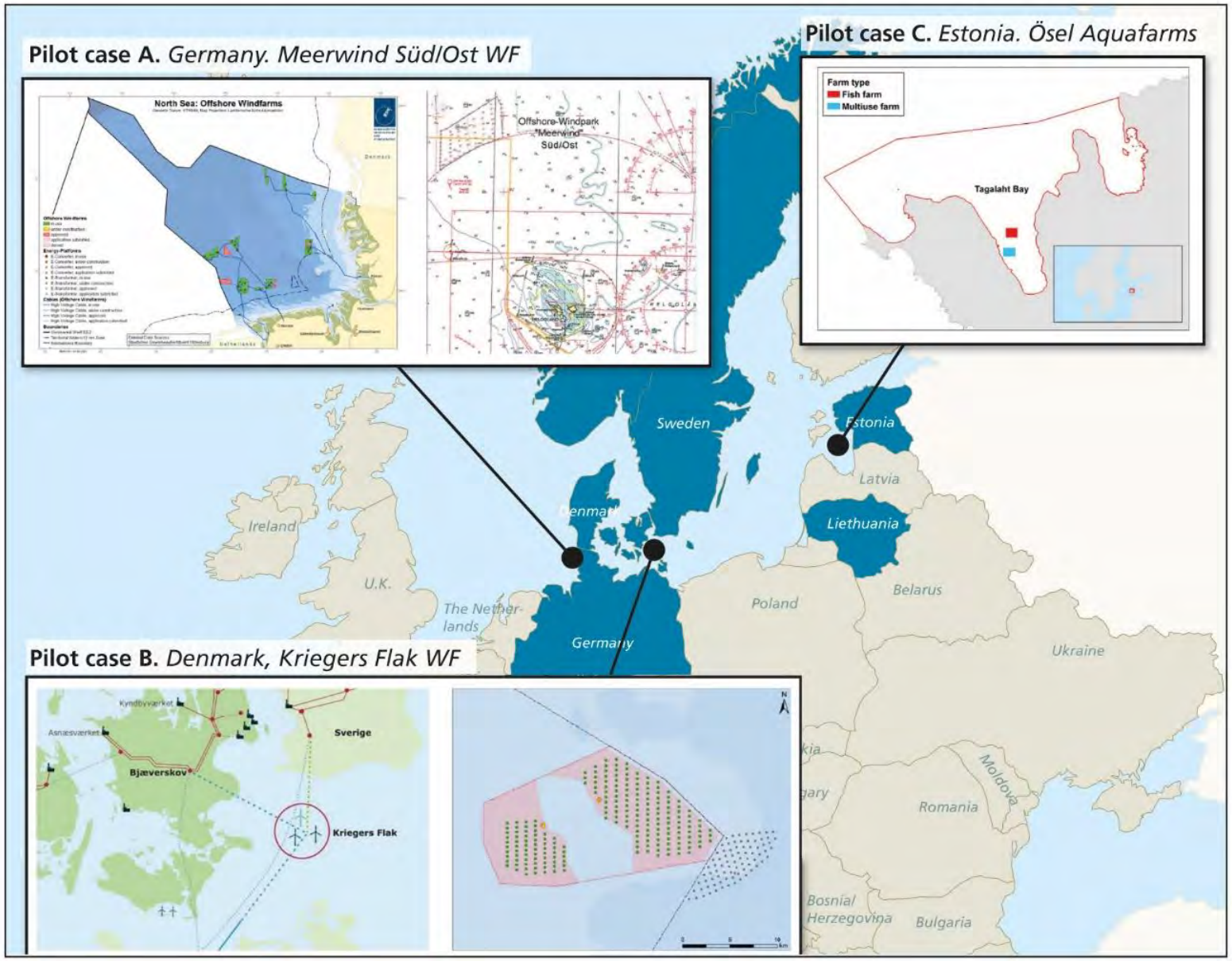
EU-Project OLAMUR

Offshore Low-trophic Aquaculture in Multi-Use scenario Realisation (**WP 1**)

Copenhagen, 8-11th January 2024, Annette Bruhn, Martin Georg, Merli Rätsep, Wolf Isbert

Horizon 2020
European Union Funding
for Research & Innovation

HORIZON-MISS-2021-OCEAN-04-01
Project ID: 101094065



Case Studies:

- A: Germany (North Sea)
- B. Denmark (Baltic Sea)
- C: Estonia (Baltic Sea)

Pilot farms: parameter			Case Study A Germany	Case Study B Denmark	Case Study C Estonia
sea basin			North Sea German EEZ (offshore)	Baltic Sea Danish EEZ (offshore)	Baltic Sea Estonian Sea (nearshore)
Case Study lead			AWI	AU	UT
condition of water column			open ocean/ extremely exposed	open ocean/ exposed	Sheltered
water depth			28 m (TR 4.5 m)	16-30 m (TR 0.5 m)	25 m (TR 0.2 m)
multi-use partner	co-use partner	type of partnership	low-trophic aquaculture candidates: blue mussel (*M. edulis*) Eur. Oyster, (*O. edulis*) sugar kelp (*Saccharina latissima*) sea lettuce (*Ulva sp.*)	low-trophic aquaculture candidates: blue mussel (*M. edulis*) sugar kelp (*Saccharina latissima*) sea lettuce (*Ulva sp.*)	low-trophic aquaculture candidates: blue mussel (*M. edulis*) sea lettuce (*Ulva intestinalis*)
		technology	longline/"SF Tower"	longline	longline
		location at the host partner	in the area of the OWF, to be defined in T1.1		within 500 m
	host partner	type of partnership	OWF Meerwind Süd/Ost (WindMW)	OWF Kriegers Flak (Vattenfall)	fish farm (RedStorm OÜ, Ösel Aquafarms)
		distance to next harbour	12.4 nautical miles (Helgoland)	8 nautical miles (Klintholm Havn)	2 nautical miles (Port of Veere)
		n turbines/ fish farms	80	72	1
		coordinates	54°23′0″ N, 7°41′0″ E	55°1′34″ N, 12°56′20″ E	58°27′41″ N, 22°4′30″ E

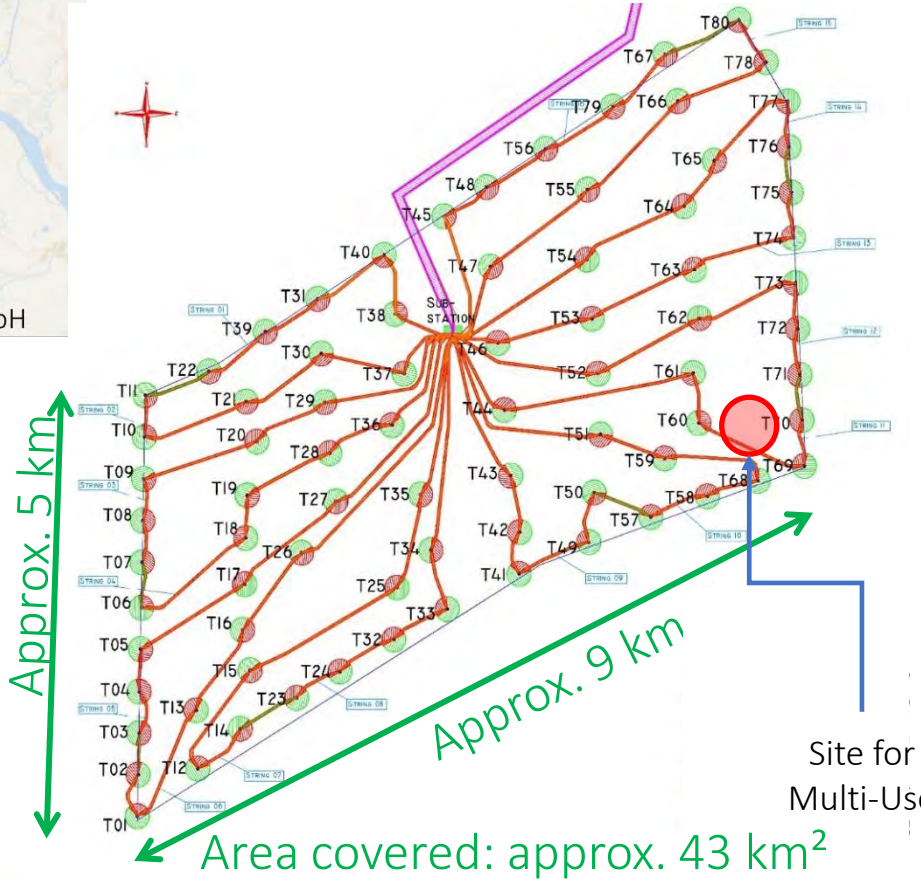
TL = tidal range, SF = Shellfish

From a high energy environment to a "duck pond"

Extractive Species (LTA only)

Partnership

Case Study A – Meerwind Süd/Ost



Study area: SE-corner of windfarm

Meerwind Süd | Ost
[288 MW Offshore Wind Farm]
Company and asset presentation
11.01.2023
Falldorf, Andrea
Senior Engineer Special Operations

Case Study A – Meerwind Süd/Ost

Application for permit to the Federal Maritime and Hydrographic Agency (BSH)
2nd November 2023

Comprises relevant information to:

- marker spare buoys for the closure of the study area in the windfarm

- wave buoy, radar, Ferry Box (Hereon)

- Smart Farm (modified)

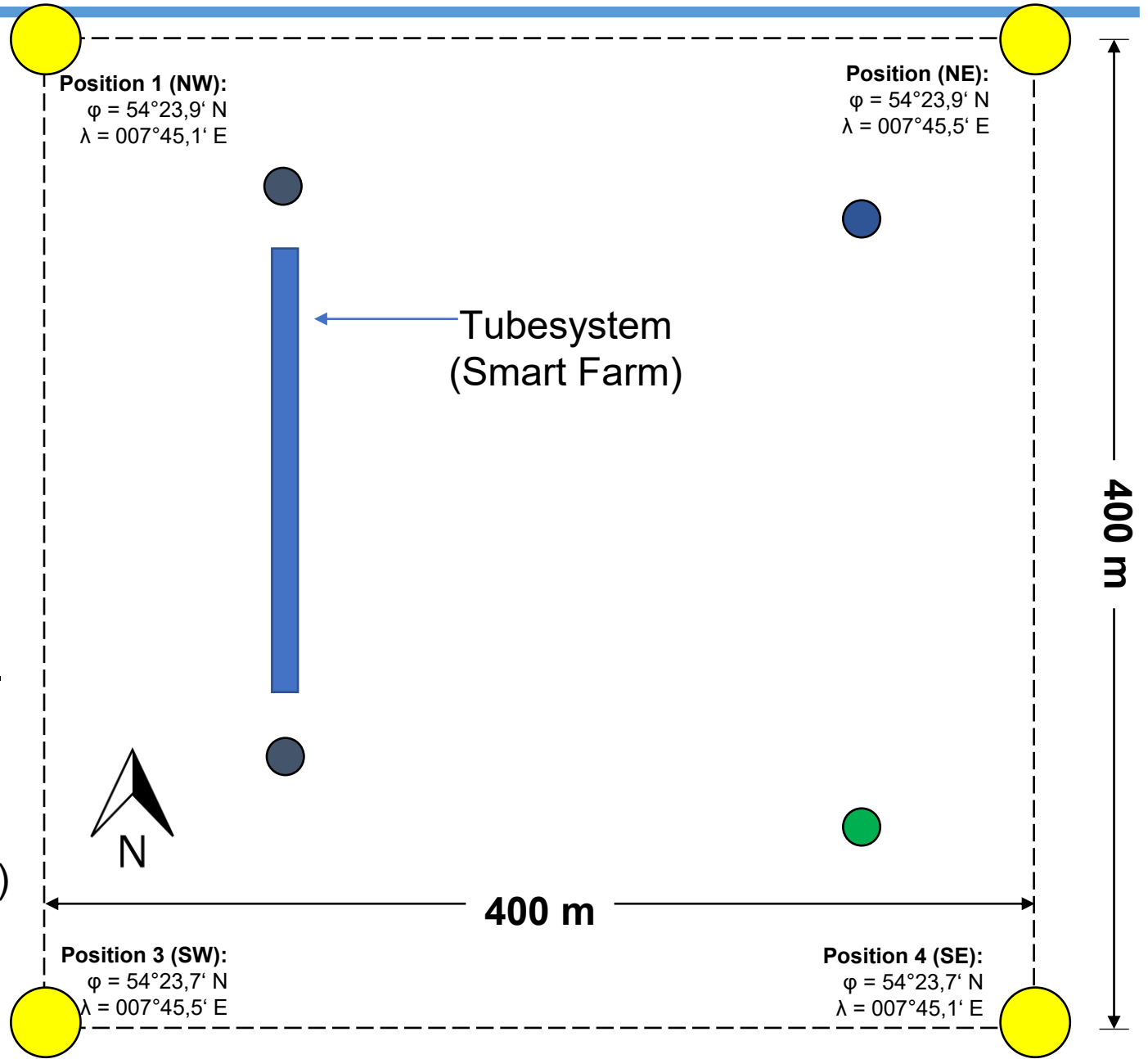
- Shellfishtower (modified)

Last notice by BSH (3rd January 2024) – decision **seems positive**, incl. evaluation by Federal Armed Forces and General Directorate for Waterways and Shipping (GDWS)

Case Study A – Scheme

Study/Test Area (AWI, HEREON, WindMW)

- 4x Marker spare buoys
  incl. position
- 1x Wave buoy (Position c. 80-100 m SW of marker spare buoy NE)
- 1x Shellfish-Tower
  (Position c. 80-100 m NW from marker spare buoy SE)
- 2x Marker buoys/fender for smart-farm anchors
  (northern position c. 100 m SE from marker spare buoy NW, southern position c. 200 m NE from marker spare buoy SW)



Case Study A – Measurements in OWF

X-band-Marine Radar (on substation platform)
- Spectral wave parameters
- Surface current field

Wave Rider Buoy (within experimental area)
- Individual waves
- Spectral wave parameters

Permission is still partly missing!!!

Ferry Box (on Crew Transfer Vessel)
- Temperature, Salinity, pH, Oxygen
- Chlorophyl A (fluorescence)
- Colored Dissolved Organic Matter

Seafloor mapping and check of subsea infrastructure: Skarv Technologies (ROV) & Maritime Robotics (USV) probably in June 2024

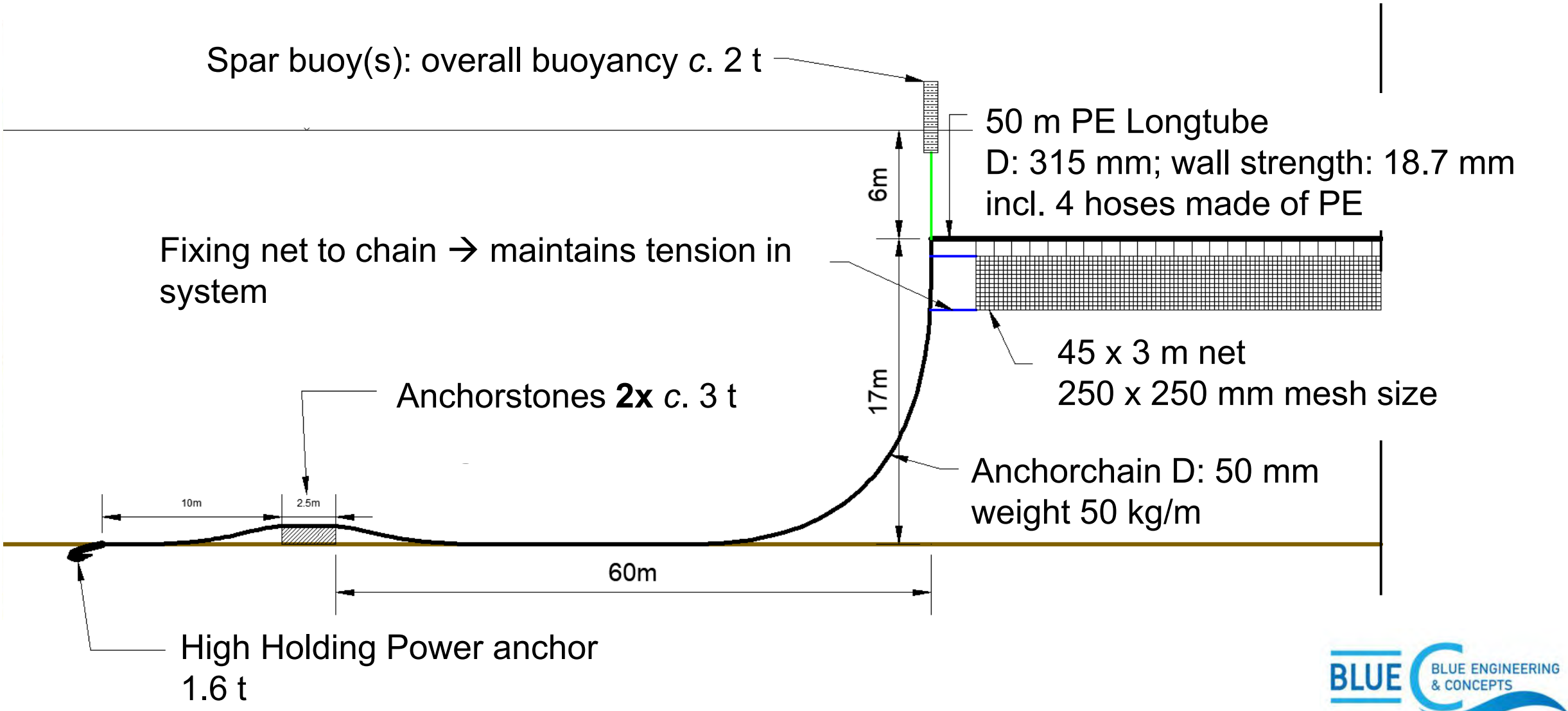
Case Study A – Smart Farm System

SMART-Farm (NO)

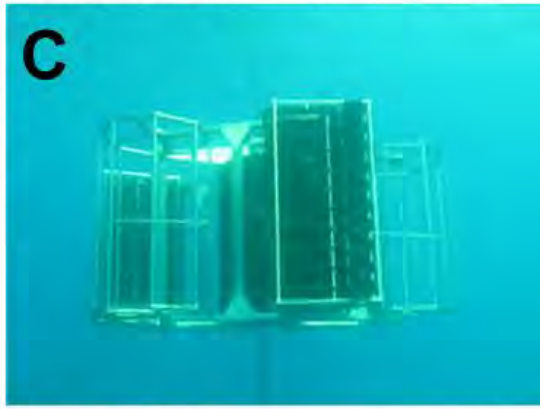
System in Germany
(Jade, Büsum, Hörnum).

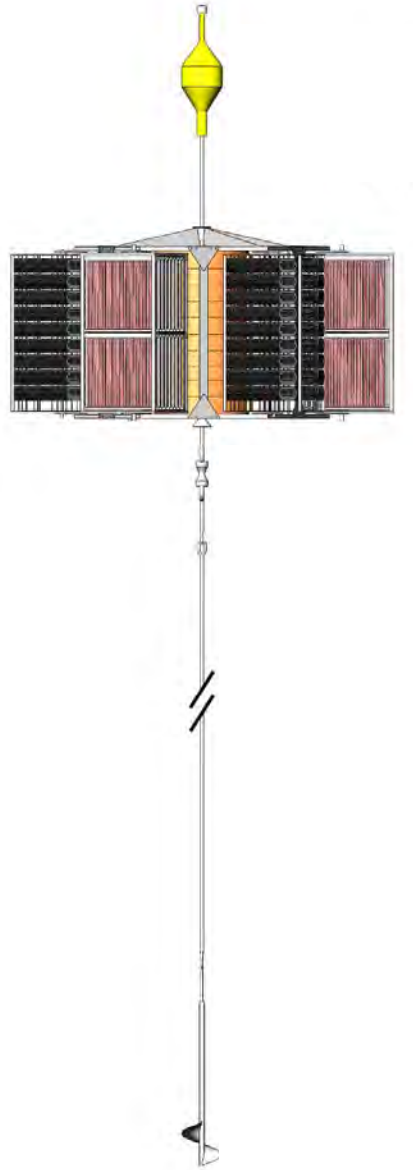
Case Study A – Smart Farm System

SMART-Farm (modified)



Case Study A – Shellfish Tower System

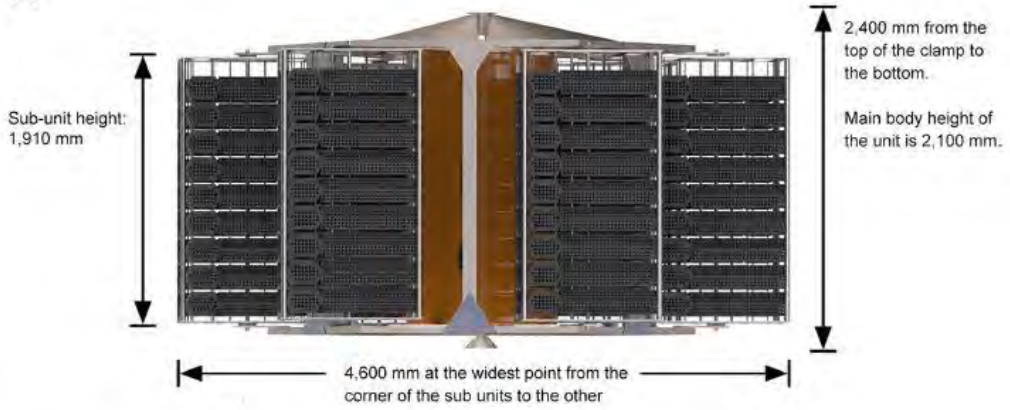


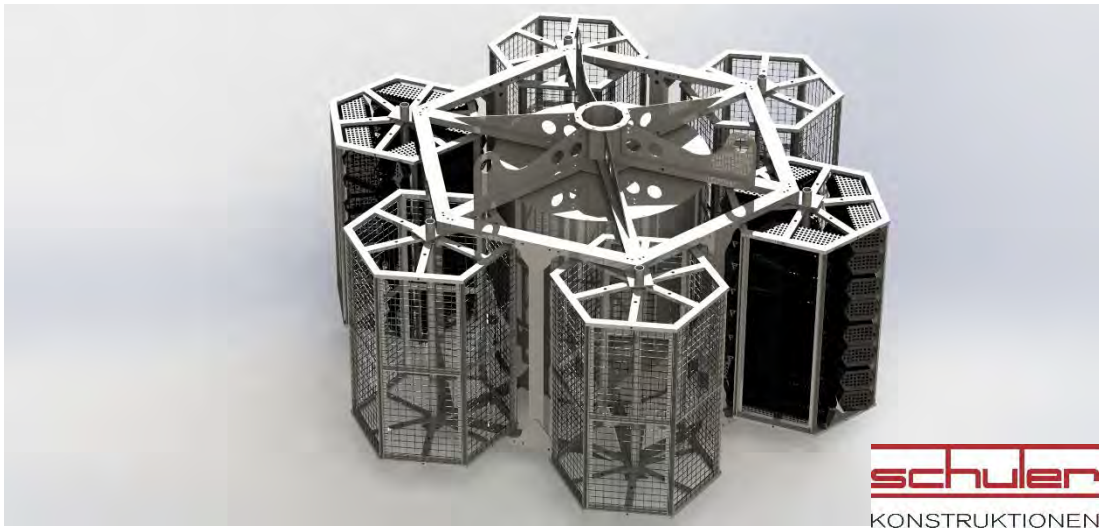


Heasman et al. 2021

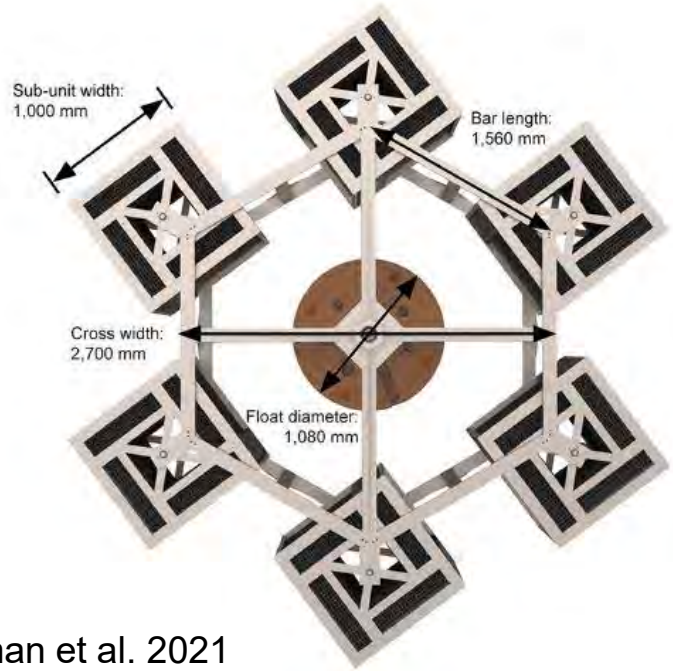
Case Study A – Shellfish Tower System

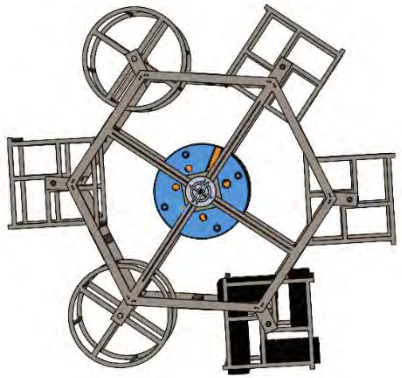
A

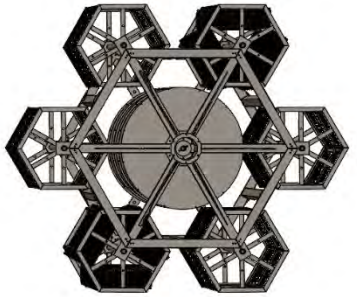




B



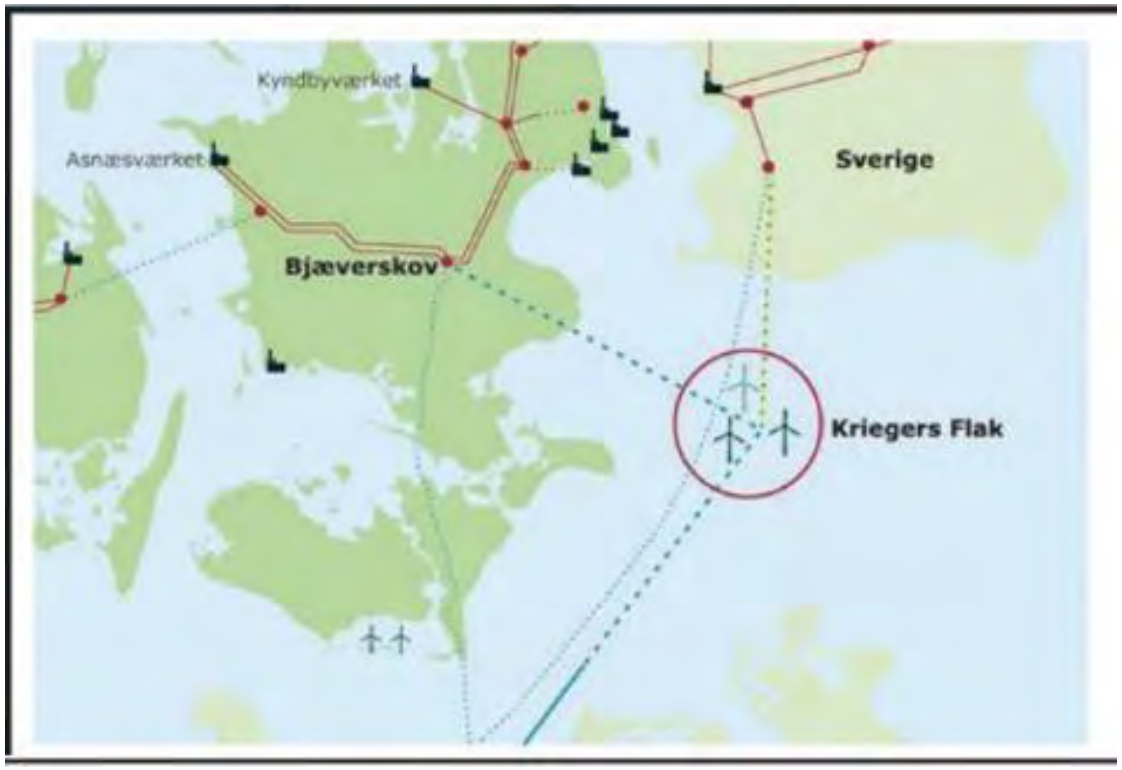




Heasman et al. 2021

schuler
KONSTRUKTIONEN

Case Study B – Kriegers Flak



Activities 2023

- Risk assessments all activities at site
- Biodiversity – eDNA, ROV, bio samples
- SDG workshop
- Baseline survey – oceanography (VOTO)
- Deploying basis for: 4 longlines for seaweed (& mussel) cultivation
- Deploying seaweed
- Dissemination
  - Cooking classes, Web site, Publication

communications earth & environment

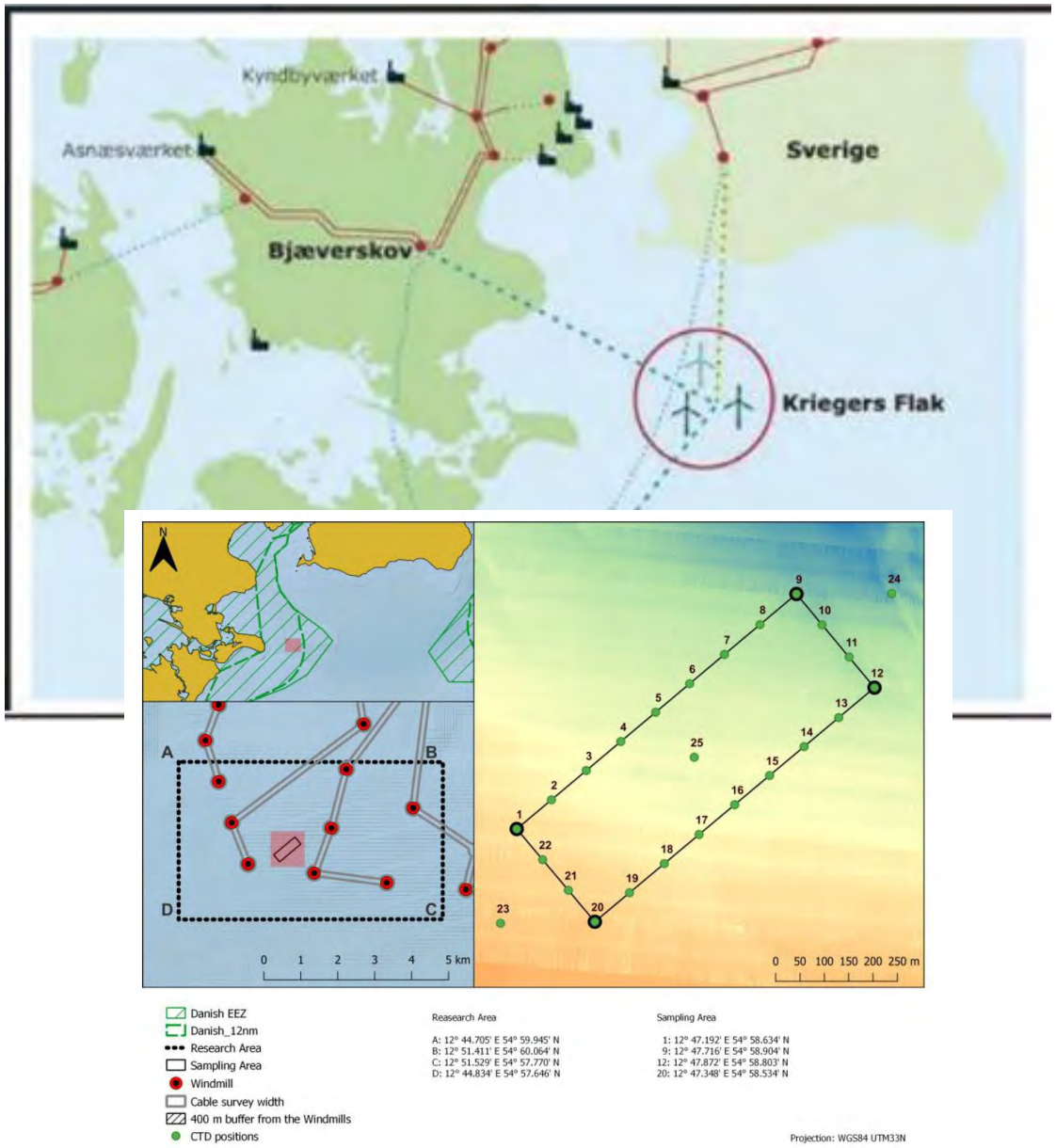
ARTICLE

https://doi.org/10.1038/s43247-023-01116-6 OPEN

Multi-use of offshore wind farms with low-trophic aquaculture can help achieve global sustainability goals

Marie Maar[1], Andreas Holbach[1], Teis Boderskov[2,3], Marianne Thomsen[4,5], Bela H. Buck[6,7], Jonne Kotta[8] & Annette Bruhn[2,3]

Case Study B – Kriegers Flak



Baseline survey: 11.09 – 15.09.2023

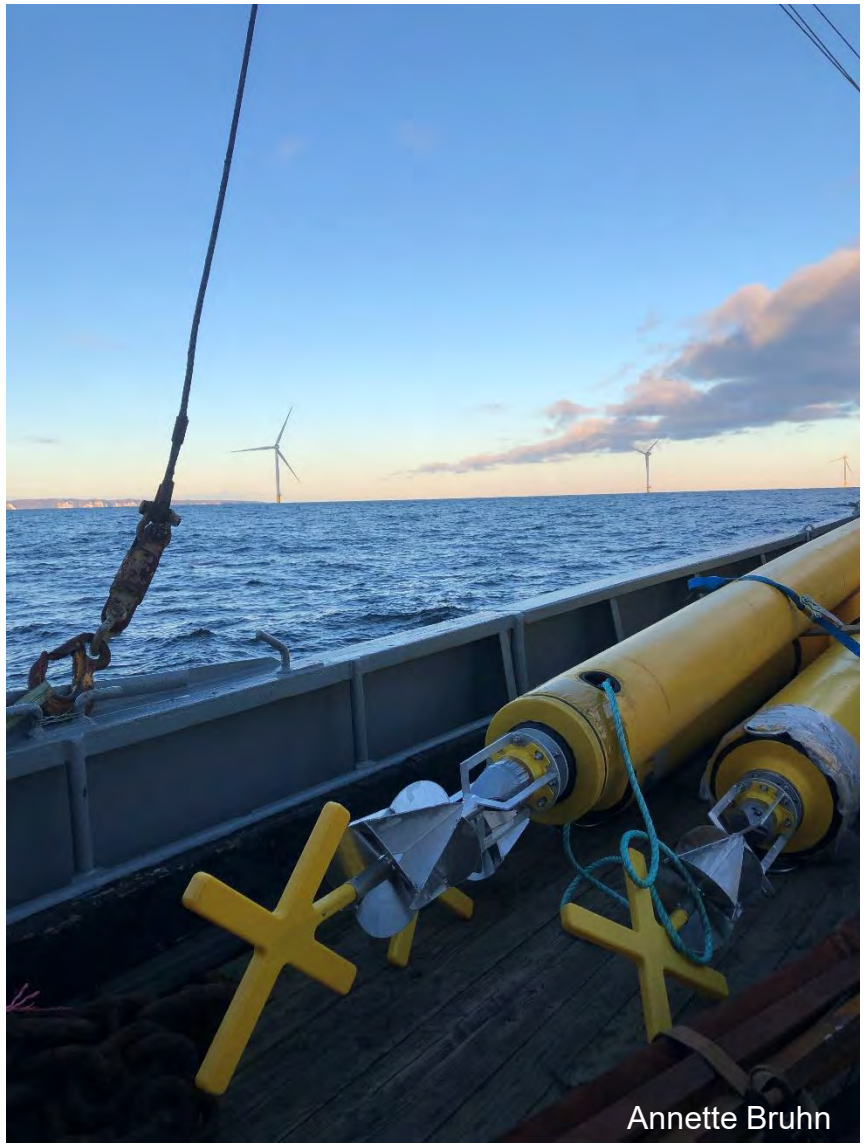
VOTO (WP5)

Comparison between AUV and CTD casts

Parameters:

- Temperature
- Salinity
- Chlorophyll /Fluorescence
- Oxygen concentration
- Depth

Case Study B – Kriegers Flak – Low trophic aquaculture

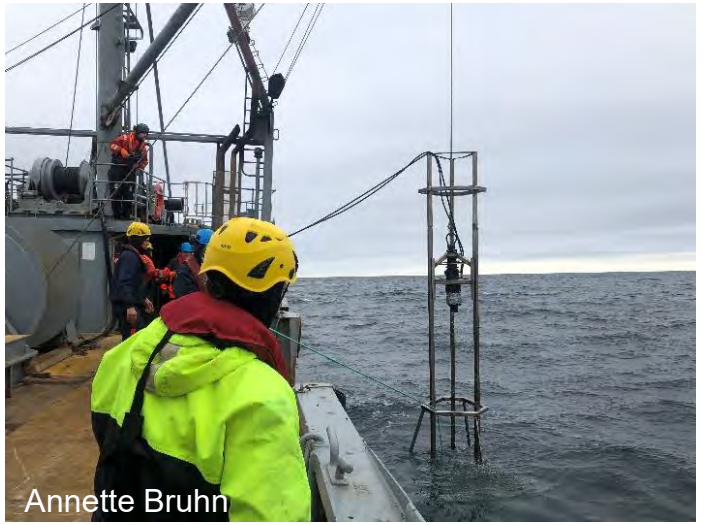


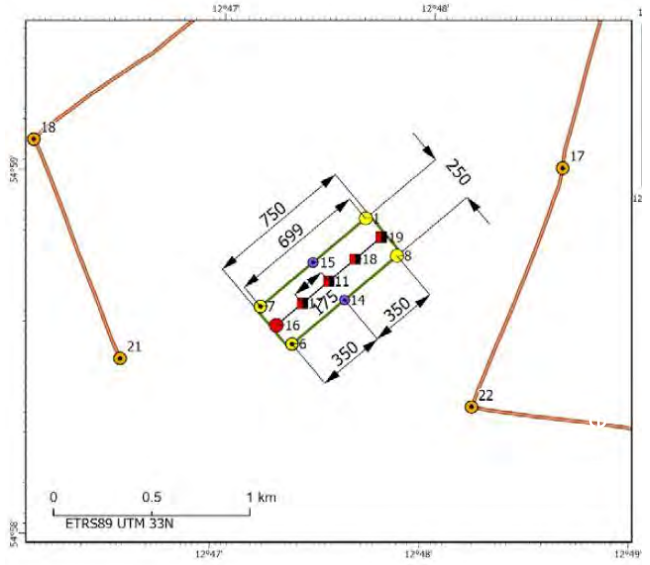
Bruhn et al. 2023

Plan for campagne:
Deployment of:

- 4 corner marker buoys
- 2 side marker buoys
- 5 drill anchors

- CTD test cast
- Film/photo for dissemination
- Visual registration of activities & structures by Marine Coordination Centre (MCC) via camera on turbine





Case Study B – Kriegers Flak – low trophic aquaculture

Status 03.11.2023:

- Deployment:
  - 4 corner marker buoys
  - 2 side marker buoys
  - 1 drill anchor, 4 concrete anchor blocks
- CTD test cast not performed
- Film and photo for dissemination taken
- Confirmation: activities/large structures being registered by MCC via camera
- Additional costs for extra day charter and 4 concrete anchor blocks + transport

Report on lessons learnt available

Case Study B – low trophic aquaculture

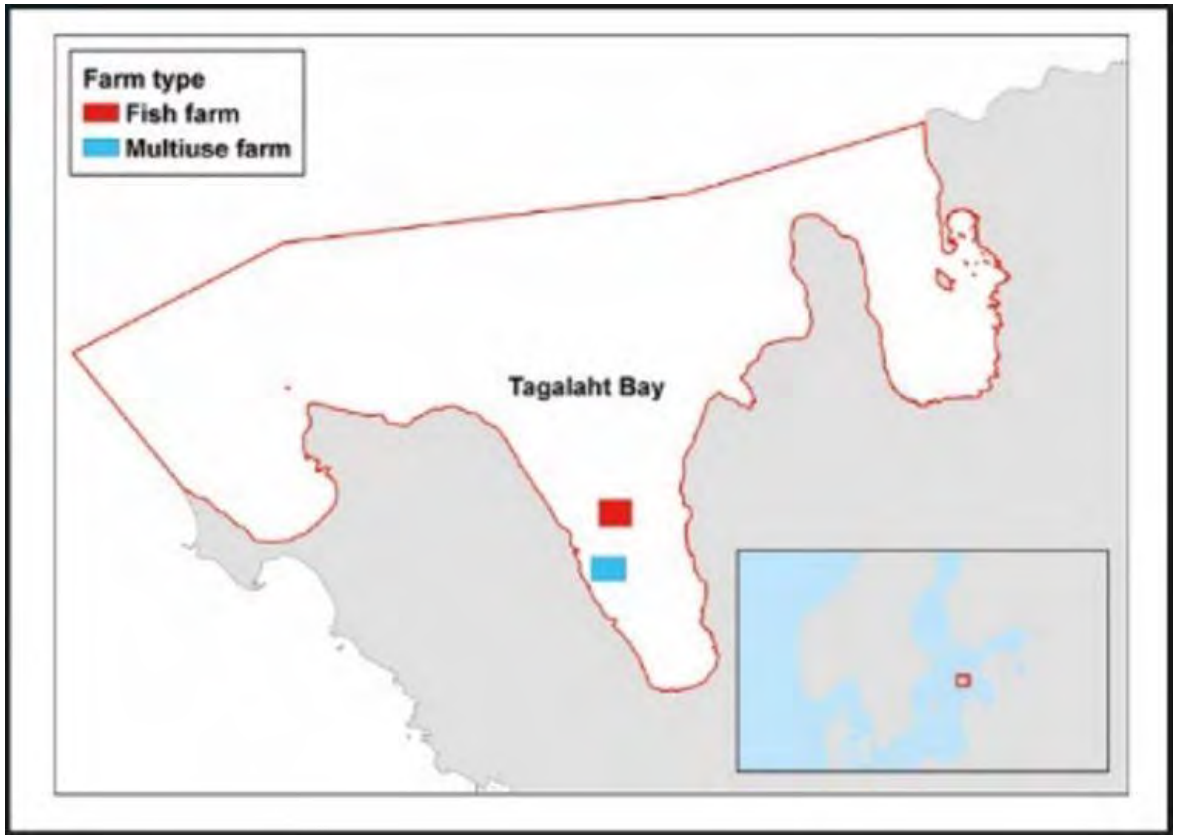
Status 08.01.2024:

- In December deployment of 2 longlines with seaweeds (*Saccharina latissima*, *Ulva* sp., *Palmaria palmata* and *Fucus serratus*):
- Application for the permission of mussel cultivation submitted in November 2023
- First procedures in place for sharing of services, vessels and crew – starting with monitoring of cultivation site and buoys

Case Study B – Kriegers Flak – plans 2024

- Mussel cultivation licence expected in spring
- Mussel cultivation initiated in spring
- Seaweed harvest late spring – samples for WP3, data for WP2+4
- VOTO survey #2 – including new parameters
- Expansion of shared services, crew and vessels (CTD cast, monitoring)
- Cod population survey late summer
- Dissemination to citizens, stakeholders and decision makers

Case Study C – Tagalaht Bay



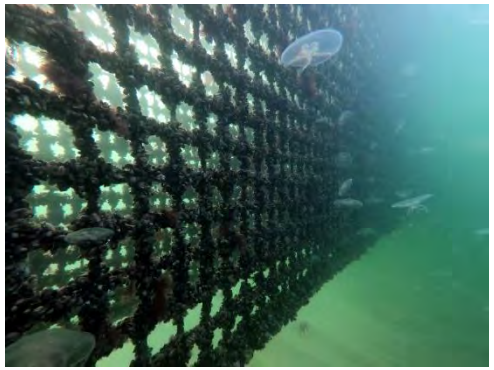
Fish farm (rainbow trout), 300t at 18 m depth – seasonal operation May-October

Status 08.01.2024:

Deployed:

- 4x100 m mussel lines since October 2023
- Smartnet type at 6 m depth

12 x 60 m Ulva lines deployed since July 2023 retrieved in October (storm damage)

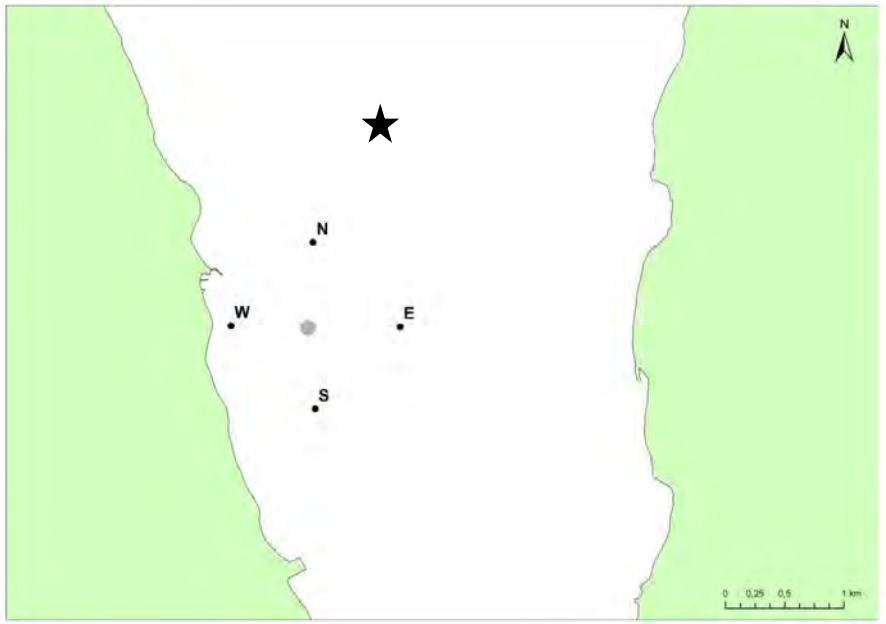


Water quality monitoring (5 stations, once per month) May-October 2023

Continuous oceanographic measurements since October 2023

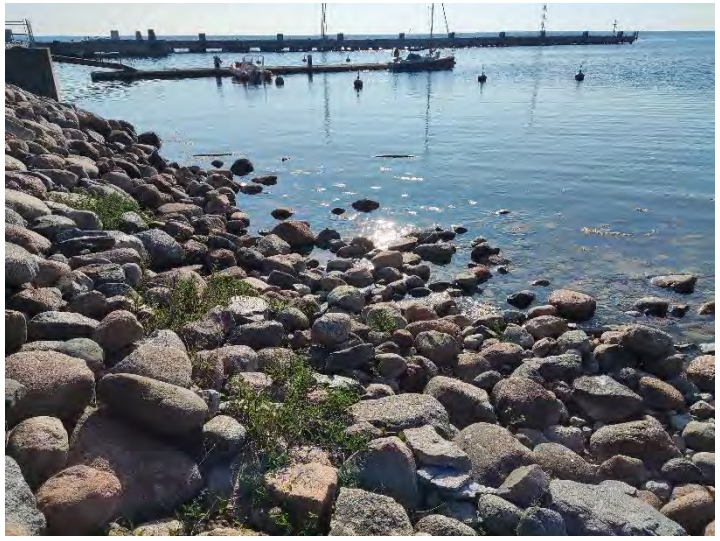
Case Study C – Measurements in farm area

Measurements of environmental parameters at 5 stations
e.g. Secchi depth, salinity, temperature, nutrients (Ntot, Ptot, NH4, NO3, NO2, PO4), oxygen, chlorophyll a.
5 stations, April-November, once per month



Continuous measurements at two stations starting from October, 10, 2023.
INFINITY-CLW – chlorophyl a, turbidity, temperature.
RINKO I W – Oxygen, temperature
ALW-CMP ja DEFI2-L - PAR
Infinity-CTW – Salinity
Alec CEM ja INFINITY-EM – water velocity

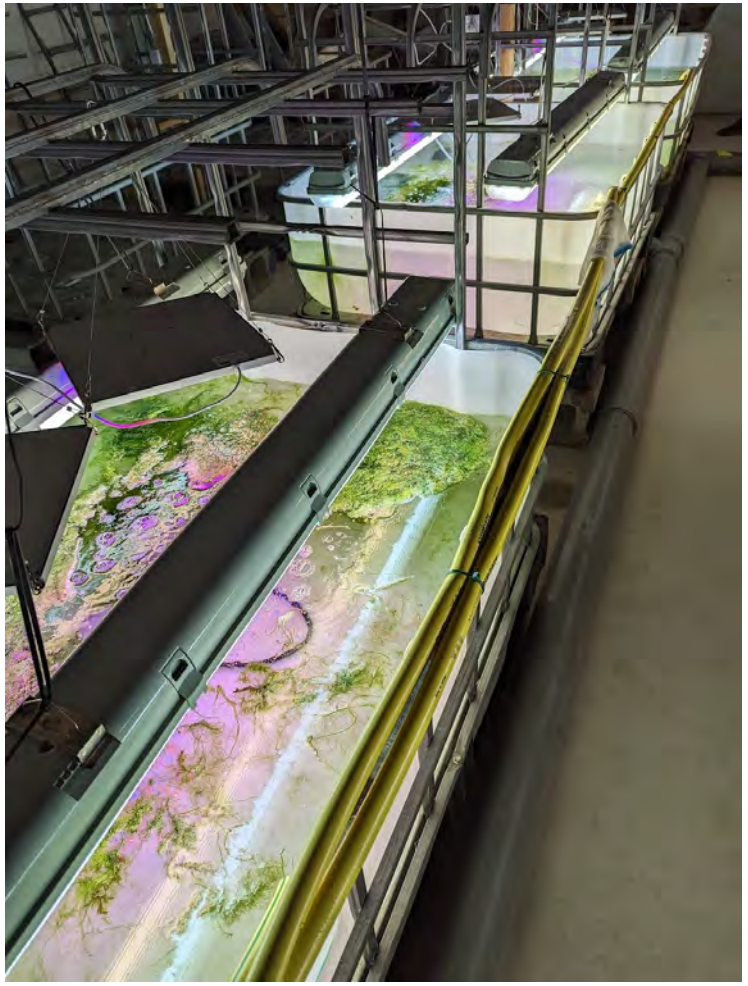
Case Study C – Tagalaht Bay – Ulva lines

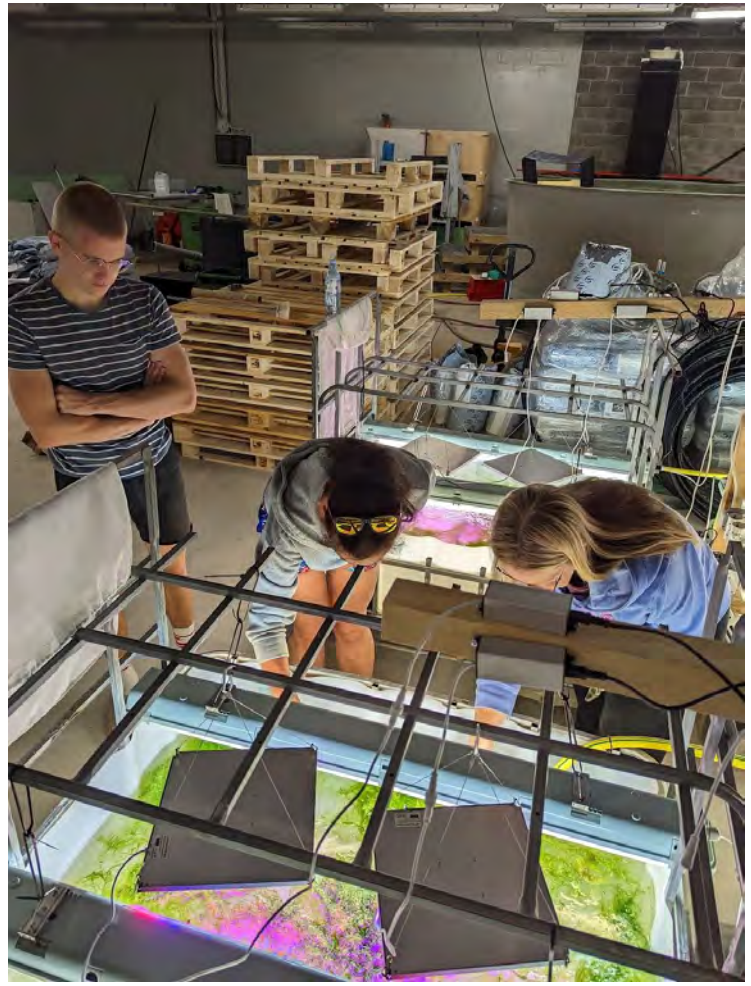


Seeding – natural environment, 2 locations

Lines deployed near fishfarm (200m)

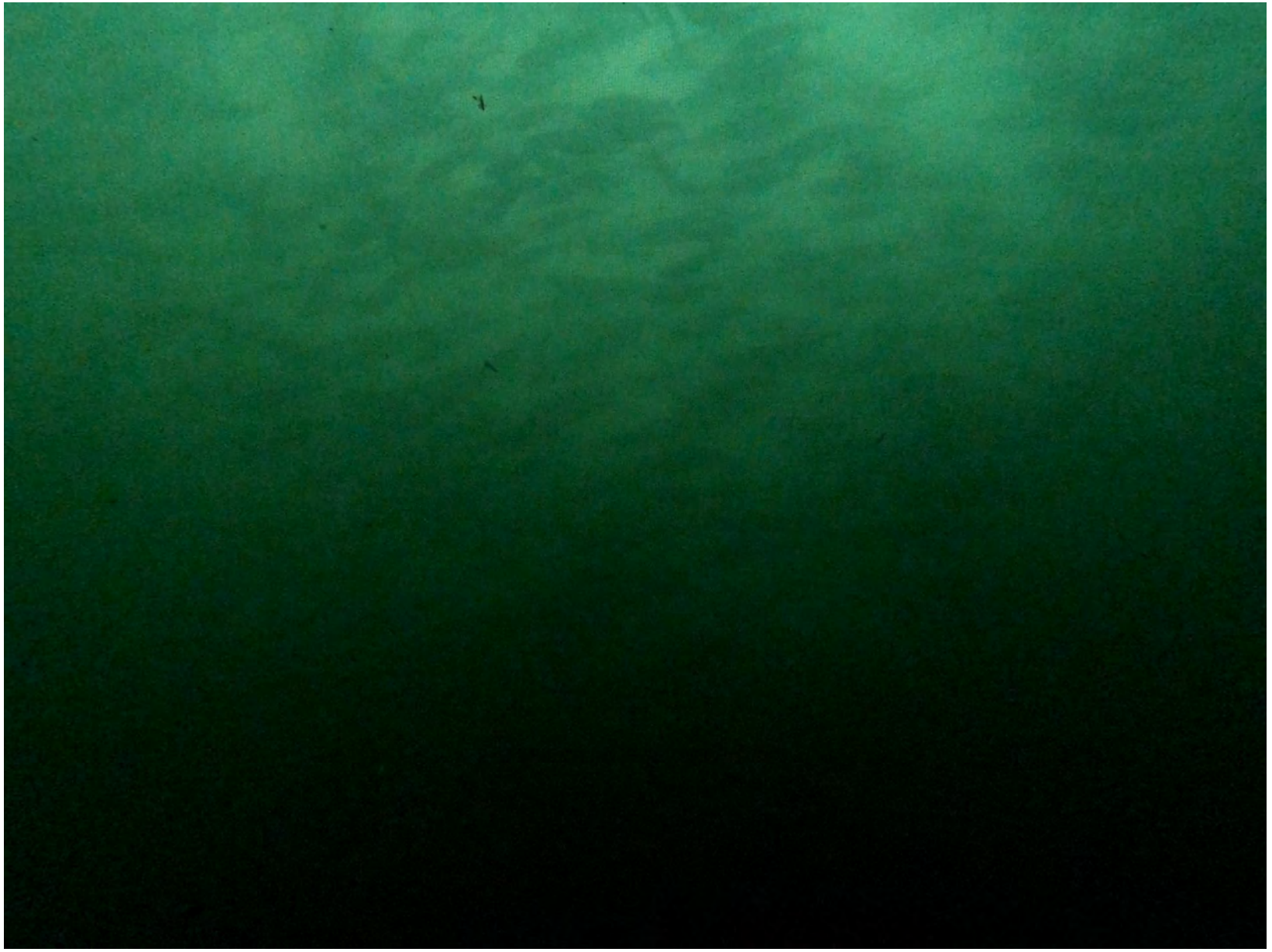
Case Study C – onland Ulva incubation facilty (Ösel Aquafarms)



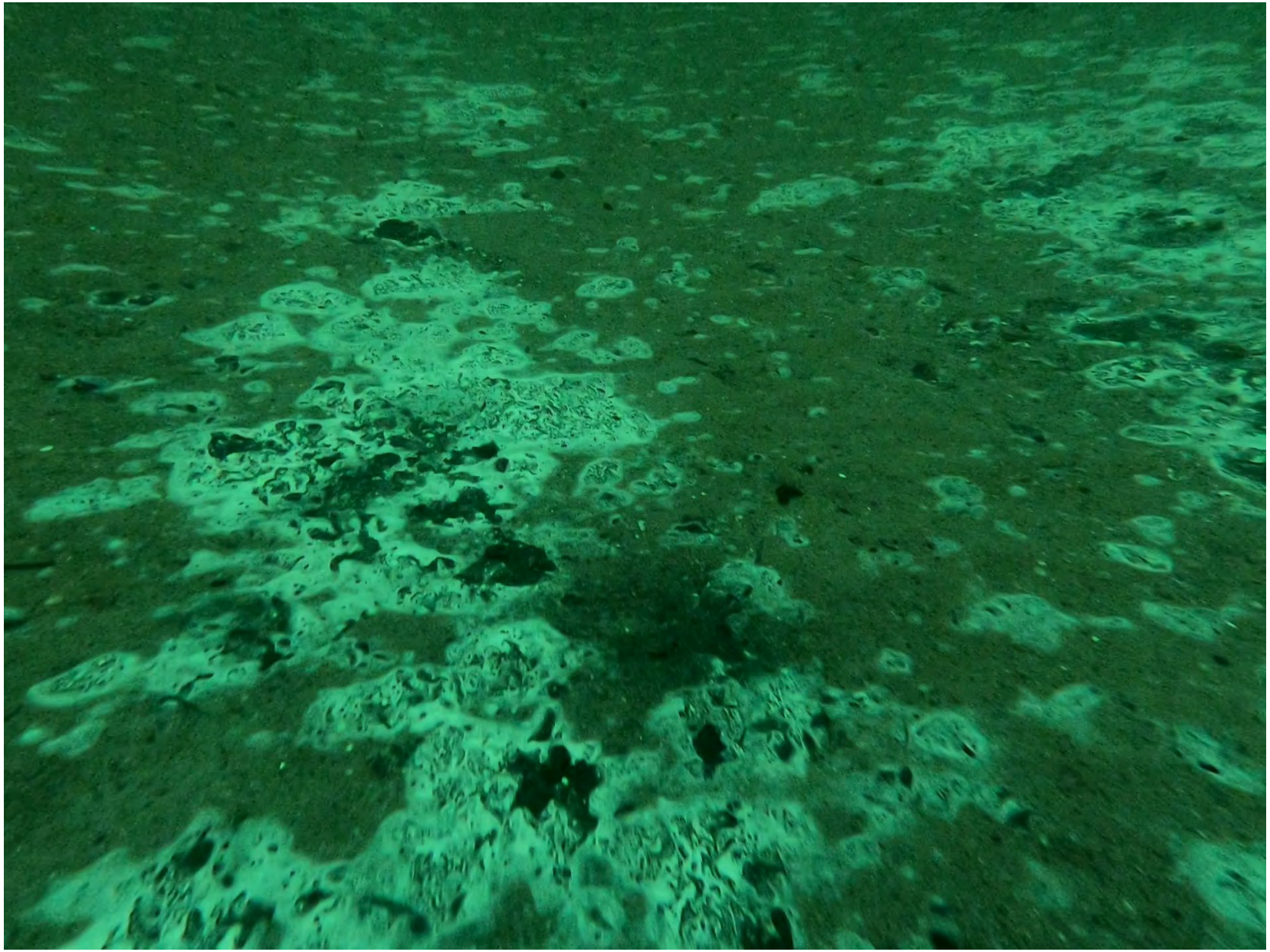


Cultivating *Ulva* using fishfarm effluents (Pihtla fishfarm)

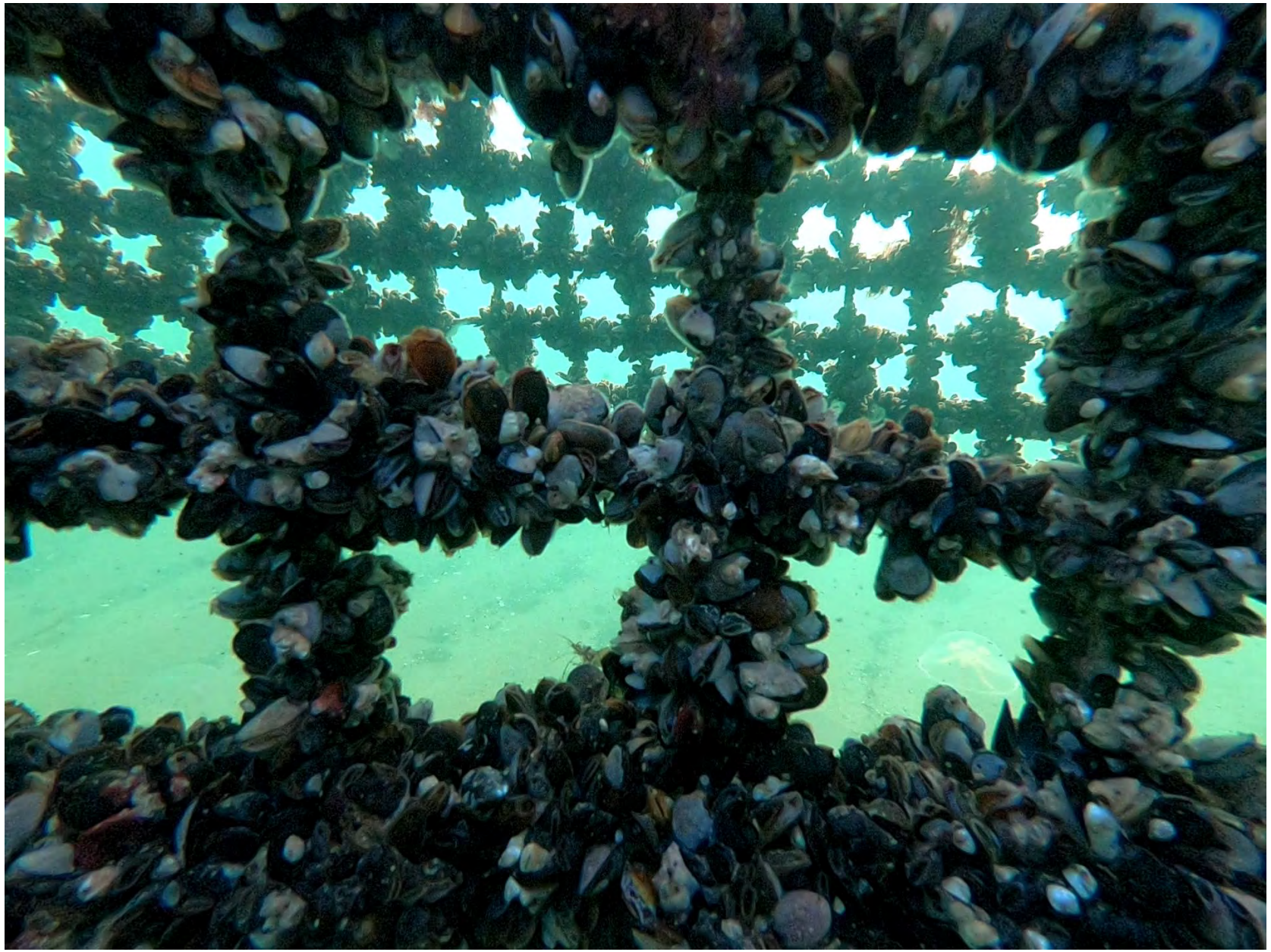
Case Study C – Tagalaht Bay



Case Study C – Tagalaht Bay



Case Study C – Tagalaht Bay

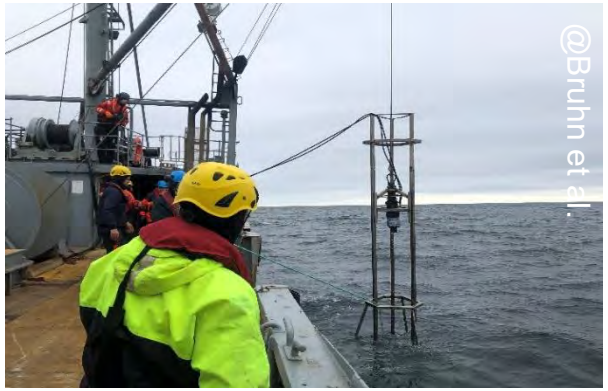


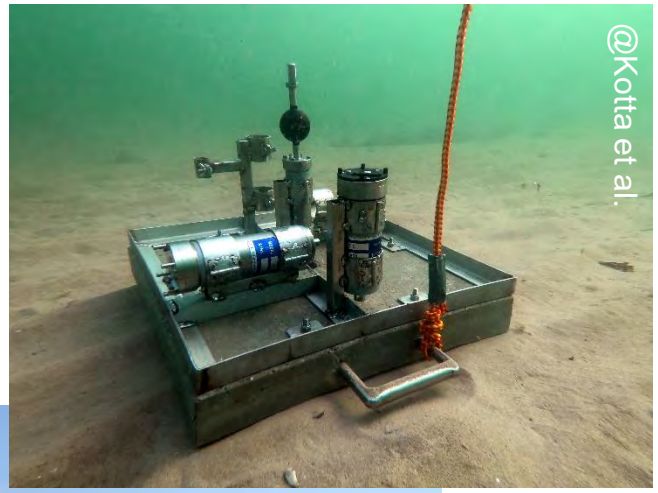
Case Study C – Tagalaht Bay

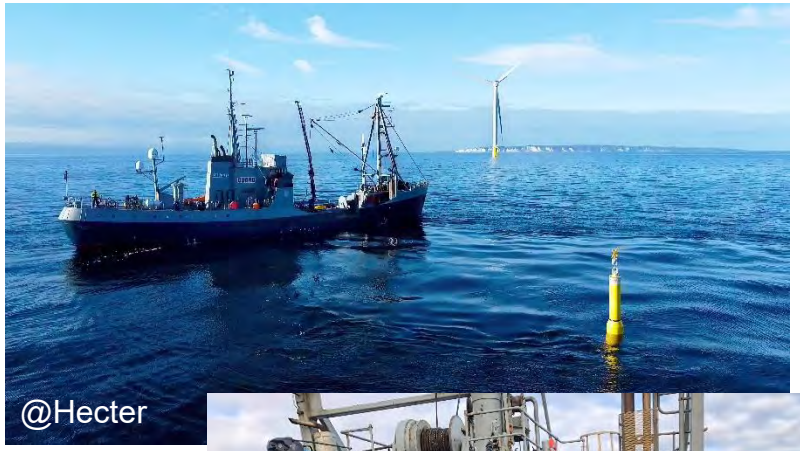
Case Study C – Tagalaht Bay

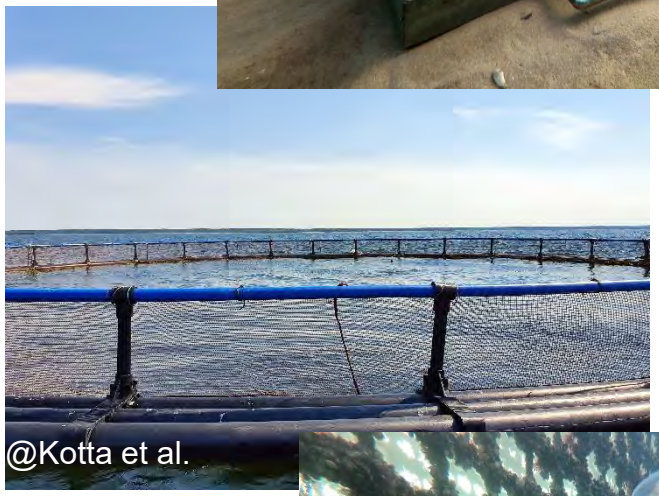
Case Study C – Tagalaht Bay

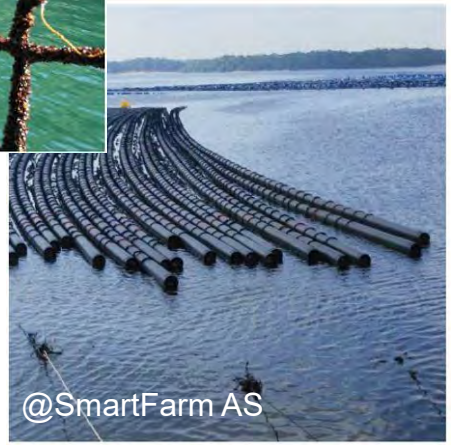
THANKS for your attention!





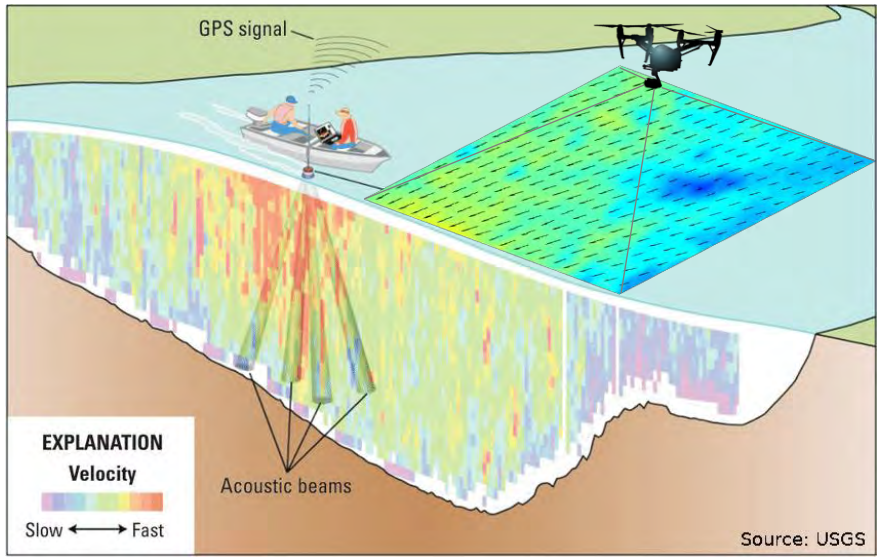






Case Study A – Autonomous Measurements

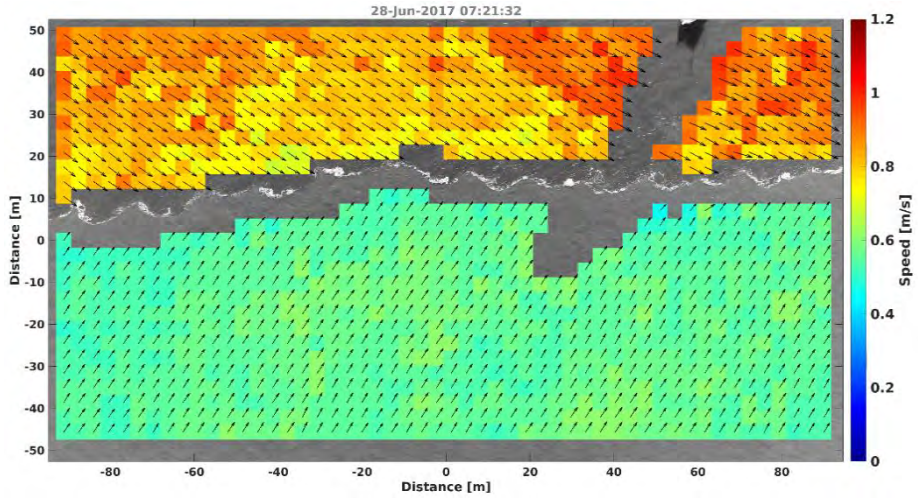
Potential Autonomous measurements



High resolution current measurements

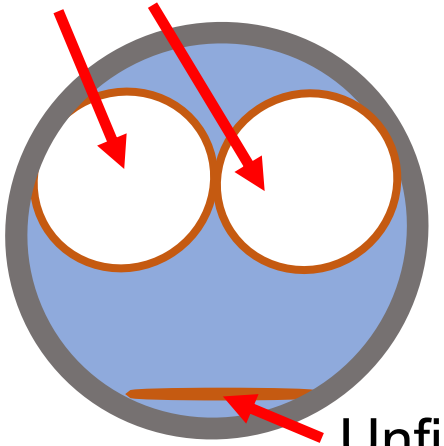
- Autonomous surface vehicle with Acoustic Doppler Current Profiler for 2D vertical current profiles

- CopterCurrents, Drone with video camera for 2D Surface currents

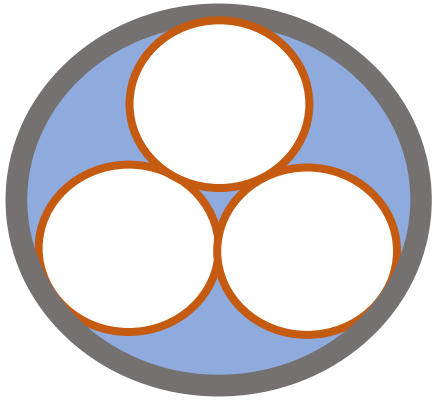


Case Study A – Smartfarm: objective

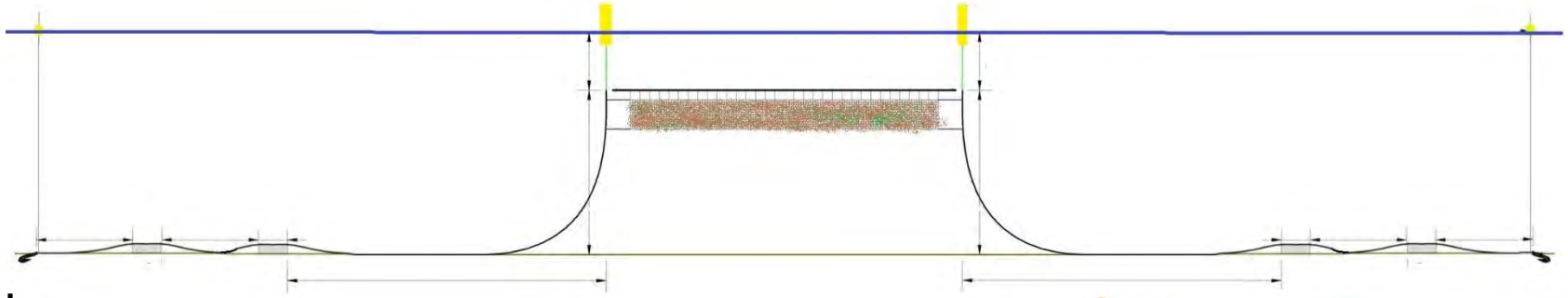
Hose filled with air



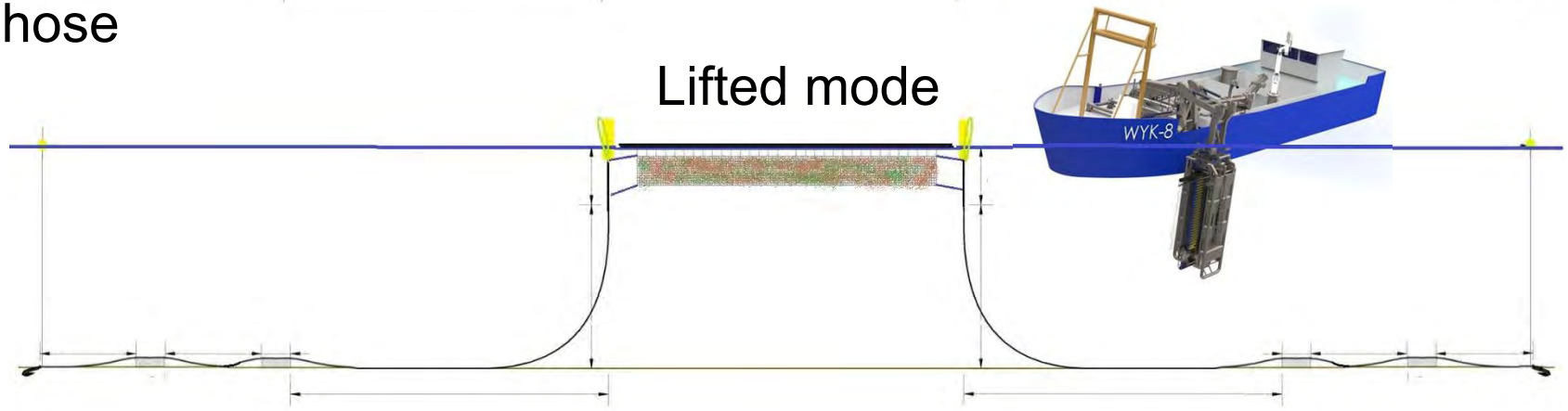
Unfilled hose



Submerged mode



Lifted mode



OLAMUR

WP2.3: status and next steps of the ODSS tool for regional planning

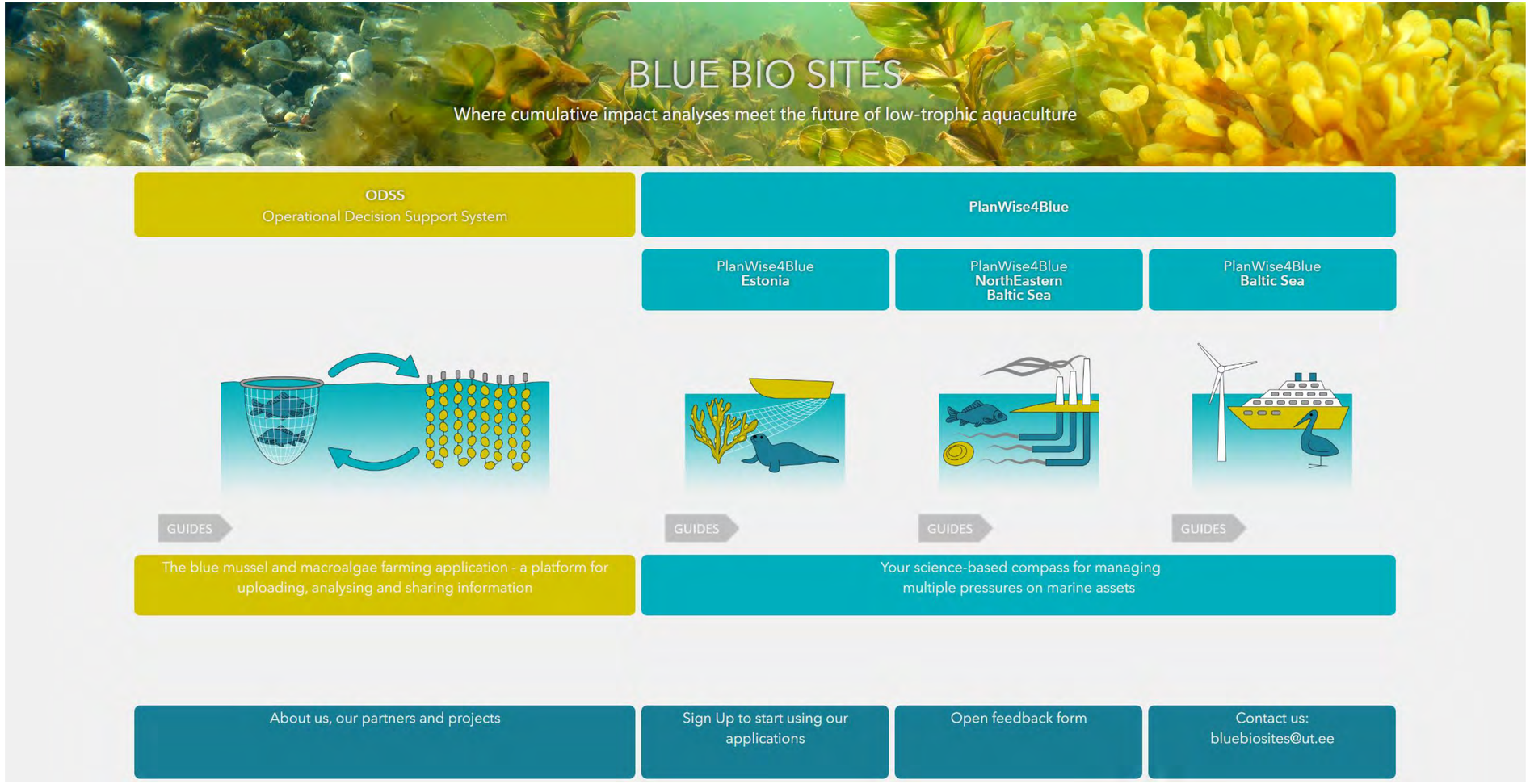
8.01.2024

OLAMUR : Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas

ODSS – Operational Decision Support System

Funded by the European Union, grant agreement NO 101094065. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

https://gis.sea.ee/odss



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ODSS – Operational Decision Support System

Helps different end-users to **make effective decisions about algal and mussel farming in the Baltic Sea**, through the OLAMUR project, we are expanding to the North Sea

These decisions are **based on the best monitoring and modelling data**

Raises the capacity of different users to **make decisions along the environmental, economic and socio-economic dimensions of LTA**

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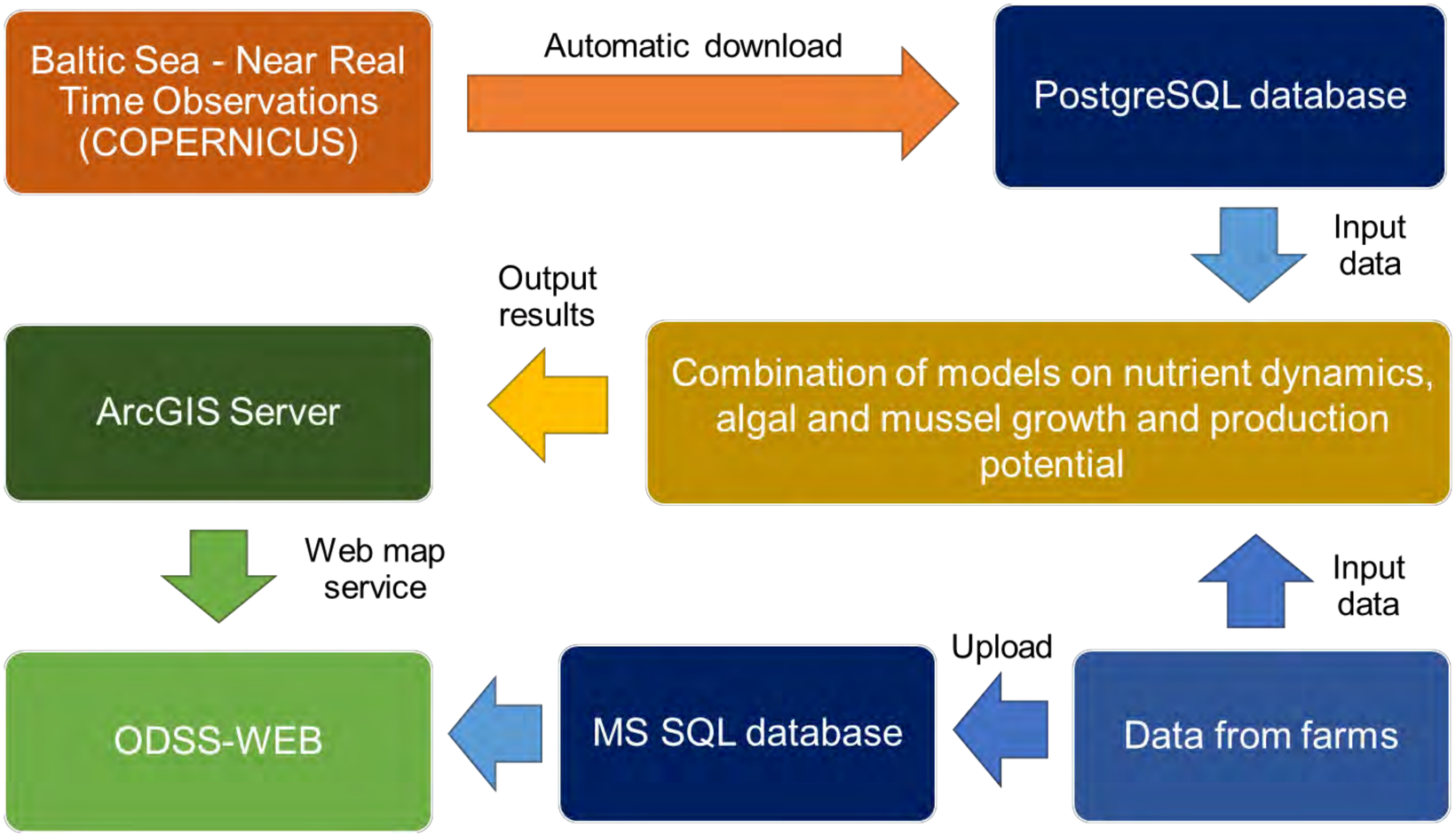
ODSS data flow



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Current actions

Extending the ODSS tool to the North Sea

Updating data (e.g. OWF sites) and models (e.g. mussel and algal growth models)

Developing new tool features (farm upscaling with no significant effects of nutrient/food limitation on biomass yields)

Quantifying ecosystem services provided by the LTA (e.g. food and feed provisioning, nutrient removal and carbon sequestration)

Integration of new tools, e.g. identification of suitable co-location of LTA with existing and planned OWFs

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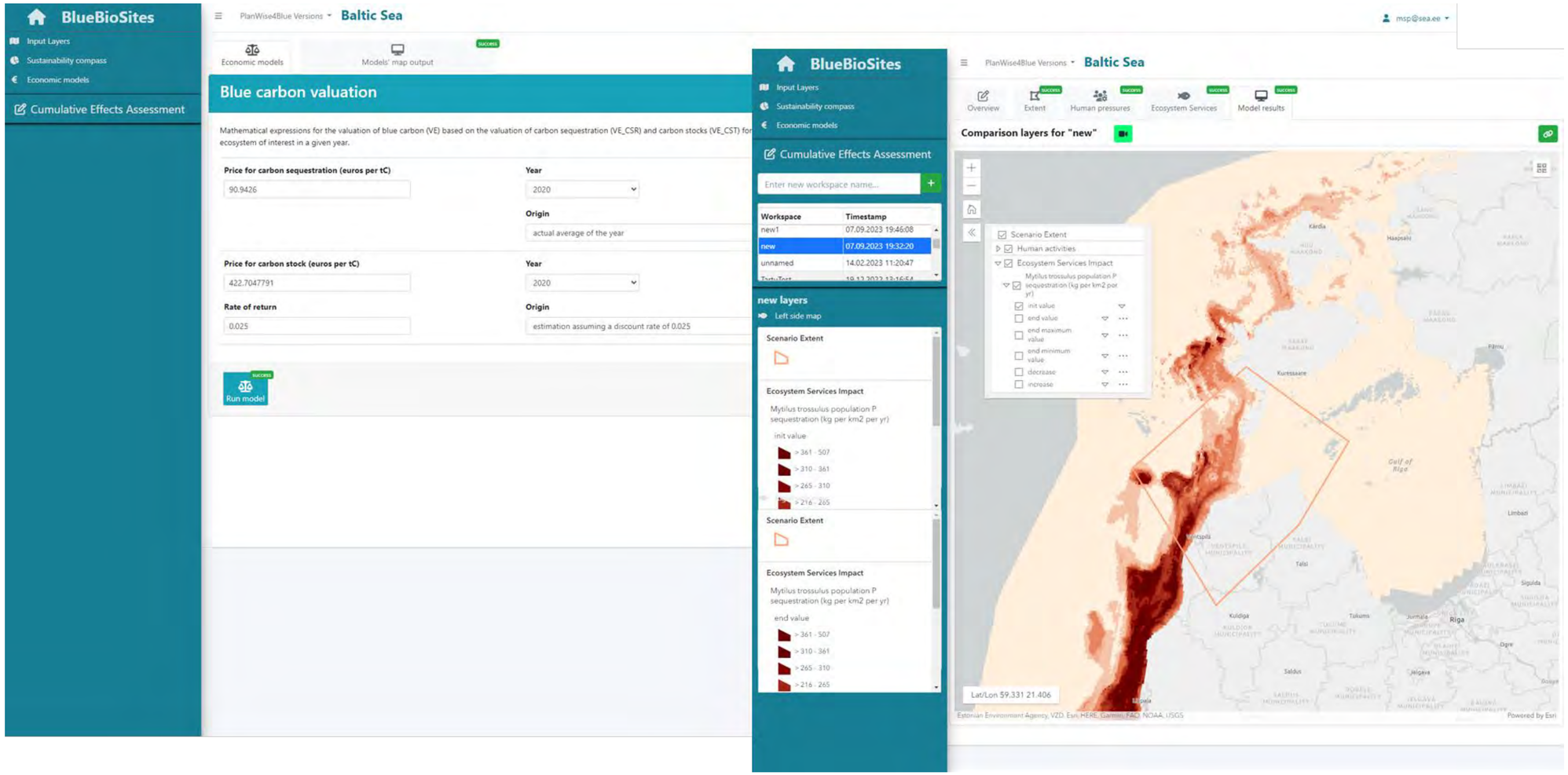
Modular design from regional siting to micro-siting



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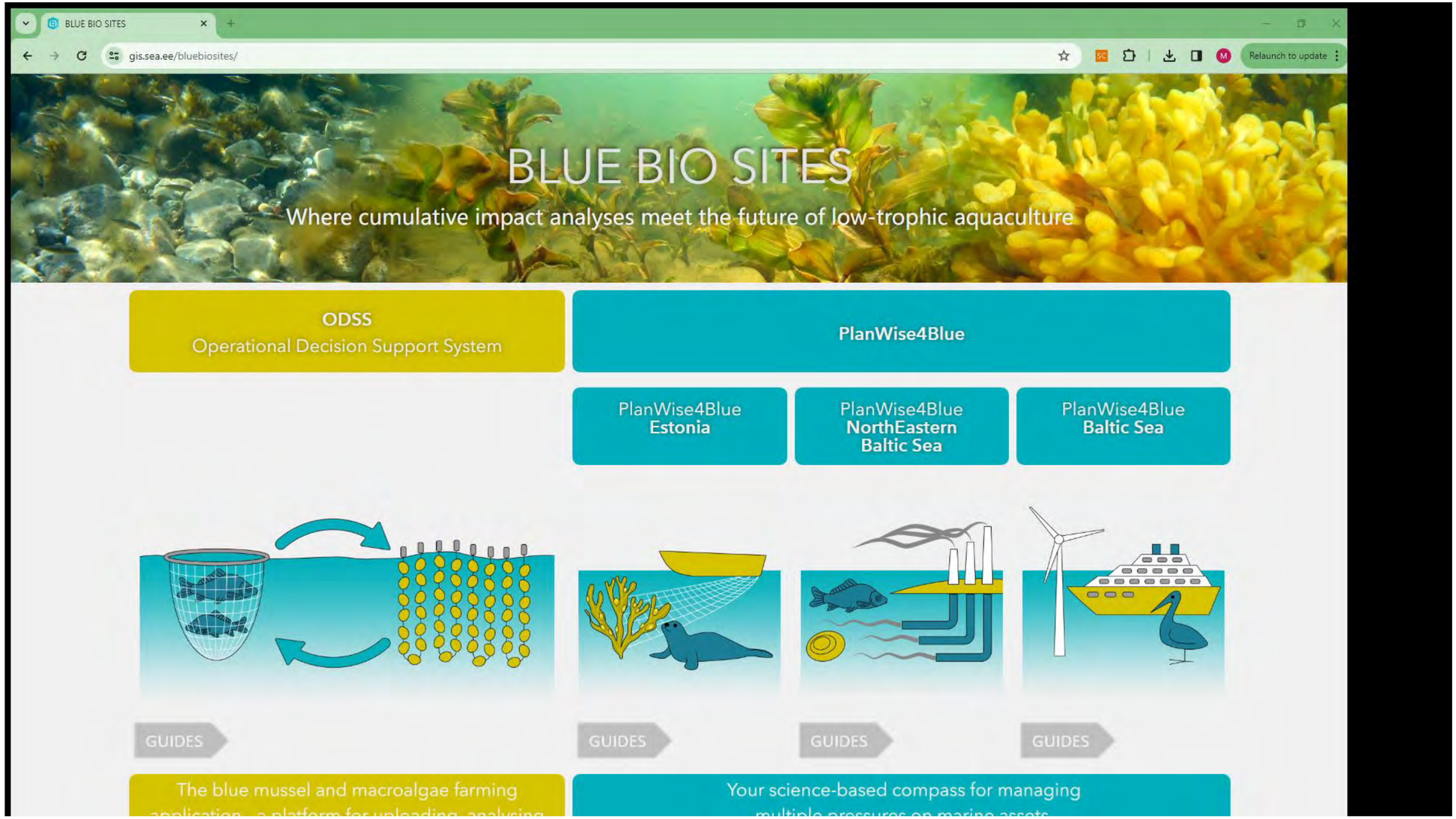

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Contact Details: Mihhail Fetissov, Merli Rätsep and Jonne Kotta
Email: mihhail.fetissov@ut.ee
merli.ratsep@ut.ee
jonne@sea.ee

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WP2: Optimal siting for multi-purpose use of marine space

Monday 8.1.2024

OLAMUR : Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas

WP2

WP2.1: Co-creation of a tool and a protocol for multi-use. Summary of stakeholder meeting in Gothenburg, next steps – Ian Overton (GCF)

WP2.2: Micro-siting of multi-use within the pilots. Concept and next steps – Asbjørn Christensen (DTU)

WP2.3: Potential multi-use locations in the North Sea-Baltic Sea. Status and next steps of the ODSS tool for regional planning - Merli Rätsep (UT)

WP2.3: New paper on multi-use of OWF-LTA – Marie Maar (AU)

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WP2.1: Stakeholder meeting in Gothenburg

08.01.2024

OLAMUR : Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas

Agenda

1. Task 2.1 (DOA)
2. Stakeholder Workshop: GOT 11.23
3. Feedback Summarized
4. Open Questions & Next Steps

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Task 2.1 (DOA)

"Co-creation of a tool and a protocol for multi-use…This task will carry out a **stakeholder process for co-designing, co-developing and co-evaluating a tool** and a protocol for co-location of LTL aquaculture of different mussel and seaweed species and OWFs." (page 10)

- **Step 1:** explore requirements, use-cases for the tool with stakeholders
- Step 2: early prototype testing of by stakeholders (Jan. 2025)
- Step 3: apply & evaluate completed tool with stakeholders for two potential sites in the pilot demonstrations

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Stakeholder Workshop: GOT 11.23

Objective: gather stakeholders to understand their use-cases and requirements

Stakeholders in attendance: ~30 potential end-users and interested parties…

- 9 **OLAMUR partners**
- 3 **Wind industry** professionals
- 6 **Environmental / NGO** professionals
- 4 **Governance** professionals
- 8 **Low Trophic Aquaculture (LTA)** professionals

Workshop agenda:

- **Expert presentations by OLAMUR partners** (50 mins)
- **Stakeholder feedback session** (50 mins)
  3 groups of ~8 participants, structured questions

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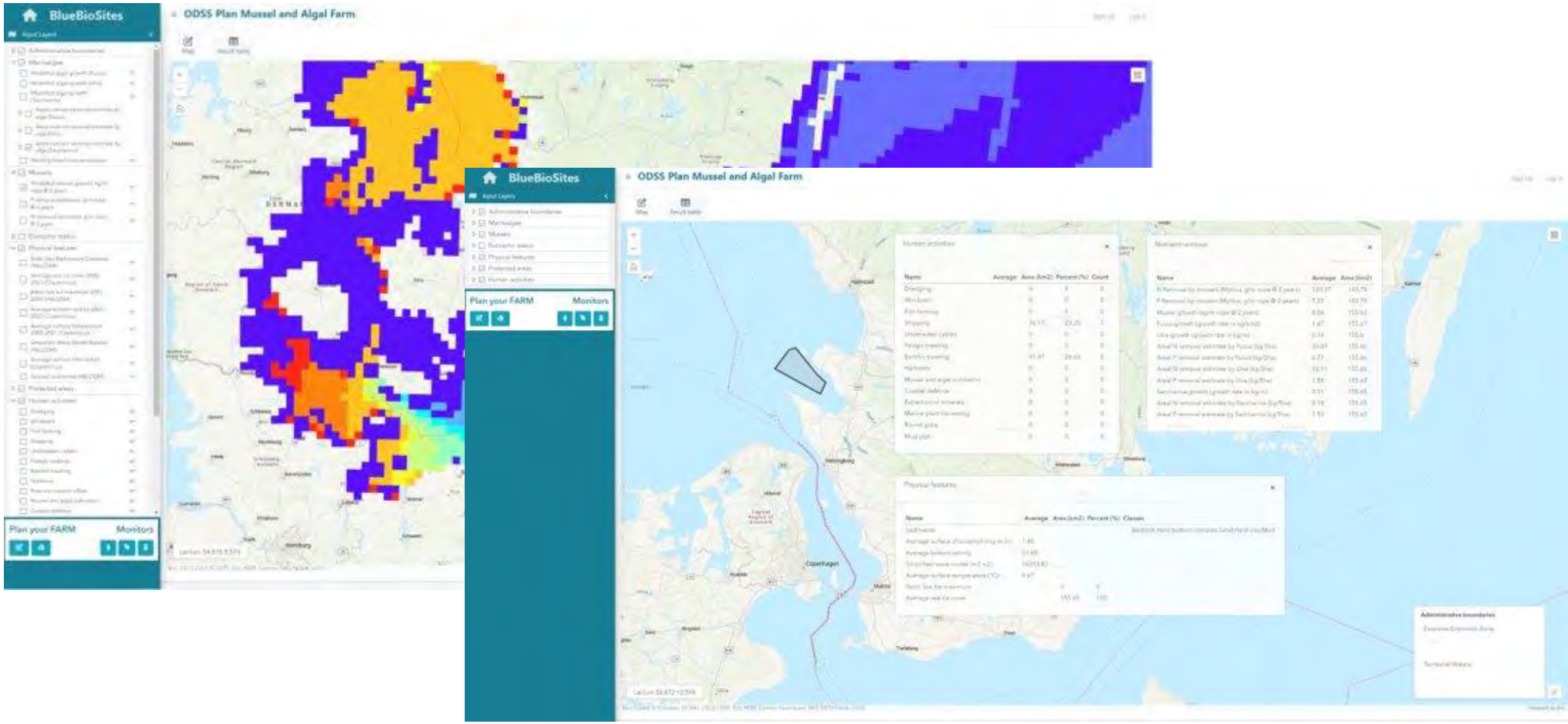
Stakeholder workshop: GOT 11.23



ODSS from GRASS project: several map layers along with user input fields, modelled outputs

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Feedback Summarized

General:

- Opportunity to be a transferrable ‘best practice’ tool
- Potentially useful during a business’ investment phase
- OWF typically to come first, treated as constraint in optimization of MU w/ LTA

Uses:

- Business financial viability (expected yields & costs), insurance applications
- Ecosystem services provisioned
- Policy planning, licensure processes

Inputs / Outputs:

- Constraints set by users (species & requirements, operational details, etc.)
- Multiple outputs possible with transparent ‘weighting’:
  Visual: maps / downloadable geotiffs
  Numerical: index with predefined weights, ranking of site options

Criteria for evaluating alternative multi-use site designs

- Cost efficiency, environmental impact, carrying capacity, risks to site usage, etc…

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Open Questions & Next Steps

Open Questions:

- Liability for tool accuracy / reliability?
- Will the tool cost anything to use?
- Can the tool provide optimization analysis in cases where multiple investors want to act in the same area?

Next Steps:

- **Step 2:** early prototype testing of by stakeholders (Jan. 2025)
- Step 3: apply & evaluate completed tool with stakeholders for two potential sites in the pilot demonstrations

Meanwhile…

- **Multi-Criteria Analysis** research into methods for eliciting weights from stakeholders for combining the multiple criteria (e.g. Analytical Hierarchy Process)

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Thanks for your attention

Ian Overton
Global Climate Forum, eV
+49 1523 8525 785
ian.overton@globalclimateforum.org

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WP2.3: status and next steps of the ODSS tool for regional planning

8.01.2024

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ODSS – Operational Decision Support System

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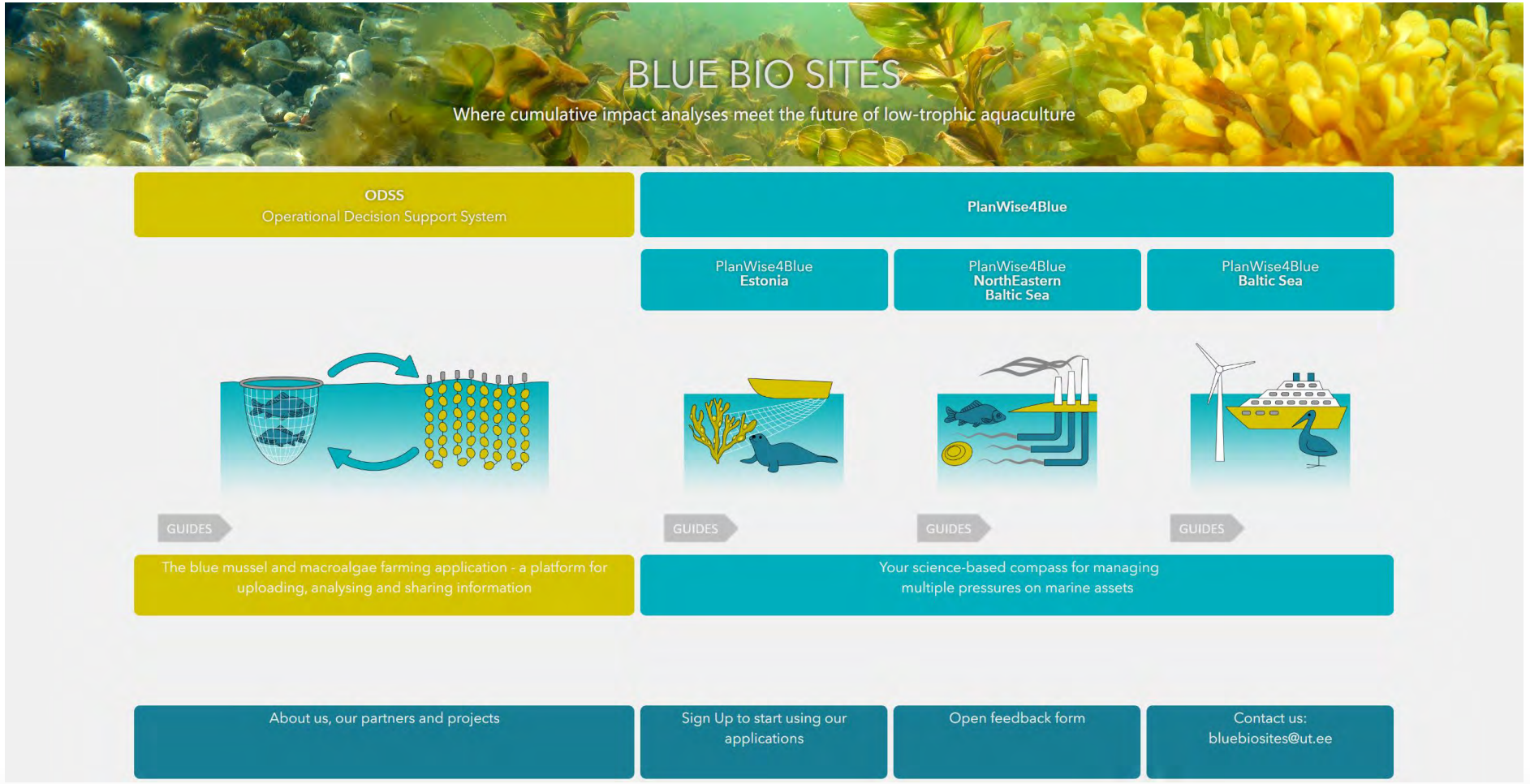
https://gis.sea.ee/odss



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ODSS – Operational Decision Support System

Helps different end-users to **make effective decisions about algal and mussel farming in the Baltic Sea**, through the OLAMUR project, we are expanding to the North Sea

These decisions are **based on the best monitoring and modelling data**

Raises the capacity of different users to **make decisions along the environmental, economic and socio-economic dimensions of LTA**

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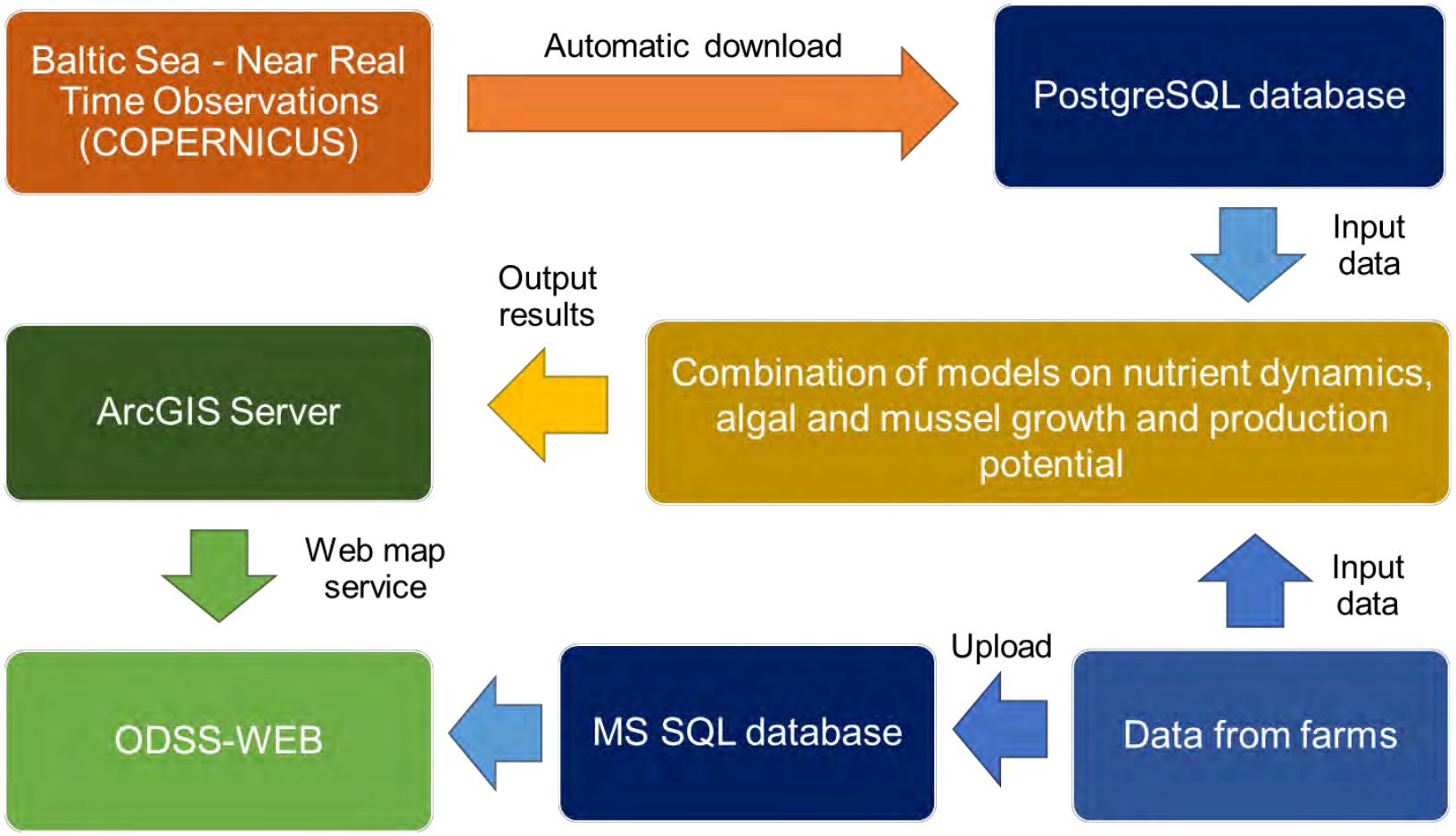
ODSS data flow



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Current actions

Extending the ODSS tool to the North Sea

Updating data (e.g. OWF sites) and models (e.g. mussel and algal growth models)

Developing new tool features (farm upscaling with no significant effects of nutrient/food limitation on biomass yields)

Quantifying ecosystem services provided by the LTA (e.g. food and feed provisioning, nutrient removal and carbon sequestration)

Integration of new tools, e.g. identification of suitable co-location of LTA with existing and planned OWFs

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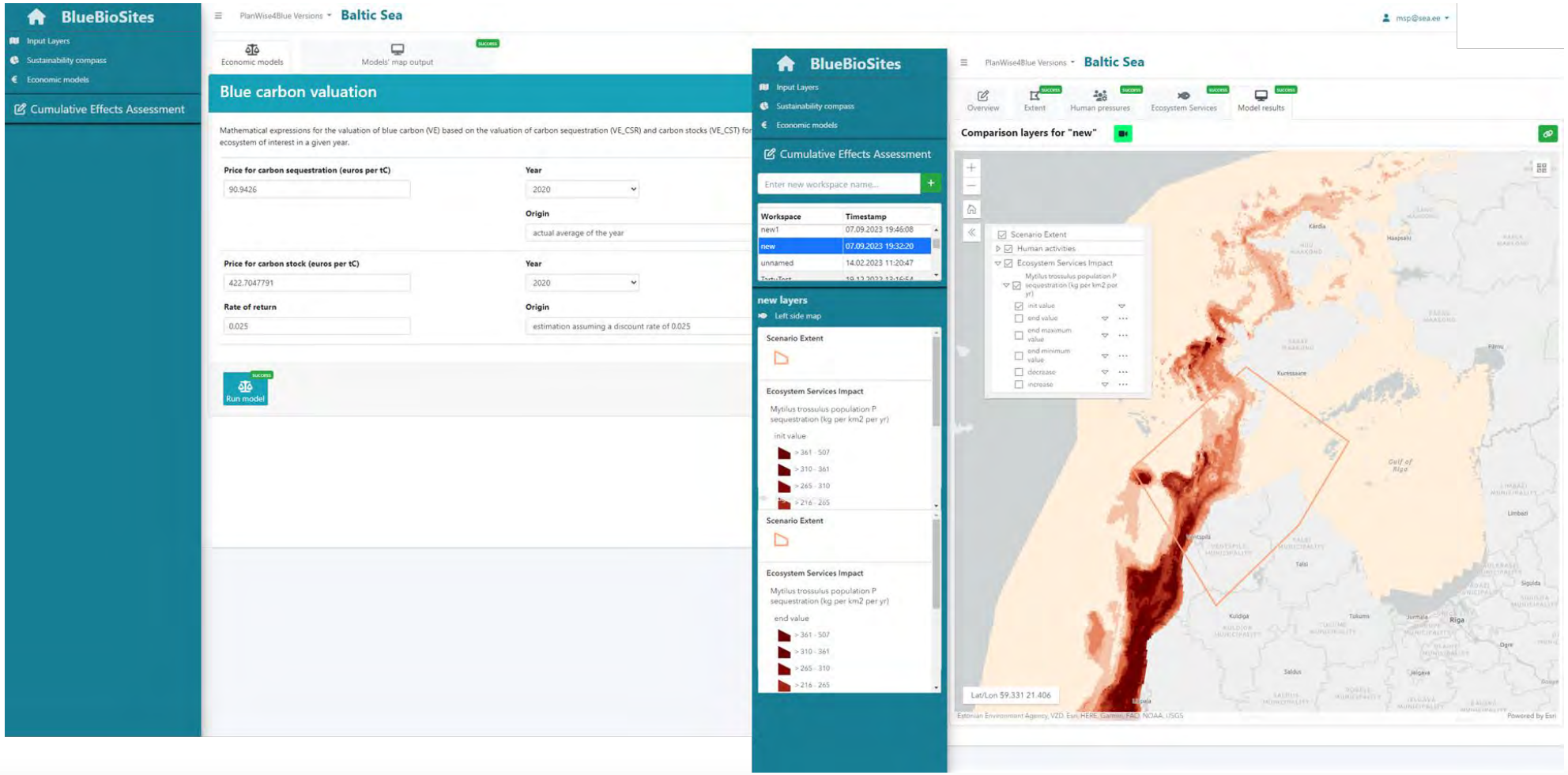
Modular design from regional siting to micro-siting



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Email: mihhail.fetissov@ut.ee
merli.ratsep@ut.ee
jonne@sea.ee

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Multi-use of offshore wind farms with low-trophic aquaculture can help achieve global sustainability goals

communications earth & environment

ARTICLE

https://doi.org/10.1038/s43247-023-01116-6 OPEN

Multi-use of offshore wind farms with low-trophic aquaculture can help achieve global sustainability goals

Marie Maar[1✉], Andreas Holbach[1], Teis Boderskov[2,3], Marianne Thomsen[4,5], Bela H. Buck[6,7], Jonne Kotta[8] & Annette Bruhn[2,3]

Marie Maar, Andreas Holbach, Teis Boderskov, Marianne Thomsen, Bela H. Buck, Jonne Kotta, and Annette Bruhn

1) Aarhus University, 2) Copenhagen University, 3) AWI, 4) University of Tartu

Photo: Vattenfall

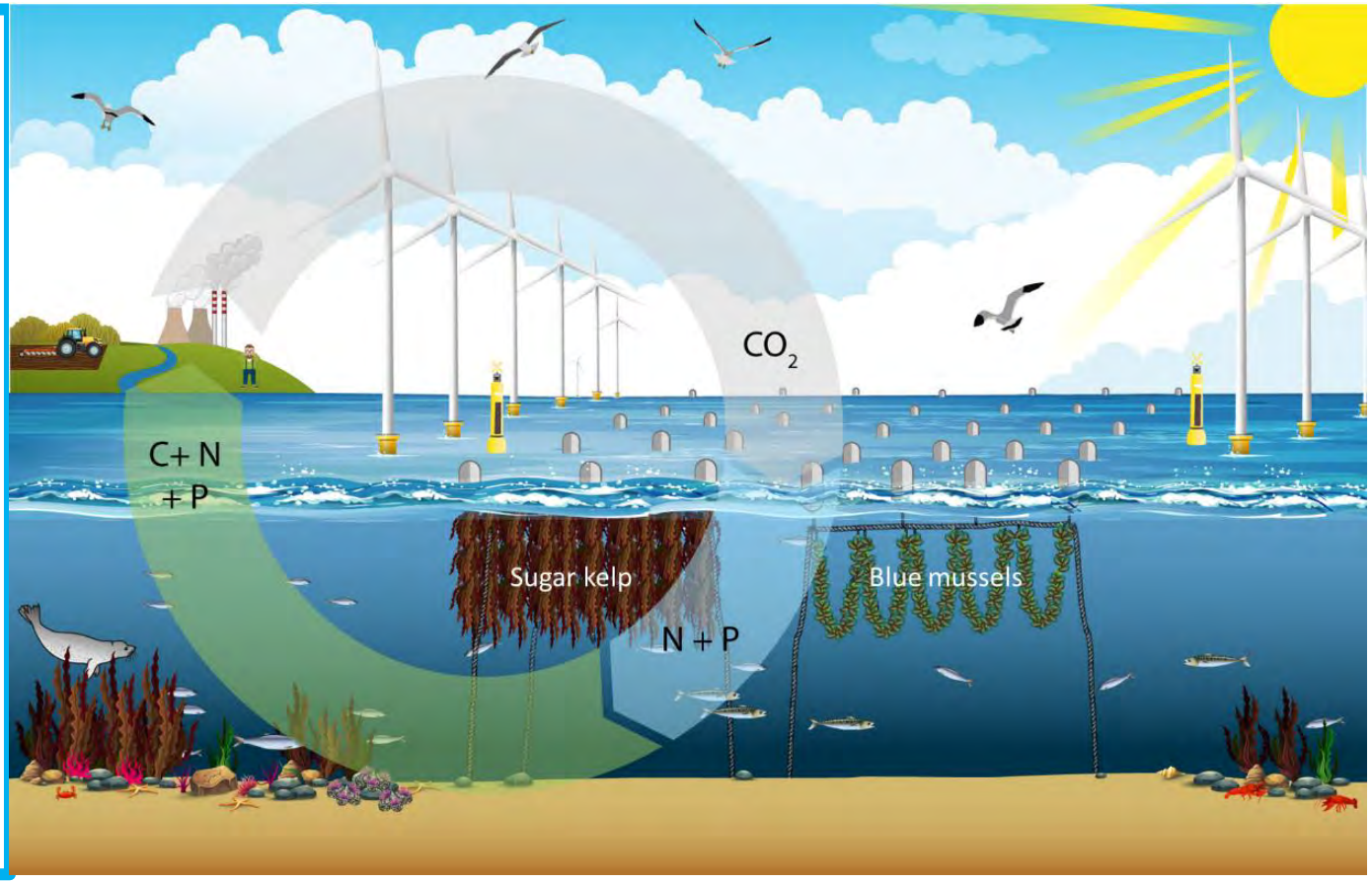
THE COASTAL ZONE

- Many maritime uses
- Stress on coastal ecosystems
- Demand for space is increasing
- Spatial conflicts and inhibition of development
- Often single use management

https://muses-project.com/

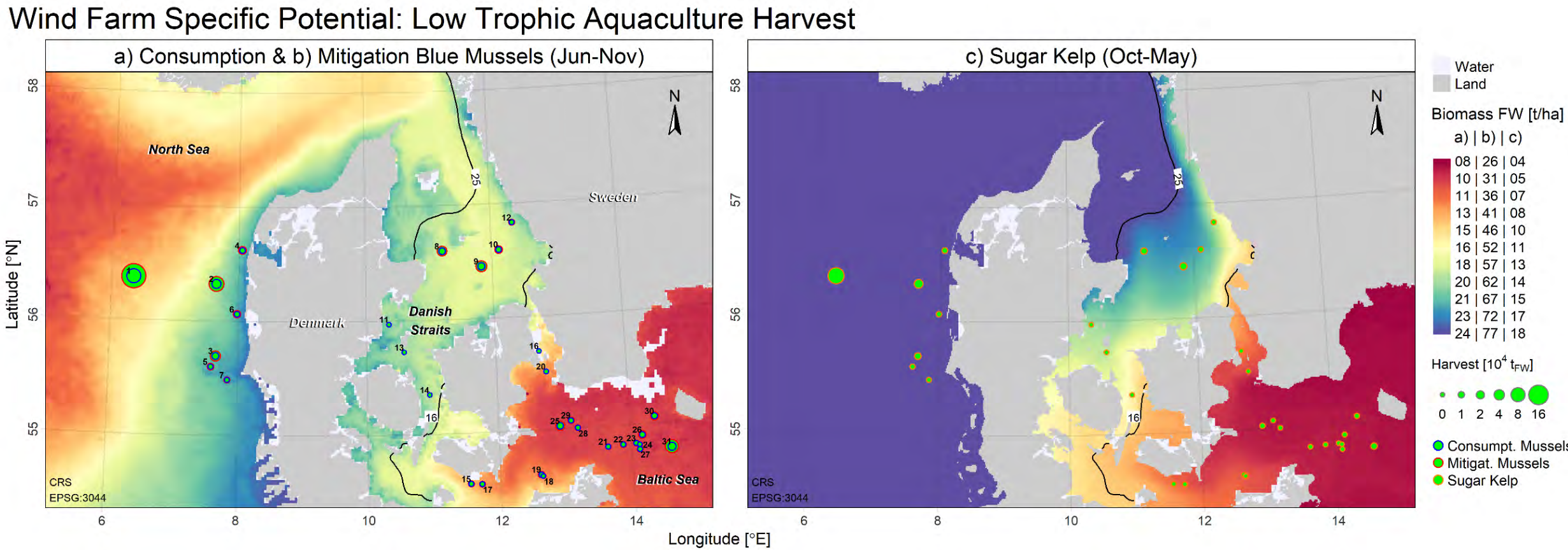
OFFSHORE WIND FARMS COMBINED WITH LOW TROPHIC AQUACULTURE

- Concentrated use in confined space
- Leave other areas free (MPAs)
- Less user conflicts offshore
- Joint infrastructure and services
- Emission-free energy
- Better wind conditions
- Nutritious seafood and feed
- Nutrient and carbon capture and utilization
- Improved water quality and climate change mitigation



HARVEST POTENTIAL

- 325 K-ha x 10% to offshore wind farms
- Average 18 t-FW/ha (seaweed + mussels)
- 578 Kt-FW harvest (x26)
- 40% of CO_2 emissions from DK agriculture



HARVEST POTENTIAL PER FARM AREA

Region	Mussel harvest (t-FW ha^{-1} yr^{-1})	Species	Country	Area name	Reference
Africa	3-91	Blue mussels	South Africa	Saldanha Bay	[106]
Asia	107	Korean mussels	China	Shengsi	[107]
Australia-NZ	7	Greenshell mussels	NZ	NZ	[108]
	20	Greenshell mussels	NZ	Beatrix Bay	[109]
North America	5	Blue mussels	Canada	Prince Edward Island	[110, 111],
	75	Blue mussels	U.S.	Gulf of Maine	Pers. comm. C. Newell
South America	30-494	Blue mussels	Chile	Los Lagos	[112]
Northern Europe	24	Blue mussels	Germany	German Bight	[47-49]
Southern Europe	65*	Blue mussels	Spain	Galicia	[113]
	50	Blue mussels	Algeria	Ain Crop	[114]
	42	Blue mussels	France	Thau Lagoon	[115]

Region	Brown seaweed harvest (t-FW ha^{-1} yr^{-1})	Species	Country	Area name	Reference
Africa	-	-	-	-	-
Asia	32	Sweet kelp**	China	East coast	[116]
Australia-NZ	-	-	-	-	-
North America	16-24	Sugar kelp	U.S.	Gulf of Maine	[117]
South America	124	Giant kelp	Chile	Southern Chile	[118]
Northern Europe	30	Sugar kelp	Germany	German Bight	[31, 48]
Southern Europe	30-46	Sugar kelp	Spain	Galicia, Canabria	[119, 120]

FAO HARVEST DATA
(FOOD AND AGRICULTURE ORGANZATION OF THE UN)

Region	Mussel species	Current mussel harvest (Kt-FW)	Brown seaweed species	Current seaweed harvest (Kt-FW)
Africa	Blue mussels	2.9	Kelp and Sargassum species	-
Asia	Green mussels Korean mussels	1,054	Kelp and Sargassum species	16,678
Australia-NZ	Australian mussels	2.5	Kelp and sargassum species	-
North America	Blue mussels	23.9	Kelp	0.3
South America	Blue-, Chilean-, Cholga, Choro- and South American mussels	404	Kelp	0.001
Northern Europe	Blue mussels	91.2	Kelp	0.4
Southern Europe	Blue- and Mediterranean mussels	361	Kelp	0.1
Total		1,940		16,679

GLOBAL SCENARIOS OF MULTI-USE

- 3 future scenarios for offshore wind farm development
- Assume 10% of the wind farm area is available for low trophic aquaculture
- 50/50 distribution between brown seaweed and mussels
- Assume similar cultured species in all regions
- Apply harvesting estimates of 18 t-FW/ha from the North Sea and W Baltic Sea

3 GLOBAL SCENARIOS (7 REGIONS)

4C-OFFSHORE DATABASE + EXPERT JUDGEMENT

Realistic projection

included areas for **consented** projects by 2023 maturing to an operational wind farm in 2030

And a fraction of **projects** in early phases

Pessimistic projection

only included areas for **consented** projects by 2023 maturing to an operational wind farm in 2030

Optimistic projection

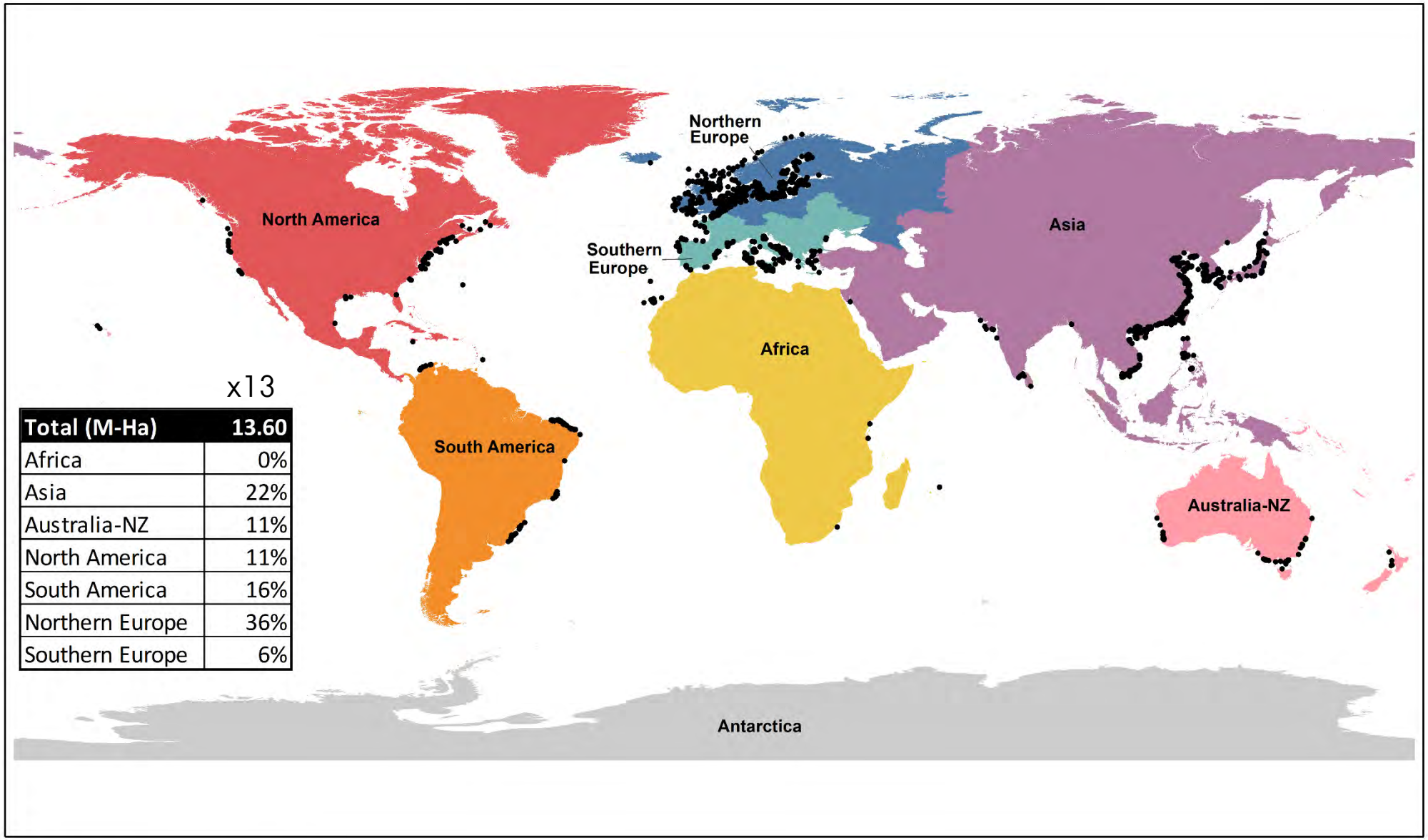
all areas allocated for projects listed in **conceptual** phases in 2023

and a fraction of development and dormant **projects**

2800 projects in database, screening for suitable projects=1893 projects

REALISTIC PROJECTION

4C-OFFSHORE DATABASE



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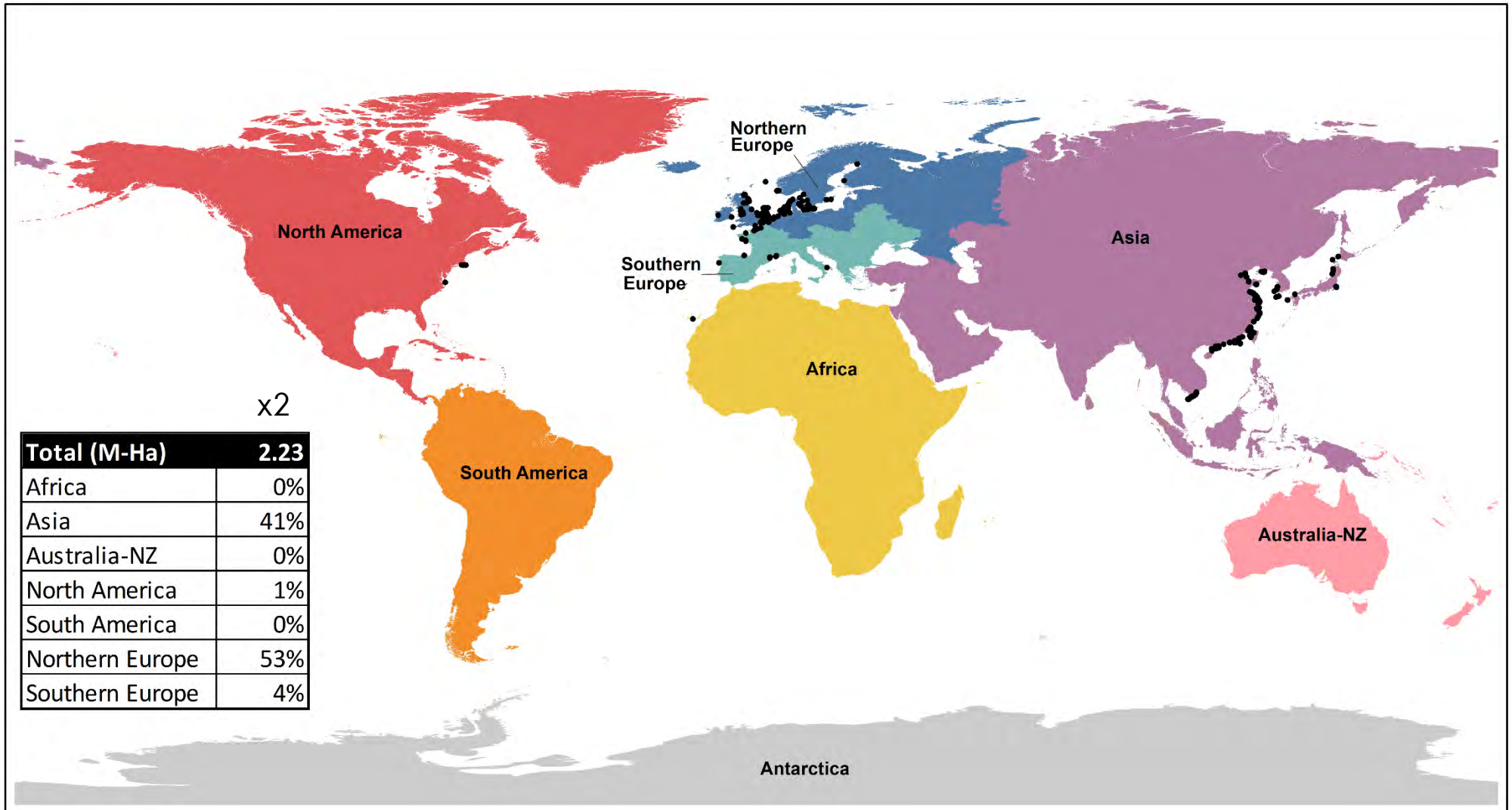
PESSIMISTIC PROJECTION

4C-OFFSHORE DATABASE

- Global Wind Farm Locations (4C Offshore, November 2022)

Offshore Wind Farms Worldwide : 2030 Pessimistic

VATTENFALL



x2

Total (M-Ha)	2.23
Africa	0%
Asia	41%
Australia-NZ	0%
North America	1%
South America	0%
Northern Europe	53%
Southern Europe	4%

Dwg No: GEUWR23-GMX-0004-B_OffshoreWindFarmsWorldwide2030Pessimistic
Datum: WGS 1984
Date: 26/06/23
Wind farm data provided by 4C Offshore, A TGS Company.

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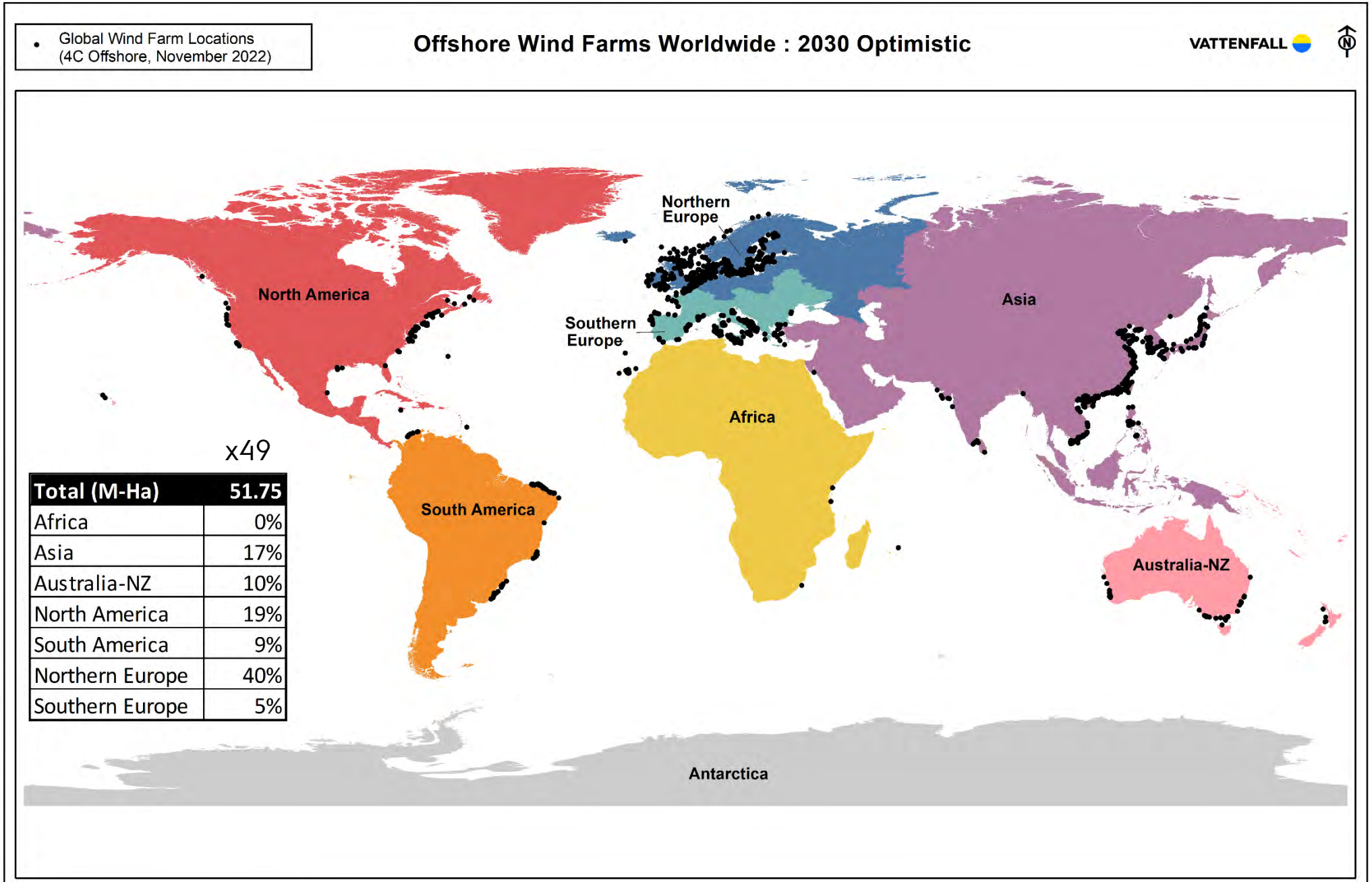
OPTIMISTIC PROJECTION

4C-OFFSHORE DATABASE



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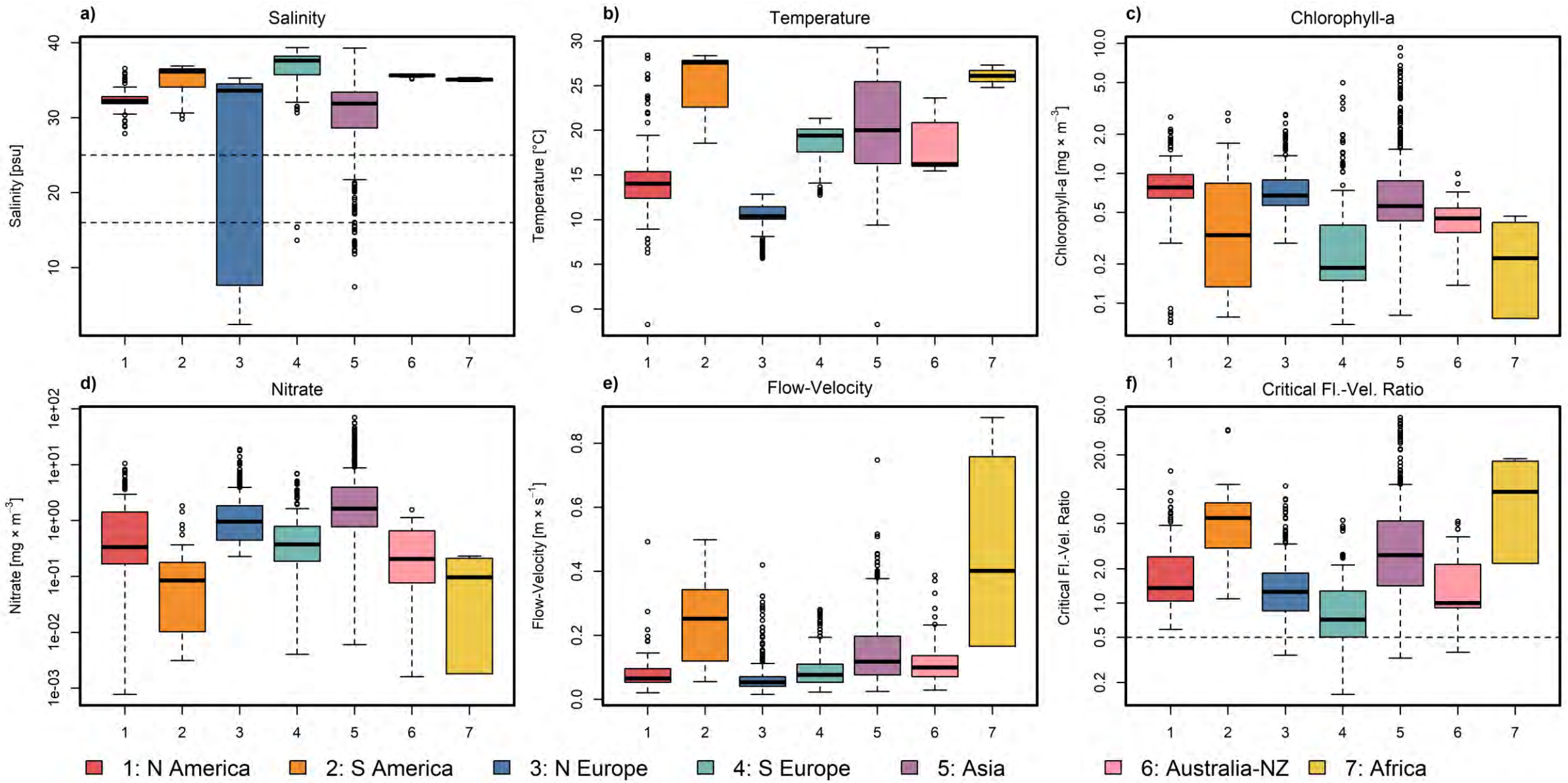
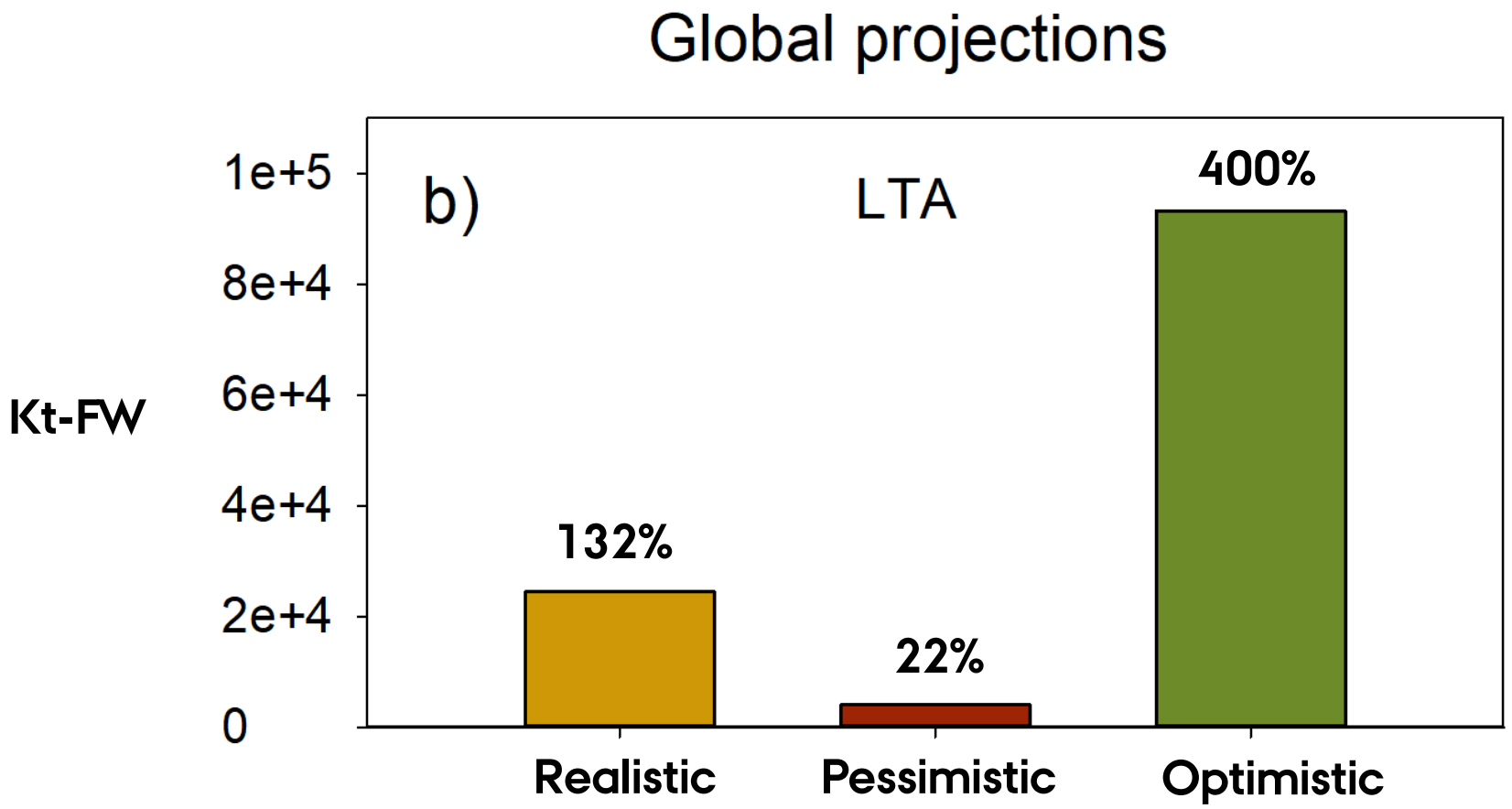
ENVIRONMENTAL VARIABLES



HARVESTING POTENTIAL IN OFFSHORE WIND FARMS



CHALLENGES

- More exposed offshore, new technologies needed
- Longer distance to land, more fuel, operational costs
- How to share services and infrastructure, safety
- Conflict with fisheries
- Spreading of non-indegenious species
- Carrying capacity
- Economic viability of aquaculture

Photo: Vattenfall

SUMMARY

- There is a great potential for multi-use, e.g. combining offshore wind farms with low-trophic aquaculture
- The outcome will support several of the UN Sustainable Development Goals (SDGs)
- But challenges remain and new technologies and approaches are needed

THANKS!

WIN@sea

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WP 3: Low Trophic Aquaculture Performance

OLAMUR annual meeting January 2024

OLAMUR : Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas

WP 3: Low Trophic Aquaculture Performance

Lead IMR – Øivind Strand / Antonio Agüera

Co-lead AU – Marie Maar

WP3 Aims to assess:

- production potential and crop status at the pilots (WP1)
- how local environment, set-up and location impact productivity and carrying capacity
- quality of the LTA products (food/feed safety)
- ecosystem services of low trophic activities
- risks of disease and invasive species
- biodiversity impact of including artificial reef structures

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WP 3: Low Trophic Aquaculture Performance

Tasks

T3.1. LTA farming performance

(Lead: AU | Partners: IMR, HEREON, AWI, UT)

T3.2. Quantification of ecosystem services of LTA

(Lead: IMR| Partners: AU, HEREON, UT)

T3.3. Food and feed safety

(Lead: IMR | Partners: AWI, UT)

T3.4. Artificial reefs ecosystem services and impact assessment

(Lead: AU | Partners: VF)

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Task 3.1: Low Trophic Aquaculture Performance
(Lead: AU | Partners: IMR, HEREON, AWI, UT)

- The aim of this task is to demonstrate the ecosystem carrying capacity of low trophic farms and the efficiency of co-use scaled farming scenarios (OWF and IMTA) represented by the chosen pilots (WP1).
- This task will use local high-resolution 3D ecological modeling of the pilot sites (FlexSem-ERGOM for pilot B, SCHISM for pilot A) and box farm model for pilot C coupled with existing IBM Dynamic Energy Budget Individual Based population Models (DEB-IBM) for mussels and rainbow trout and a dynamic macroalgae model (Holst & Boderskov, 2023).
- These models link local environmental conditions with the physiological performance of the crop to allow estimations of spatial and temporal variability of the crop status.
- These population models will also aim to integrate mortality caused by predation and losses from extreme weather events (storms, heat waves, ice,...) using data from WP1 and WP4 identifying thresholds and providing feedback on remediation protocols and technological needs.
- These models will also provide data and information for the development of tools for site selection (T2.3) and microsite selection within the co-use zone (T1.1 and T2.2).

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Task 3.2: Quantification of Ecosystem Services of Low Trophic Aquaculture (Lead: IMR | Partners: IMR, HEREON, AWI, UT)

- Apply the high resolution IBM models from T3.1 to quantify the effect of LTA in the pilot areas in CNP removal, water clarity, oxygen concentrartion.
- Link crop status/ biomass to other ecosystem services: impact on currents, shading and habitat provisioning)
- Assess current relevant regulation in EU (EU Animal Health law EU2016/429 & diagnostic manual EU2018/1882) and existing protocols for diagnosis, surveillance and disease management in low trophic cultured species to perform an analysis of potential risk related to the co-locations in the pilots.
- Develop an inventory and identification guide of potential invasive species including risk assessment that can be used by WP5 to create tools for assessment of risks and dissemination of awareness, education and training of the LTA facilities personnel to deal with these organisms.
- Quantification of ecosystem services, especially nutrients and carbon uptake will be used in WP2 site selection tool and WP6 sustainability assessment and economic viability

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Milestones and Deliverables from Task 3.1 & 3.2

- **MS3.1:** Ecosystem models established for pilots are up and running (Task 3.1 - June 2024)
- **MS3.2:** Transfer of modeled data on farm performance and related ecosystem services to WP2 and WP6. Data quality is validated and available on project workspace (Task 3.1/3.2 - December 2024)

- **D3.1:** Data on farming productivity for different scenarios (Task 3.1. Lead: Marie Maar. December 2024)
- **D3.2:** Report on assessment of carbon and nutrients uptake. Quantification of ecosystem services (Task 3.2. Lead: Antonio Agüera. June 2025)
- **D3.3:** Report on protocols for diseases and invasive species control (Task 3.2. Lead: Erwann Legrand & Mats Bøgwald. December 2025)

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Task 3.3: Food and Feed Safety
(Lead: IMR | Partners: UA, AWI)

- Assess food safety risks of farming LTA in OWF and IMTA
- Regular analysis of contaminants will be sampled from harvested LTA crop for comparisons of the pilots and assessed for suitability for different applications
- Particulate emissions from OWF in operation can be a source of emerging pollutants (microplastic, etc) of potential food safety risk for LTA products
- Propose a food safety protocol for LTA in OWF. The protocol will be combined with the biomass production models from T3.1 to create a tool to help stakeholders to optimise the use of the production and the optimal production cycle.

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Task 3.3: Milestones and Deliverables

- **MS3.3** Samples of seaweeds and mussels received from T1.4 for composition analysis (AU & AWI | December 2024)
  - Sampling of mussels and macroalgae ready in 2025 -> sampling Spring 2025.
  - May focus only on one pilot (Danish pilot): Mussel lines to be deployed spring 2024. Biomass samples for food and feed safety to be taken during 2024 and 2025

- **MS3.4** Composition & contaminants analyses finalised (Lead: Arne Duinker & Tanja Kögel | December 2025)

- **D3.4** Report on protocol for food and feed safety (Lead: Arne Duinker | December 2025)
  - Likely to be delayed based on LT species sampling timeline.

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Task 3.4: Artificial reefs ecosystem services and impact assessment (Lead: AU | Partners: VF)

- The aim of this task is to document and quantify biodiversity and fish abundance of benthic habitats associated with artificial reef structures in OWFs, using, testing and comparing methods, i.e. eDNA, ROV images, direct sampling.
- This work is only in WP1 pilot B (Kriegers Flak in the Baltic).

- **D3.5:** Report comparing biodiversity on different artificial reef structures - input data for WP2 and WP6. (AU | December 2025)

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Task 3.4: Artificial reefs ecosystem services and impact assessment

Boulder reefs, biodiversity and fish (Annette Bruhn)

Question:

- Do we find the same biodiversity on the original reef structures as on the turbine basis and the scour protection?

Status:

- Biodiversity survey: Biological samples, ROV and eDNA - finalised summer 2023

Plans:

- Biodiversity survey results expected summer 2024
- Cod population determination – citizen science fishery survey - summer 2024

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OLAMUR

Thanks for your attention

Contact Details: Antonio Agüera

Email: antonio.aguera@hi.no

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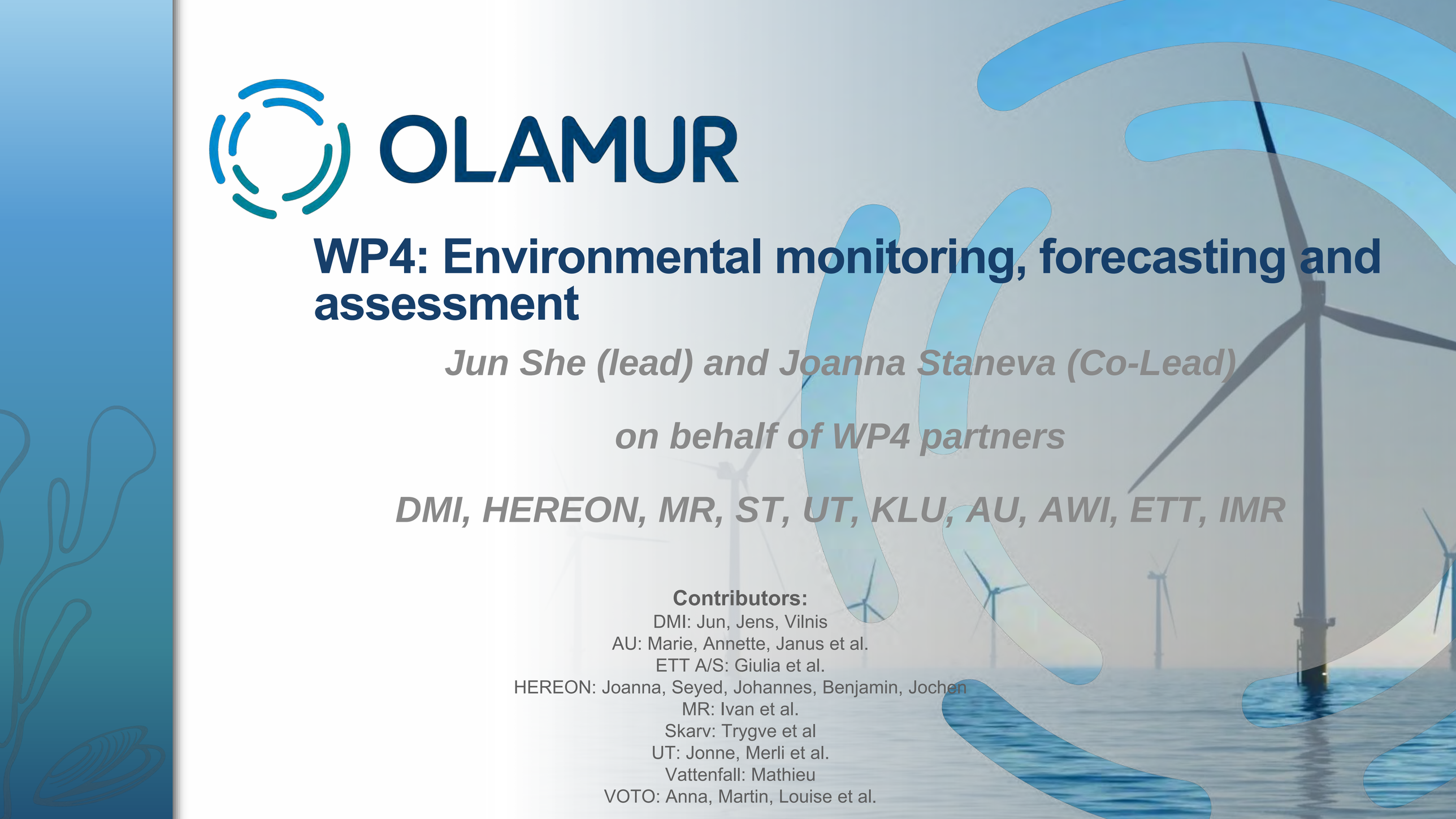
WP4: Environmental monitoring, forecasting and assessment

Jun She (lead) and Joanna Staneva (Co-Lead)

on behalf of WP4 partners

DMI, HEREON, MR, ST, UT, KLU, AU, AWI, ETT, IMR

Contributors:
DMI: Jun, Jens, Vilnis
AU: Marie, Annette, Janus et al.
ETT A/S: Giulia et al.
HEREON: Joanna, Seyed, Johannes, Benjamin, Jochen
MR: Ivan et al.
Skarv: Trygve et al
UT: Jonne, Merli et al.
Vattenfall: Mathieu
VOTO: Anna, Martin, Louise et al.



Objectives

- Advancing existing and emerging robotic monitoring technology
- Observing farm status by combining robotics with traditional monitoring.
- Advancing basin- and local-scale models for forecasting service and assessing impacts of OWFs on physical, biogeochemical and ecological states

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Milestone & deliverables

Milestone/ deliverable number	Milestone/Deliverable name	Due date
MS4.1	Monitoring strategies and schemes designed	M12, M24
MS4.2	Forecast system developed with resolving impacts of offshore farms	M24
MS4.3	Robotics-based monitoring technology optimized for field demonstrations in operational environment, and field monitoring sampling strategy finalized	M36
MS4.4	Physical and environmental impacts of the farms assessed and transferred to WP2 and WP6	M42
D4.1	Emerging autonomous monitoring solution for co-located, low impact aquaculture farms (incl. prototype ASV+AROV system for autonomous subsea surveys and drones, ferrybox)	M36, MR
D4.2	Integrated monitoring solution for offshore LTA farming (incl. monitoring standards, sampling design, integration of robotic and classic monitoring and field campaign demonstration)	M36, UT
D4.3	Environmental forecast solutions for co-located, low impact aquaculture and wind farms	M39, DMI
D4.4	Common protocols for environmental impact assessment of LTA	M44, HEREON

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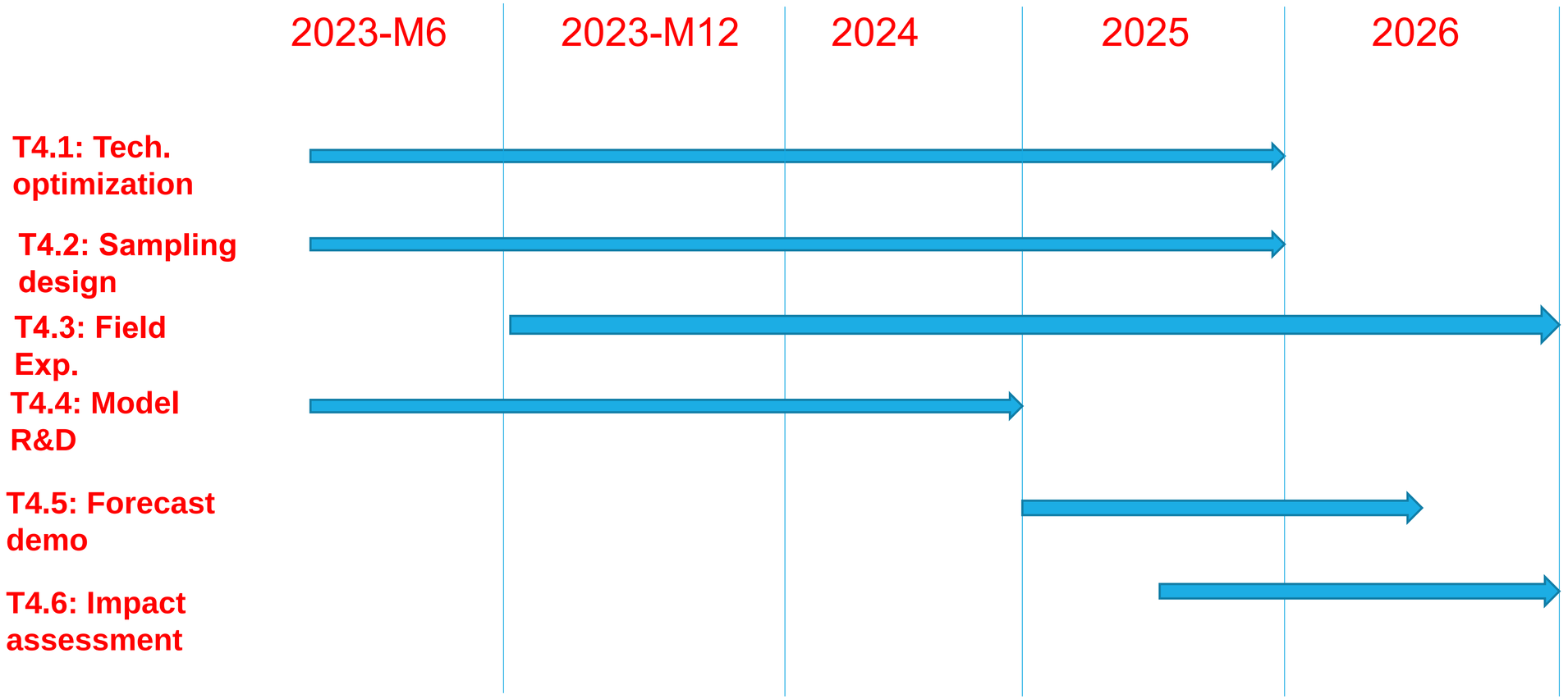
Tasks & timeline



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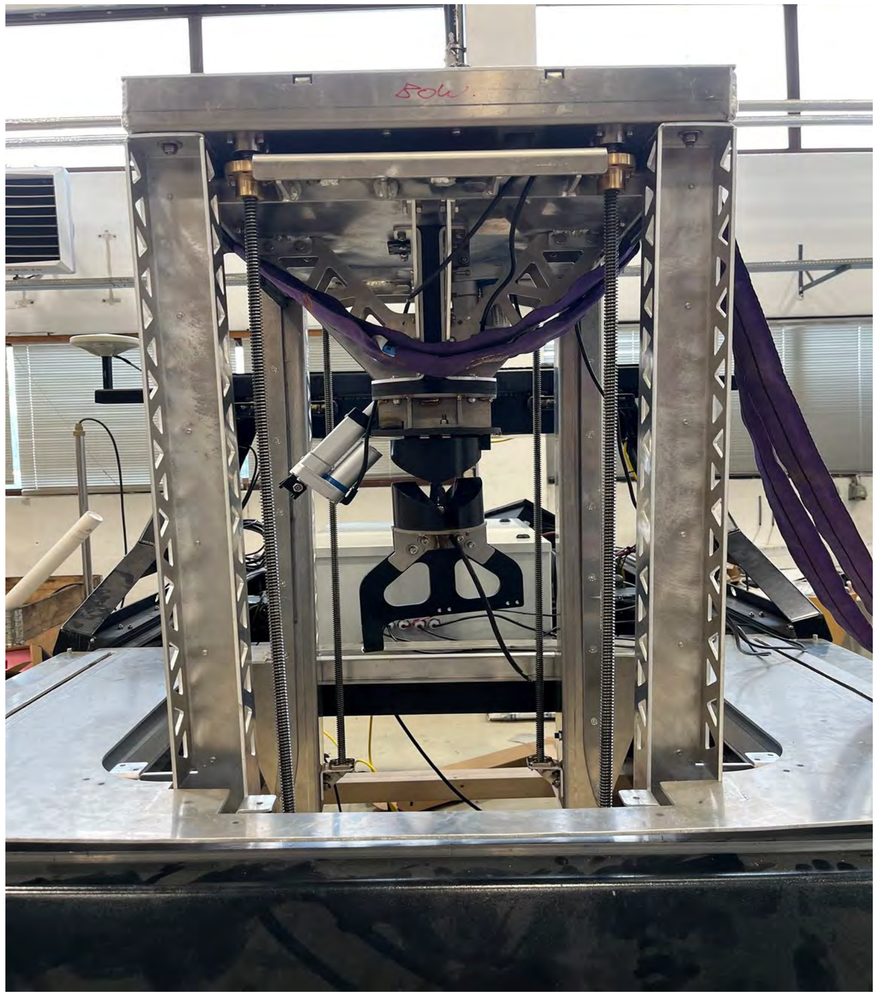
WP4.1 Technology development: MR

Overview of UUV-ASV integrated solution (work in progress)

- OtterX is the **ASV** platform (a larger size to allow more payloads)
- Skarv modified **BlueROV** is the UUV, tethered to the ASV
- A Custom Launch and Recovery System (**LARS**) is mounted on OtterX
- Platform is lowered through the splash zone UUV **attached** rigidly
- When UUV is submerged, a lock is released, allowing UUV to be **detached** from the platform
- A separate mechanism grips the **tether** if it is subjected to snap loads during the operation. Otherwise, it flows freely
- A **winch** is mounted next to the LARS, reeling tether as needed
- **USBL** acoustic modem used for relative **positioning** between UUV and ASV, to provide UUV with redundant global positioning information

Overview of UUV-ASV operation

- OtterX, LARS and winch **controlled remotely through WiFi over radio**
- Plans are drawn in a **GUI console**, and forwarded to the UUV through WiFi and tether
- **ASV follows the UUV** in formation mode during operation
- UHI and video **data** is streamed back to land
- USBL is continuously providing **improved positioning** to the UUV



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WP4.1 Technology development: MR

MARITIME ROBOTICS

OtterX and Launch-and-recovery (LARS) platform

- LARS: built, tested and integrated on OtterX
- Winch: by renting (to stay on schedule)
- Software for interfacing and coordinating with USV: developed and tested
- Work on the platform: behind schedule
- First LARS field test: in Trondheim with Skarv, scheduled for end of January

Software development to support autonomy and operations in OWF

- **OtterX situational awareness** improvements to radar and camera systems (Release of Furuno radar software for improved situation awareness)
- **OtterX navigation** improvements to positioning sensors fault tolerance

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WP4.1 Skarv Technology

- Sea trials with Maritime Robotics delayed, will be conducted in Q1 2024
- Control and navigation prototype for tandem remote operation
- Autonomy for seafloor mapping and image processing

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WP4.2 Sampling design in 2023

Pilot 1 MR&ST&AWI:

- **Planning for first field deployment May-June together with Maritime Robotic**
- **Sampling with the ASV+UUV platform payload, Underwater Hyperspectral Imager (UHI)**

Pilot 1 HEREON/AWI

- **X-band Marine Radar (on substation platform)**
- **Wave Rider Buoy (near to the experimental area)**
- **FerryBox (on Crew Transfer Vessel)**
- **Drones & ADCP**

Pilot 2 VOTO/AU

- **Physical-Biogeochemical condition monitoring: R/V+AUV, seaweed farm August 2023, VOTO**

Pilot 3 UT

- **Traditional oceanographic monitoring from October 2023**

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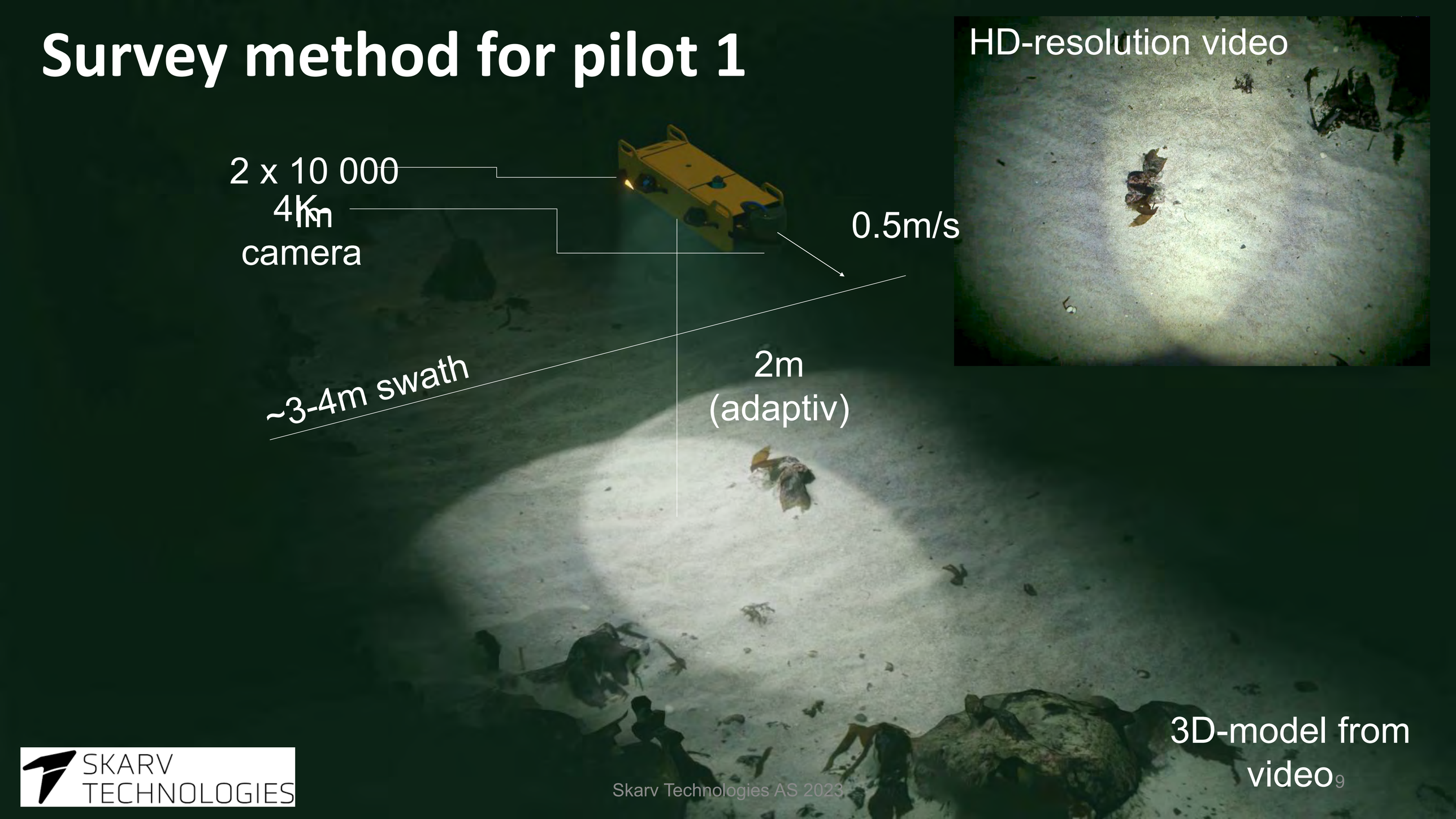
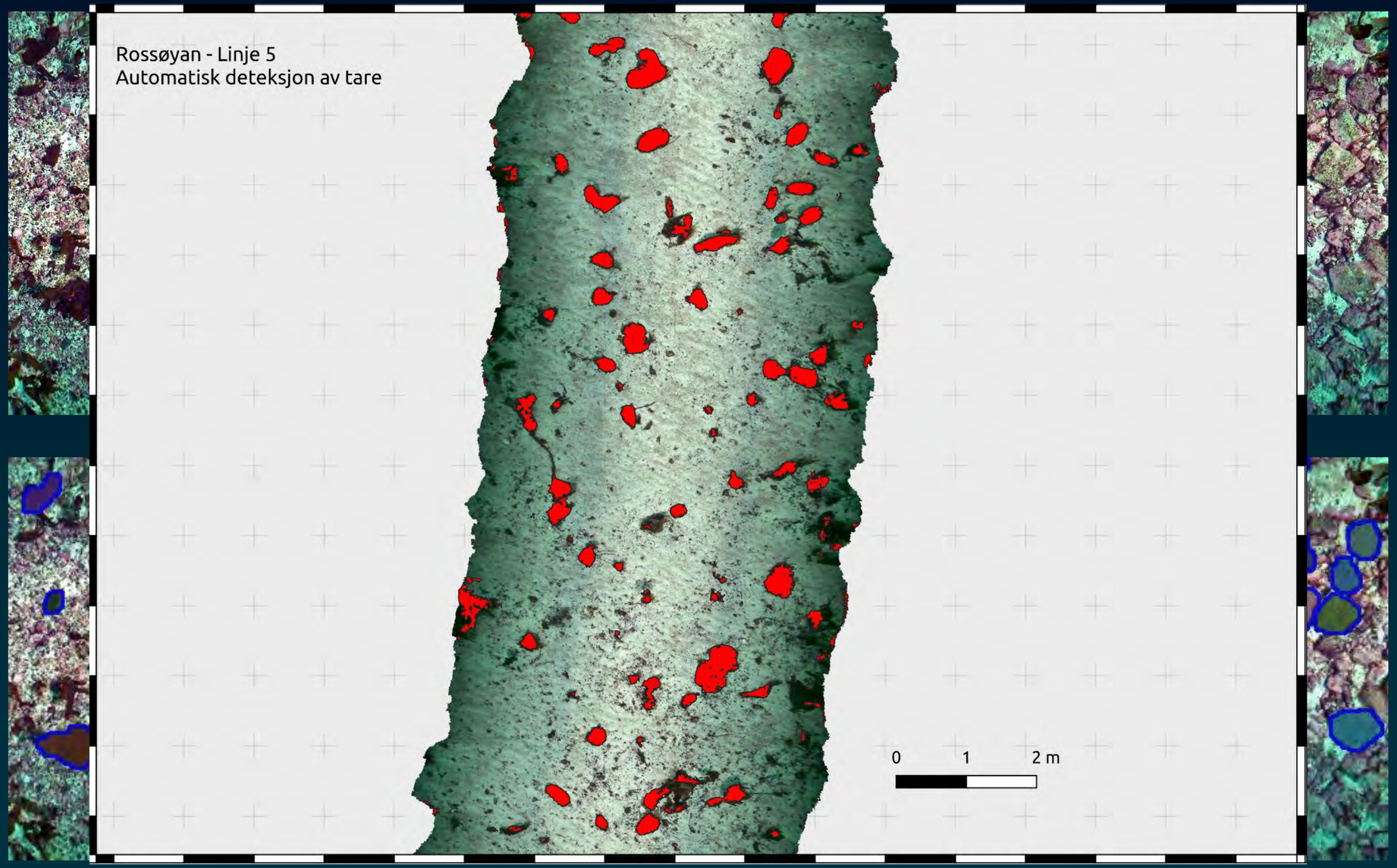
Survey method for pilot 1



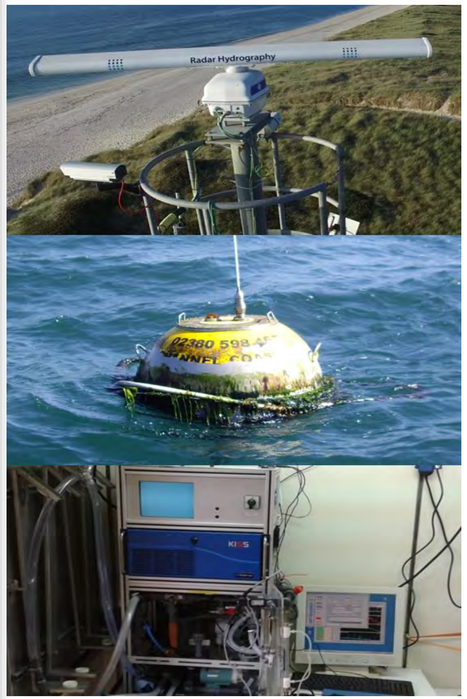
SKARV TECHNOLOGIES

Skarv Technologies AS 2023

Example data



Measurements within the Offshore Windpark



X-band Marine Radar (on substation platform)

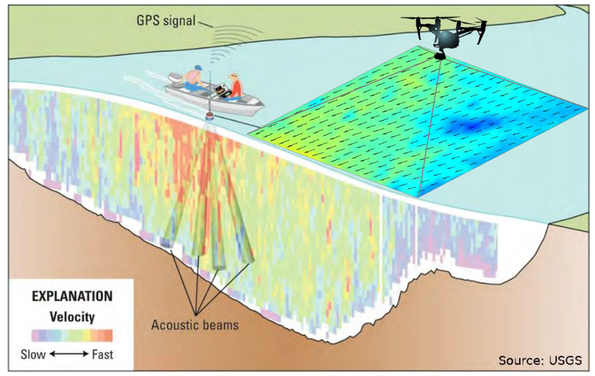
- Surface current fields
- Wave spectrum, significant wave height, peak wave period, peak wave direction

Wave Rider Buoy (near to the experimental area)

- Individual waves, wave spectrum, significant wave height
- Peak wave period, peak wave direction

FerryBox (on Crew Transfer Vessel)

- Temperature, Salinity
- Ph, Oxygen
- Chlorophyl A (fluorescence)
- Colored Dissolved Organic Matter



High resolution current measurements

- Autonomous surface vehicle with Acoustic Doppler Current Profiler for 2D vertical current profiles
- CopterCurrents, Drone with video camera for 2D Surface currents

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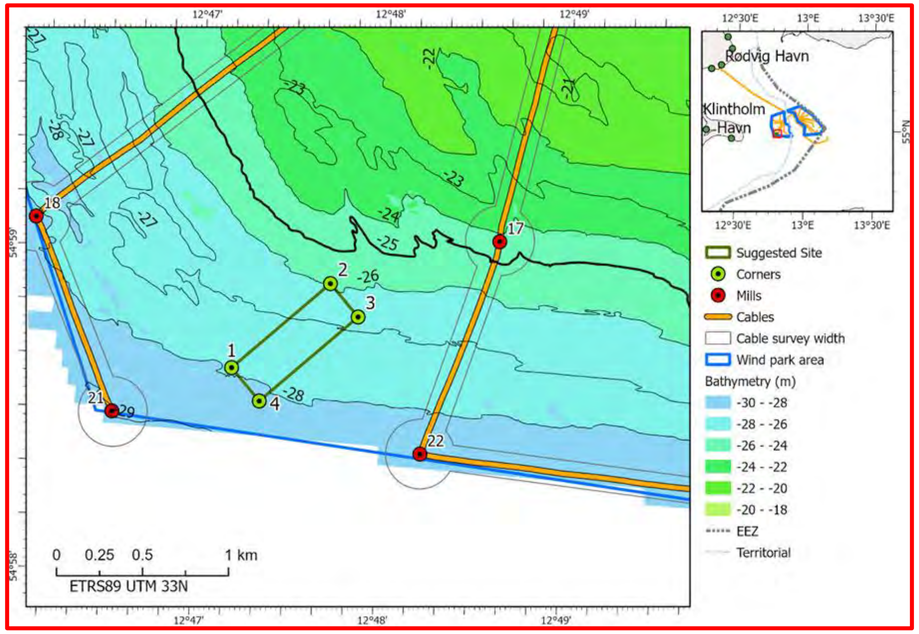
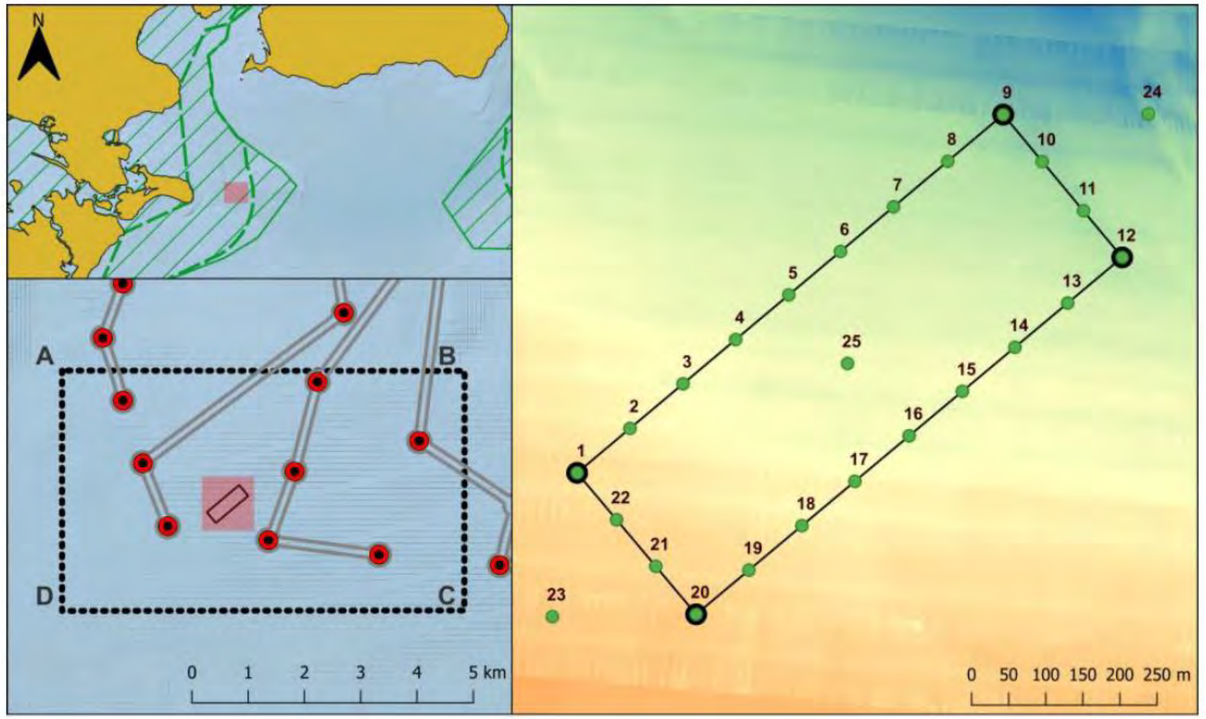
WP4.2: sampling design – Pilot 2

- Oceanographic base-line survey done by VOTO
- Procedures in place for Vattenfall to run regular CTD casts
- Procedures for monitoring of jellyfish in progress
- Coupling to the Danish National Marine Monitoring Program in progress



WP4.3: Field campagin: baseline survey by VOTO: 11-15.9.2024



Comparison between AUV and CTD casts

Parameters:

- Temperature, Salinity
- Chlorophyll /Fluorescence
- Oxygen concentration
- Depth

Cruise report available
Data available

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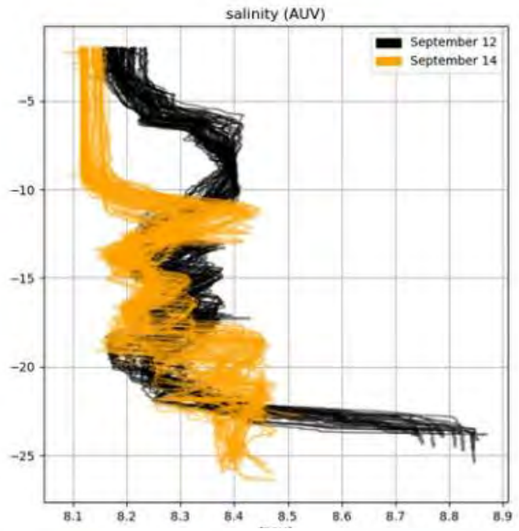
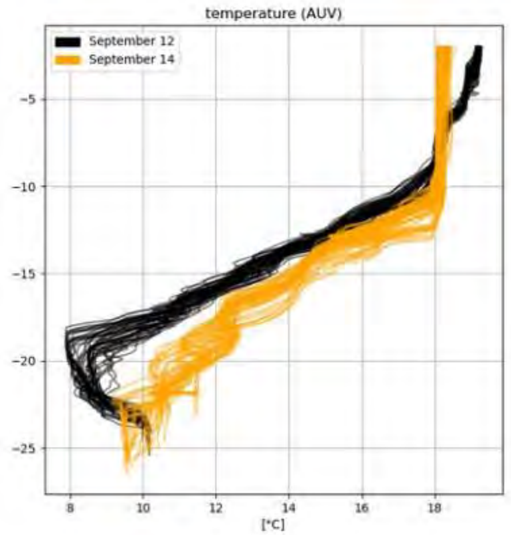
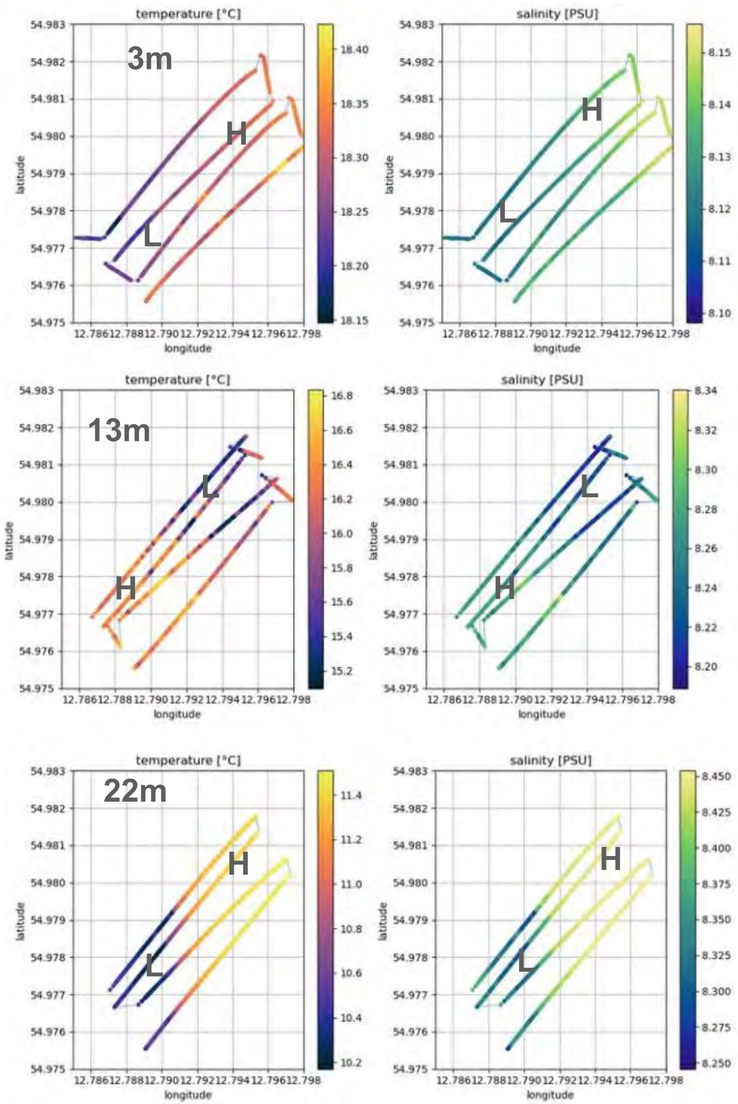
Submesoscale variability observed by VOTO







Vertical profile

- In up 10m, colder & fresher water has moved in
- Below 10m, warmer and fresher water has moved in
- Enhanced vertical mixing between 12-14 Sep. changed the vertical T/S structure (less stratified)
- Oxygen became less in 14 Sep.

Horizontal pattern

- Clear spatial variability in scale of a few hundred meters: SW side has less stratified water; NE side has more stratified water
- At 3, 13 and 22m, there are different water masses: 3m/22m, colder, fresher in SW; warmer, saltier in NE; 13m is opposite

Joint research on submesoscale variability by using on-site observations and models (DMI, AU, VOTO)

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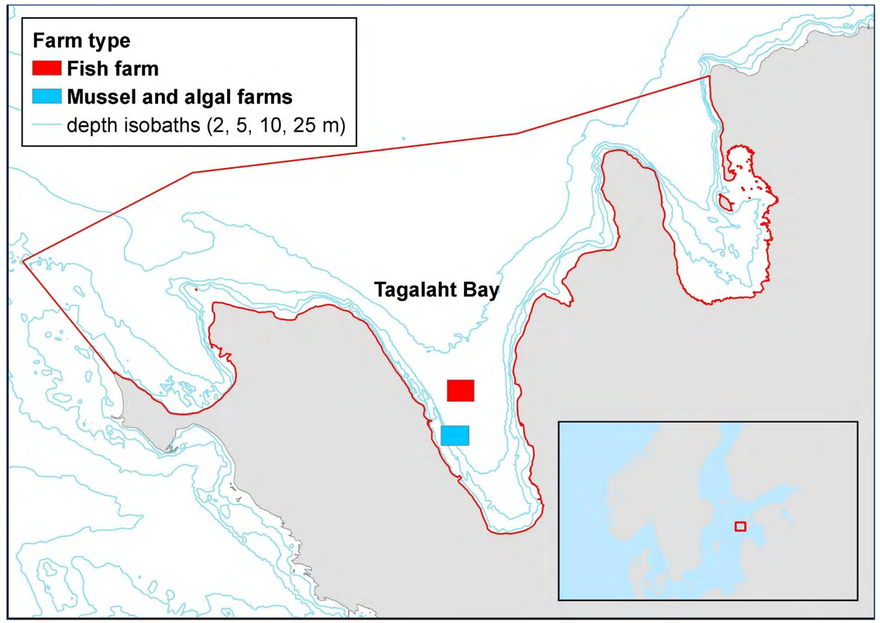
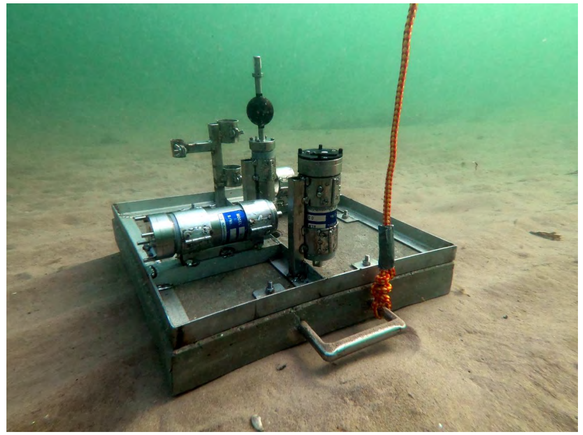
WP4.3 Field monitoring: Pilot 3



SAMPLING VARIABLES	START OF MONITORING	END OF MONITORING
Oxygen	October 2023	October 2024
Turbidity		
Chlorophyll		
Light		
Temperature		
Salinity		
Water velocity (speed and direction)		



- **2 sites: mussel farm vs control site**
- **continuous measurements**
- **monitoring on-going**

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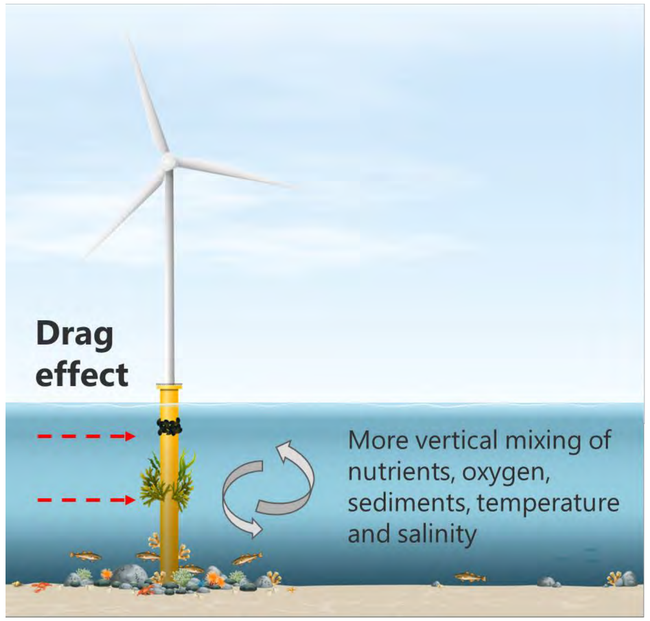
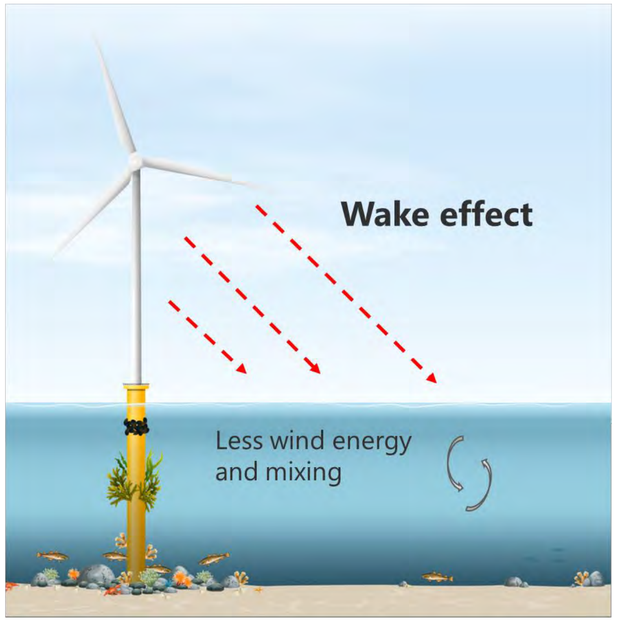
WP4.4 Model development for forecasting and impact assessment

Progresses

- Modelling and forecast impact of OWF wake effects caused on ocean-waves by winds: DMI HEREON
- Modelling impact of OWF turbine foundation on ocean and waves: AU, HEREON





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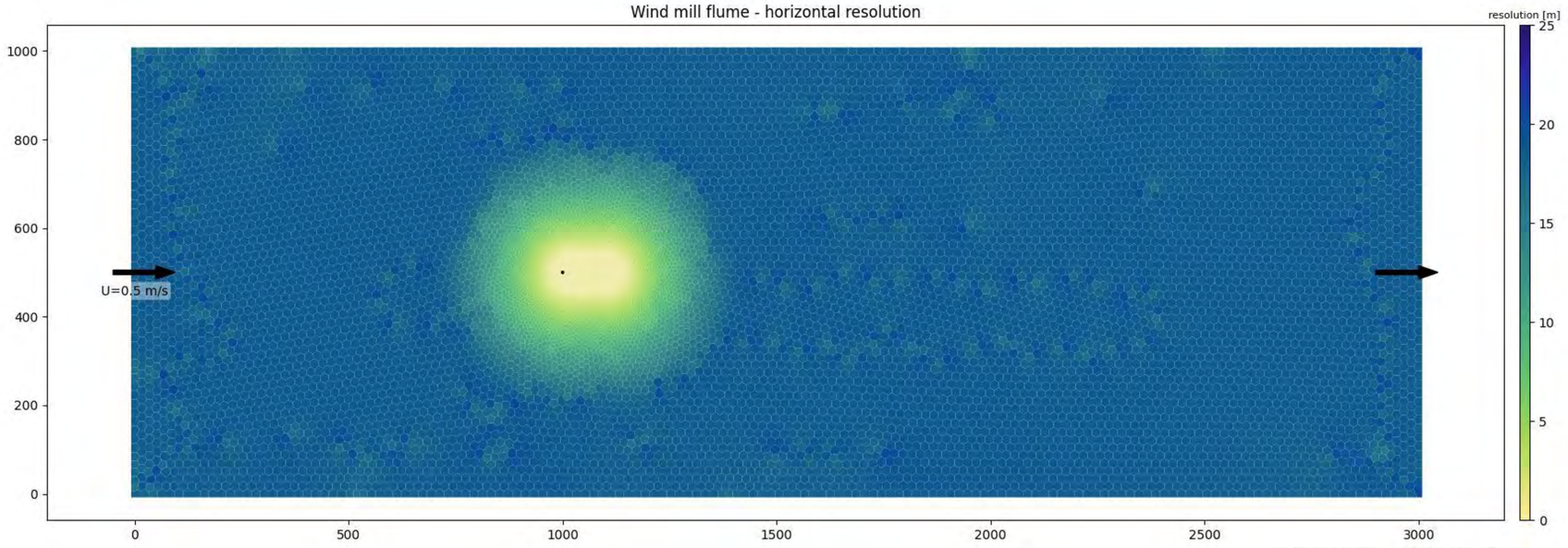
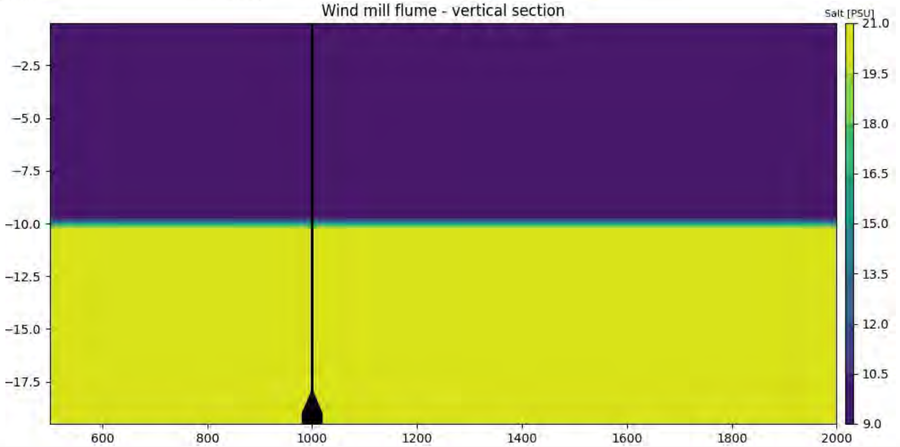
Does windmill foundations influence flow and stratification significantly?





Very high-resolution (20 m) hydrodynamic model set-up to investigate the drag effect of monopiles

- Windmill foundation (diameter 7m)
- Scour protection (diameter 40m, height 1-2m)
- Constant water velocity
- No surface (wind) drag
- Vertical wall drag on foundation and scour protection only
- Botton roughness 0.003 m
- Roughness on scour protection 0.02 m

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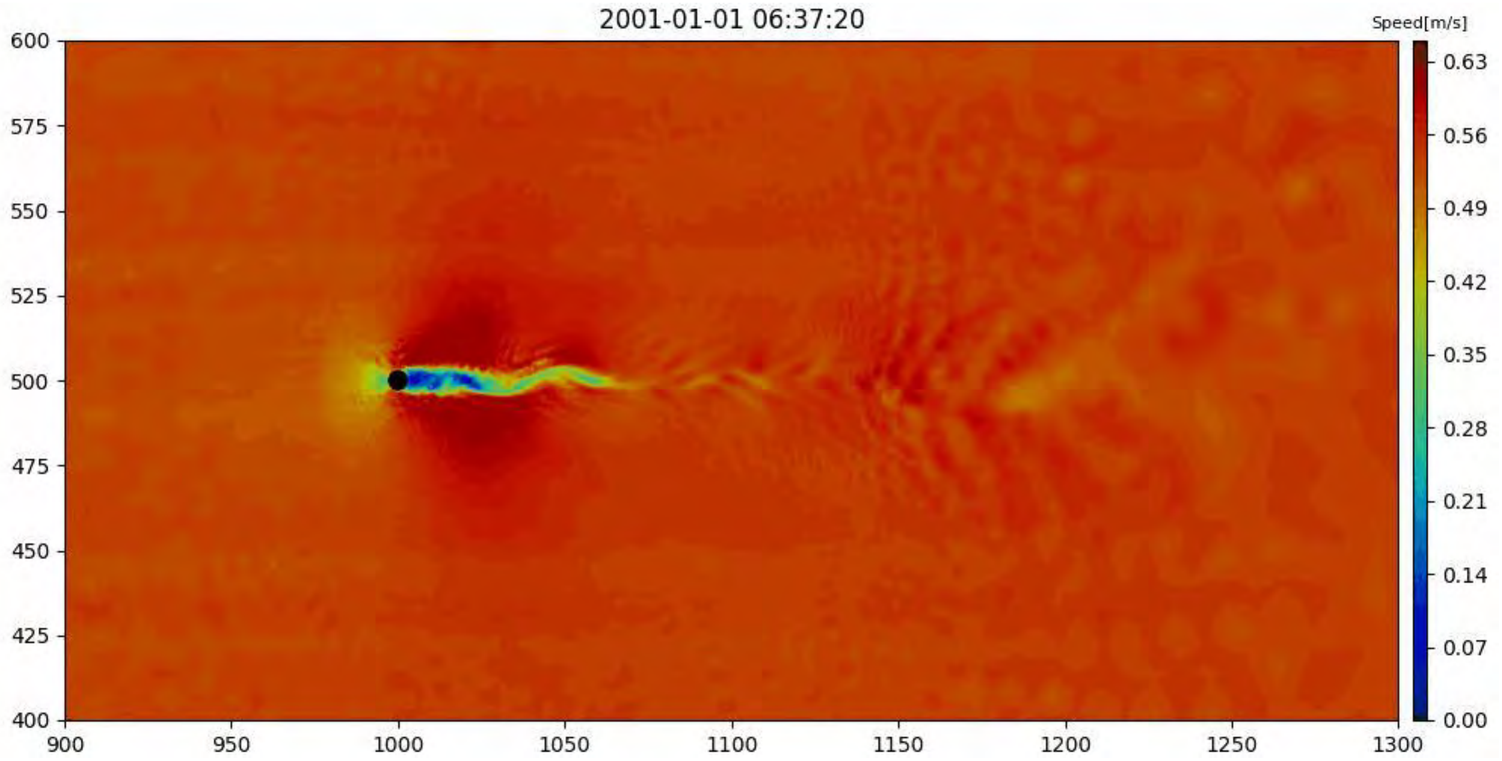
Surface speed



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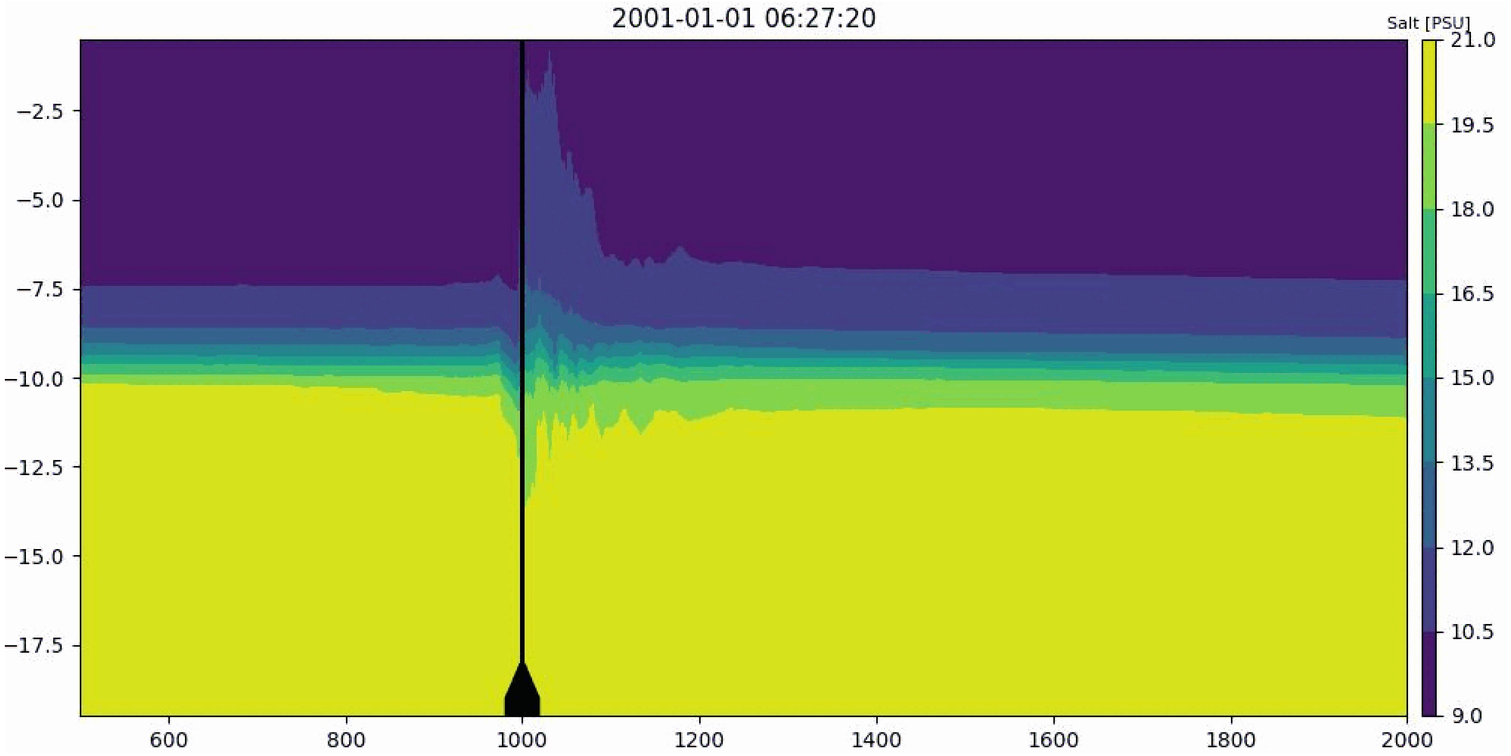
Vertical particles and stratification



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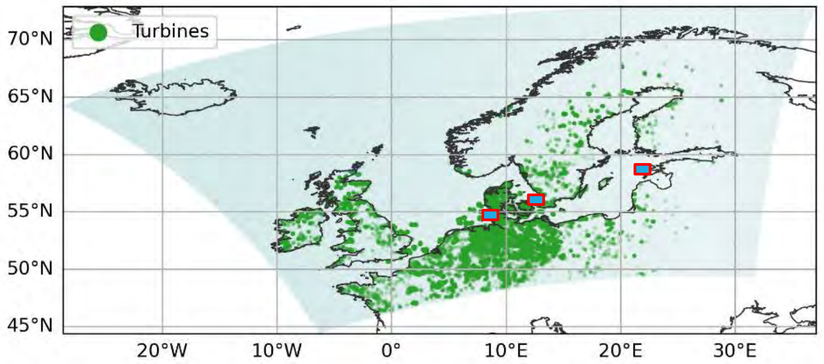
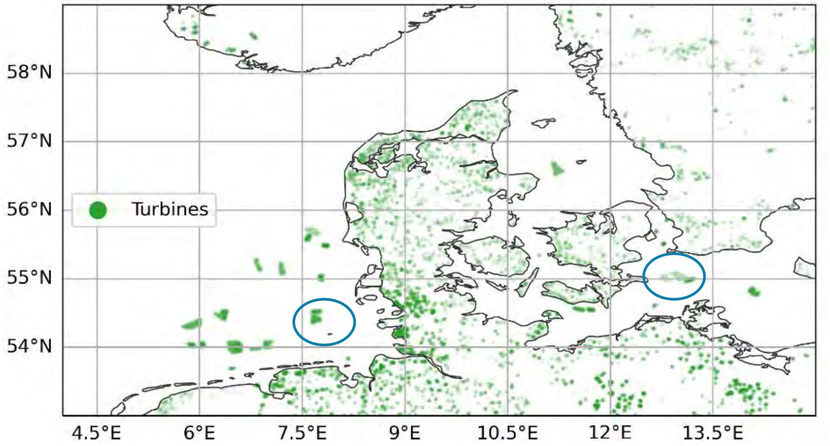
DMI configurations for OWF impact simulation experiments





- **Models**: HARMONIE-HBM-WAM
- **Coverage**: Baltic-North Sea
- **Resolution**: NWP: 2.5km; HBM-WAM: 1nm (BAL, Wadden Sea), 0.5nm (IDW), 3nm (North Sea); 0.1nm resolution for OLAMUR farms
- **Period**: Aigust 2022 (Summer), Feb. 2020 (Winter)
- **Experiments**: No OWF (NWF); FIT and EWF with OWF parameterizations
- **Wind Farms**: both land and offshore WFs are included

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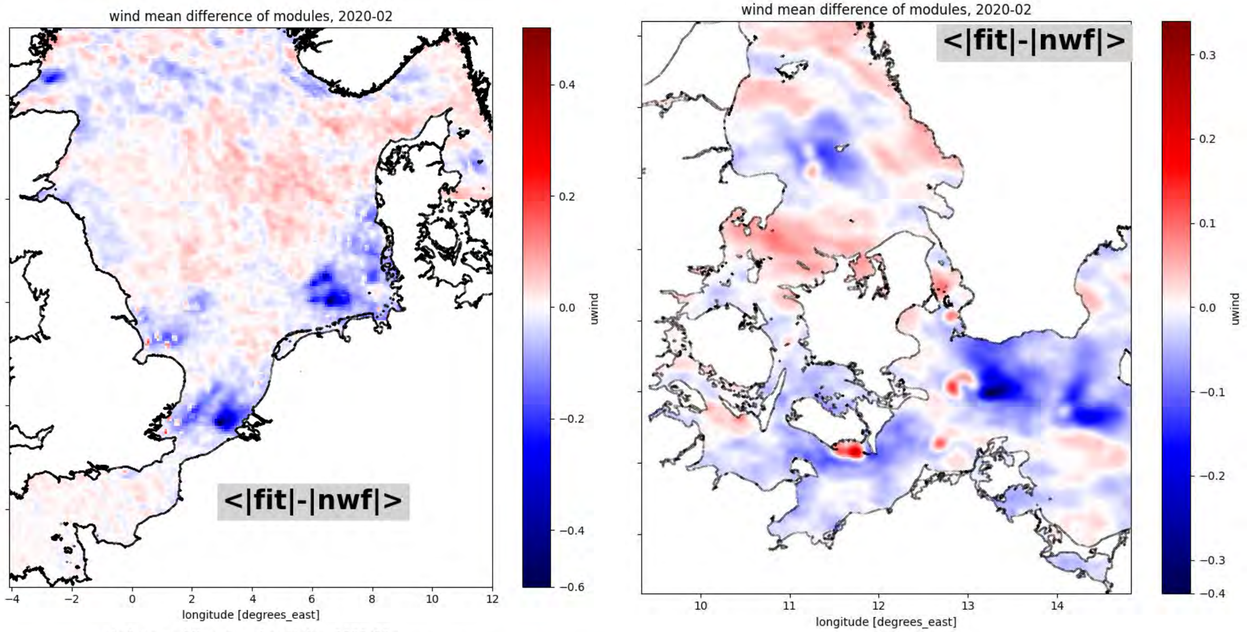
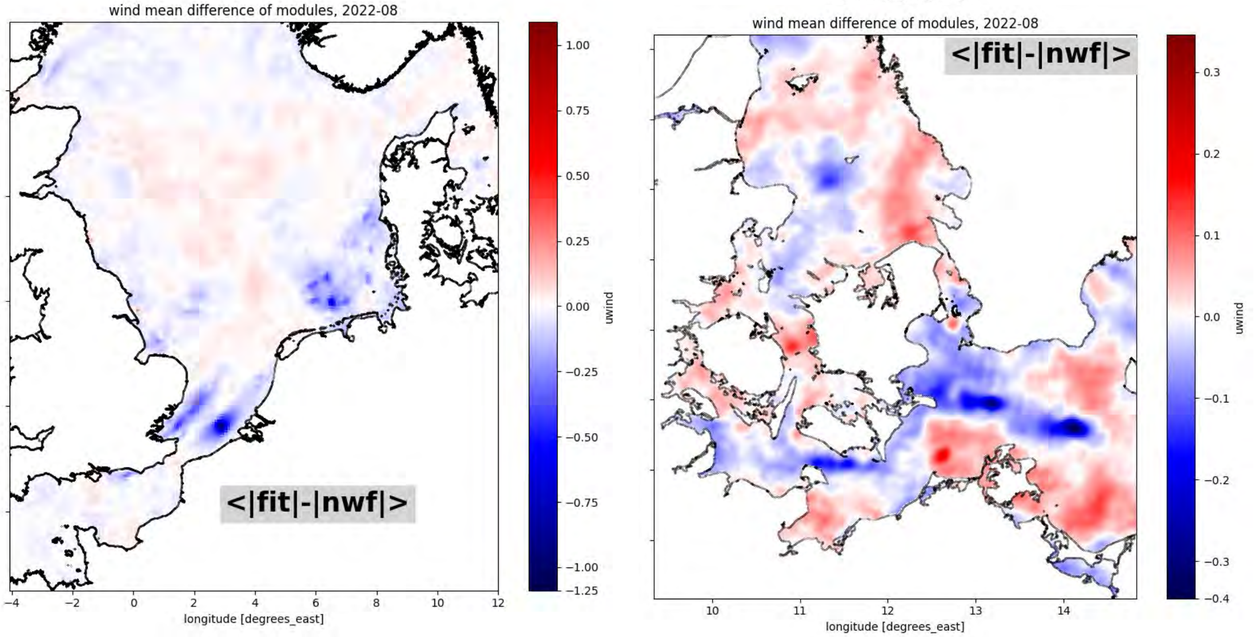
OWF impacts on 10m winds

DMI
Vejr, klima og hav

Feb. 2020



Aug. 2022

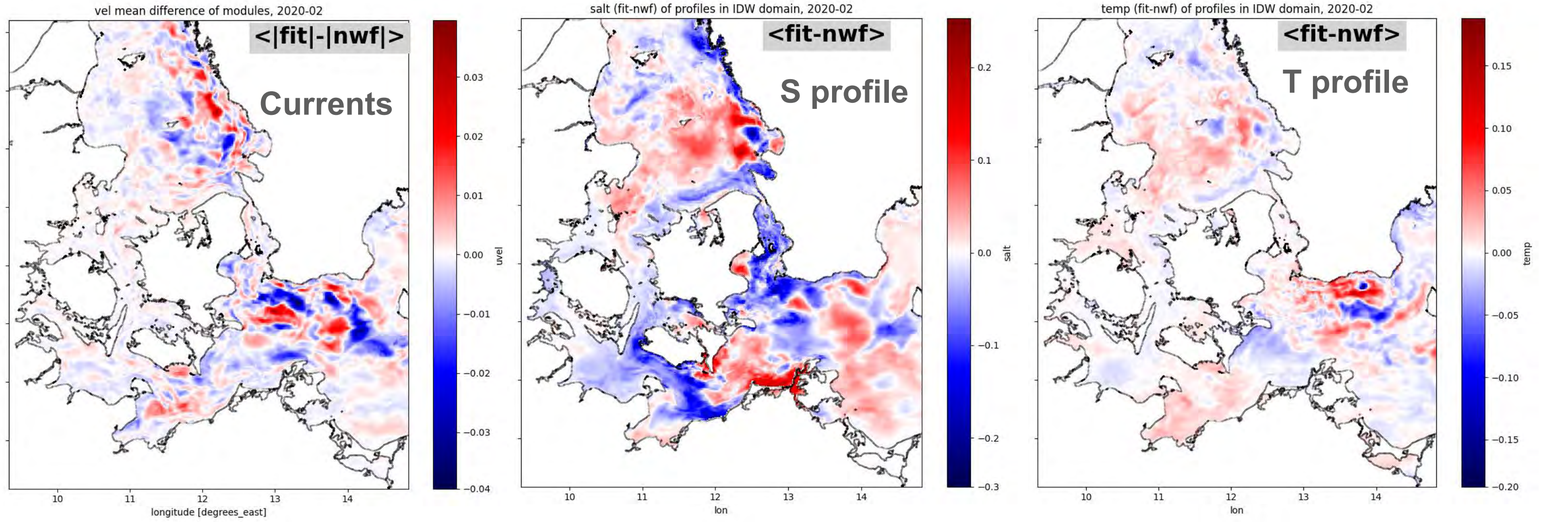


- **Local impacts are clearly visible, related to wind power capacity**
- **Non-local impact can also be significant**
- **22-08 generates higher wind change than 20-02**

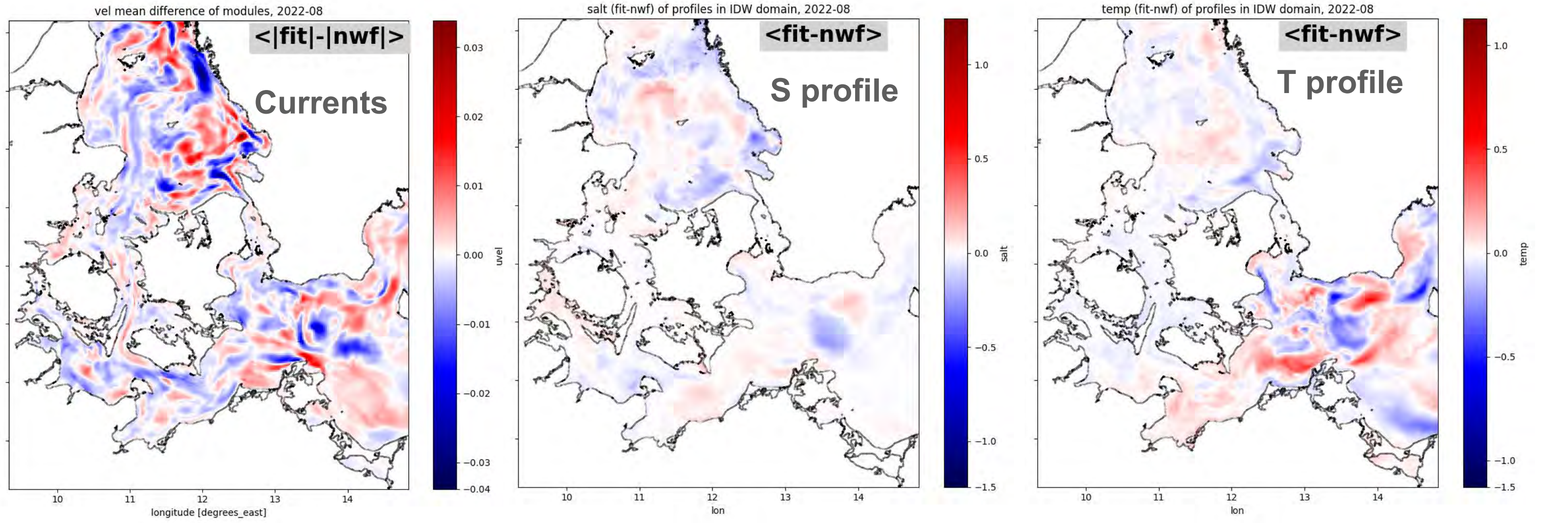
OWF impacts on hydrodynamics in transition waters

DMI
Vejr, klima og hav

Feb. 2020



Aug. 2022



- Local impacts are clearly visible
- Arkona Basin has largest local impacts
- There are wave-like non-local impacts
- Non-local impacts in E. Kattegat are largest
- 22-08 Generates much higher T/S change than 20-02

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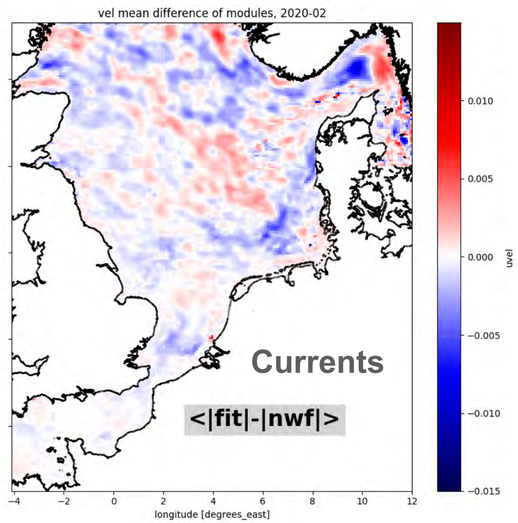
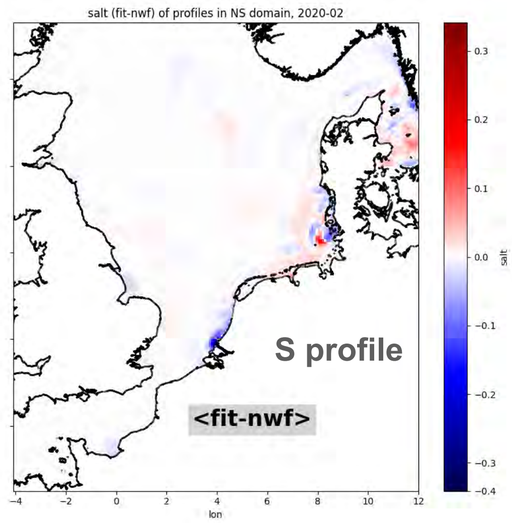
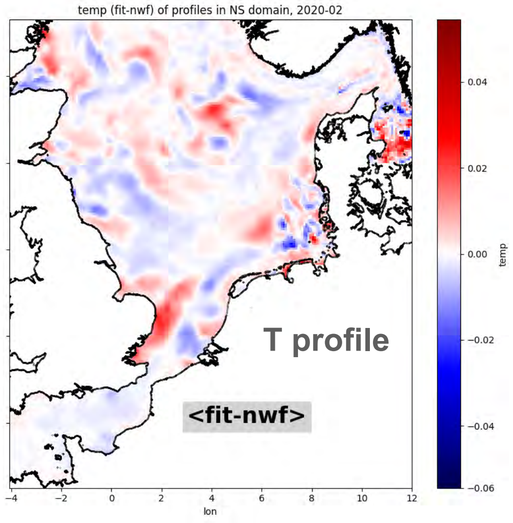
OWF impacts on hydrodynamics in North Sea

DMI
Vejr, klima og hav

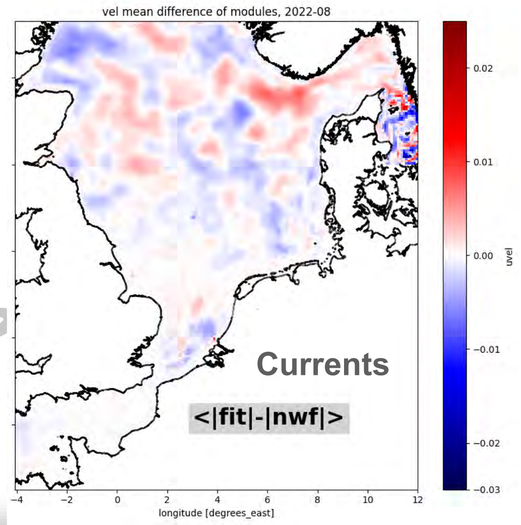
Feb. 2020

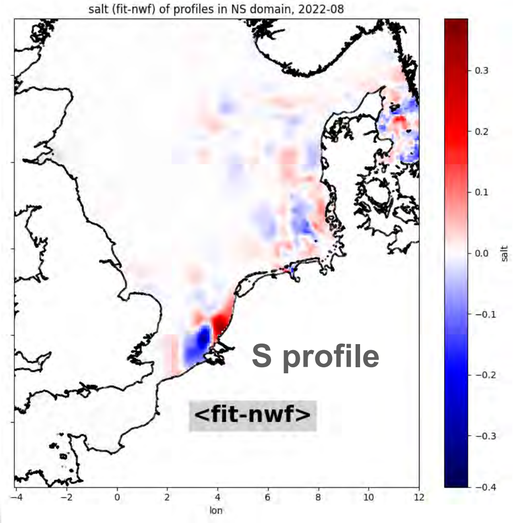


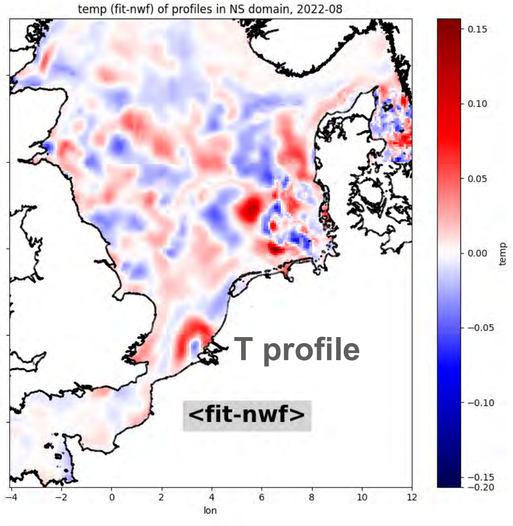




Aug. 2022







North Sea impacts are smaller than transition waters
22-08 generates larger changes in currents, T/S profiles than 20-02

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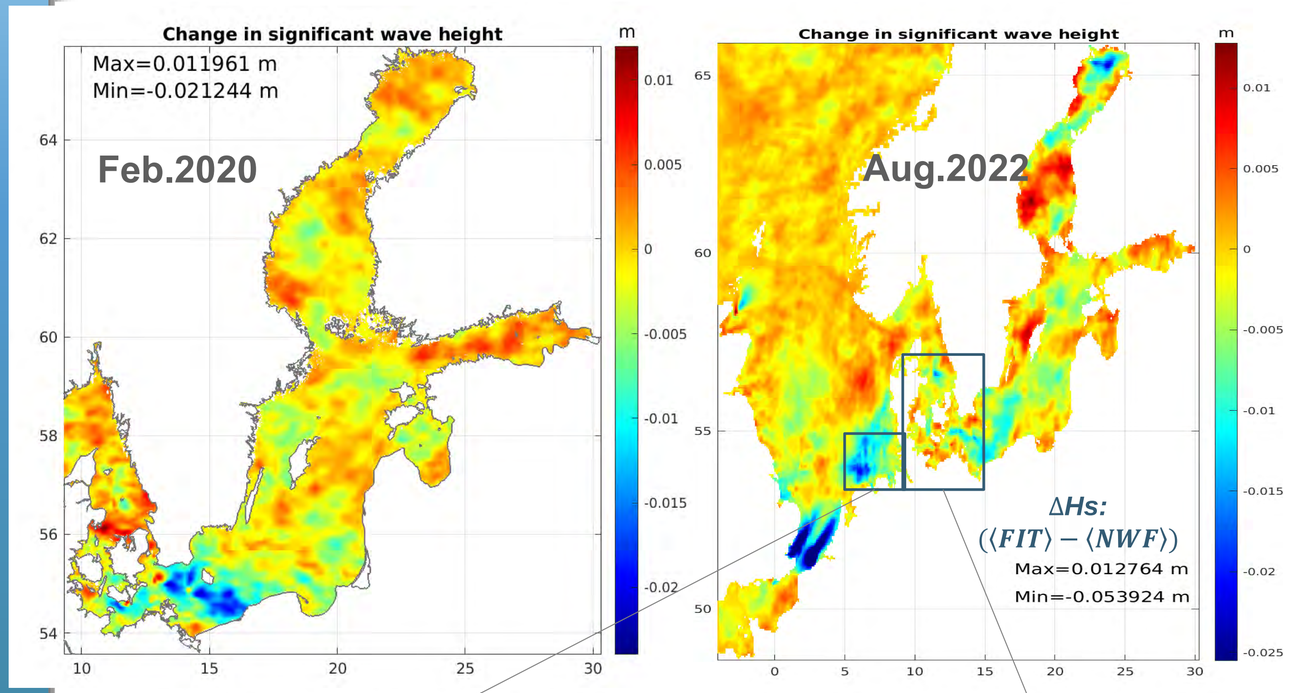
Windfarm related impacts on the wave height



- Offshore wind farms (OWF) reduce the wind speed and wave height in the wake of the turbine: near Wick, in the English channel, the German bight, Kattegat and southern Baltic Sea.
- Monthly mean difference pattern for summer and winter seasons are rather similar
- Regional impacts:
  - Waddensea: Wind farms reduce the significant wave height in nearly the entire region, in August 2022, but the monthly mean effect is rather small (max -2cm).
  - Kattegat and Danish Straits: Wind farm impacts leads to local increase and decrease of wind speed and significant wave height. Compared to the Waddensea, the negative differences are smaller but the positive differences are larger.

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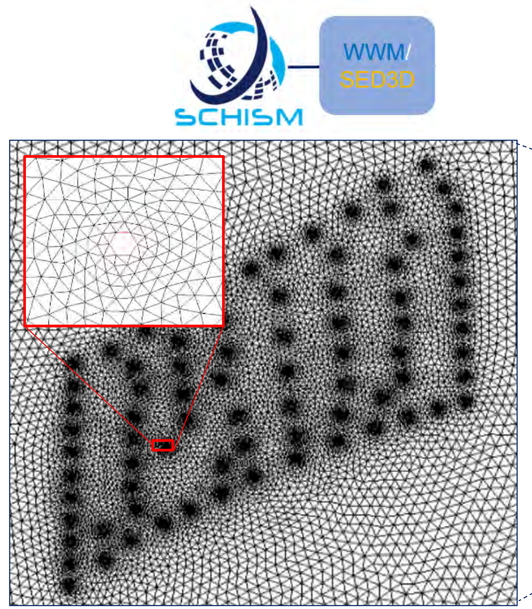
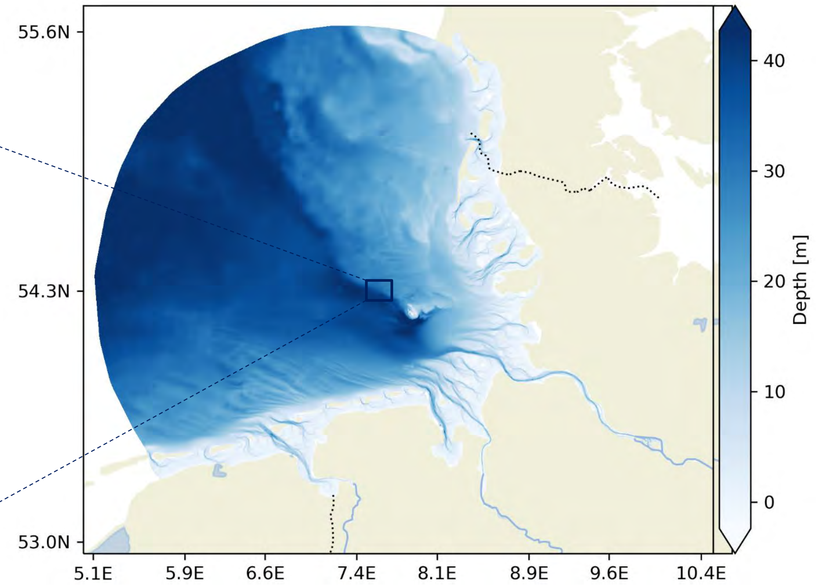
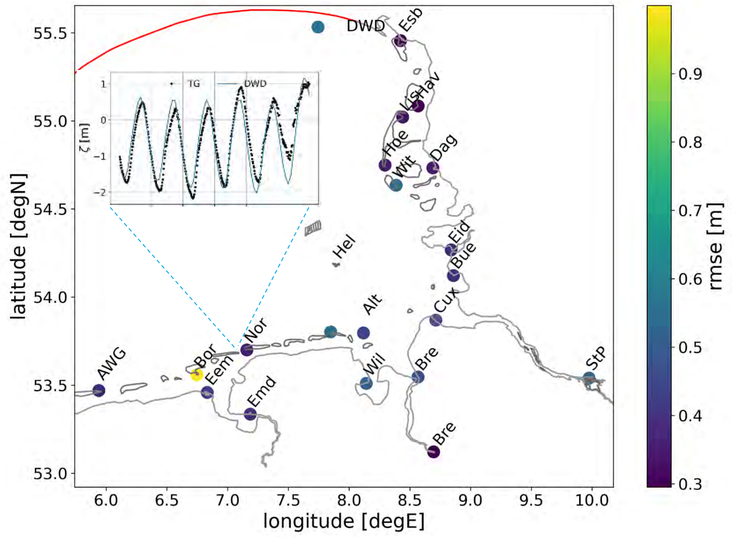
Forecasting model development and validation
HR model resolving OWF impacts

- Building upon a high-resolution unstructured model of the German Bight (Stanev et al., 2019)
- Implementation of coupled model hydro plus windwaves (SCHISM-WWM, Jacob et al. 2023)
- 80 monopiles implemented in numerical mesh (Meerwind/Case study 1, see mesh rhs)
- Forcing & observational data gathered for 2020-2022 (Hydro, waves, SPM)
- Model validation against publicly available observations (ongoing)







German Bight HR set-up

Left: Validation against gauge data

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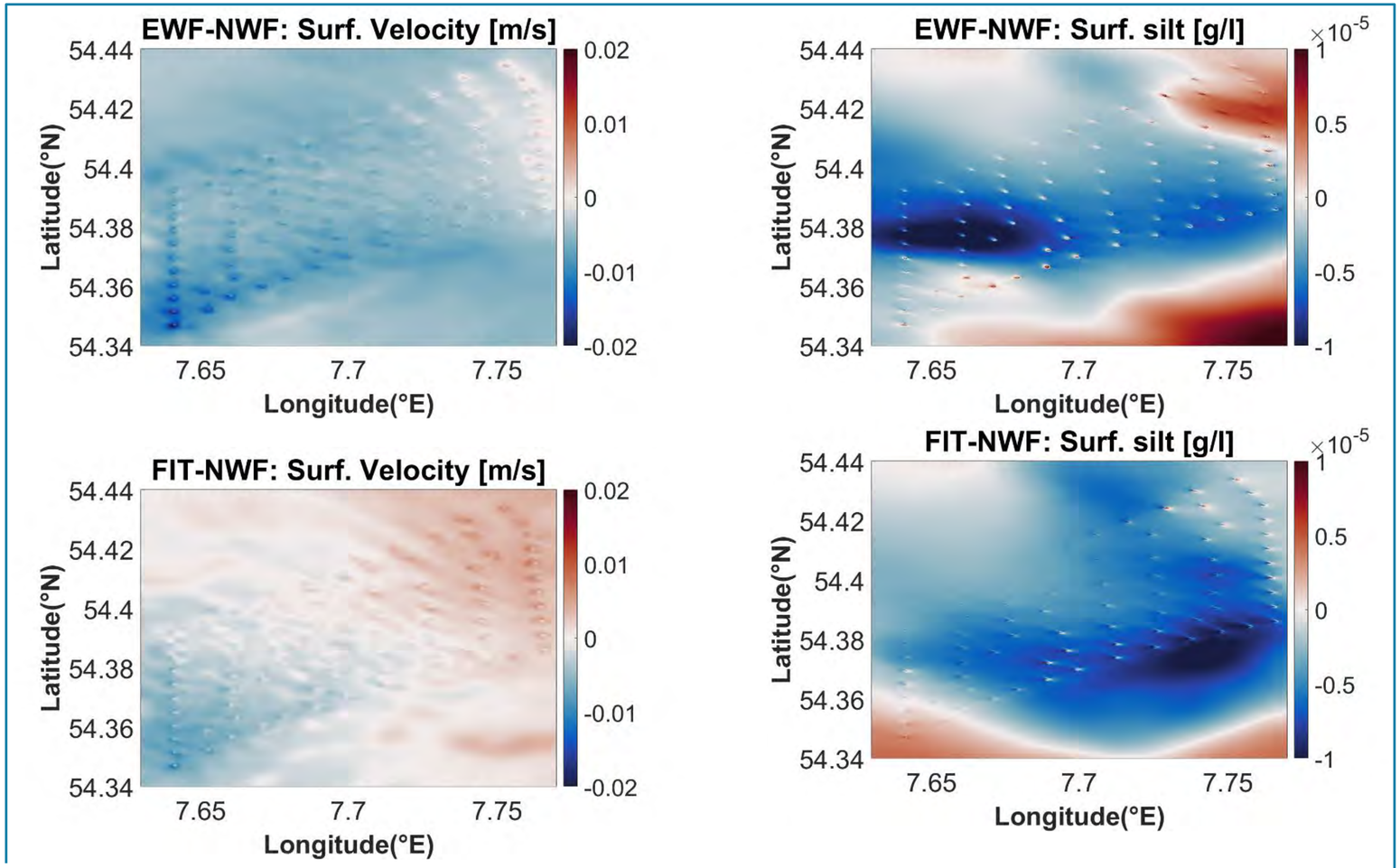
High-resolution model resolving OWF impacts Sensitivity studies

- Sensitivity tests using different OWF parametrisations of HARMONIE meteo forcing w/o effects of OWF (see rhs)
- Implementation of coupled hydrodynamical-biogeochemical model of southern North Sea SCHISM-FABM-ECOSMO to derive boundary conditions in German Bight/case study area
- Calibration/validation of SPM and Chlorophyll dynamics (ongoing)



Surface averaged differences of SCHISM forced by HARMONIE atmospherics model, Feb. 2020 (EWF/FIT minus NWF).

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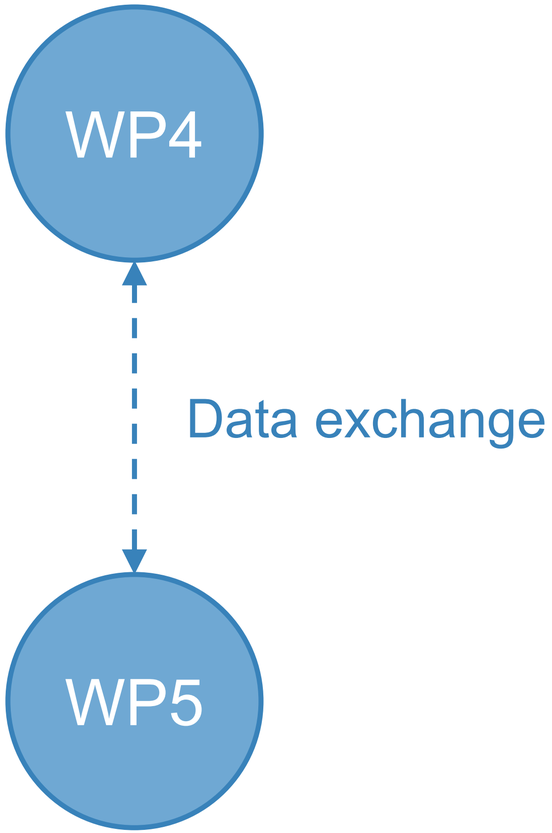
Interaction between WP4 and WP5



1. Define specific flows
2. Develop flows
3. Data exchange tests
4. Final data exchange

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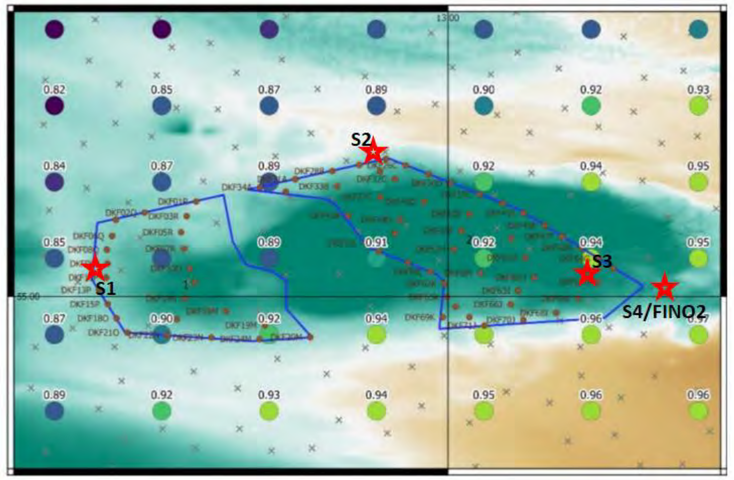
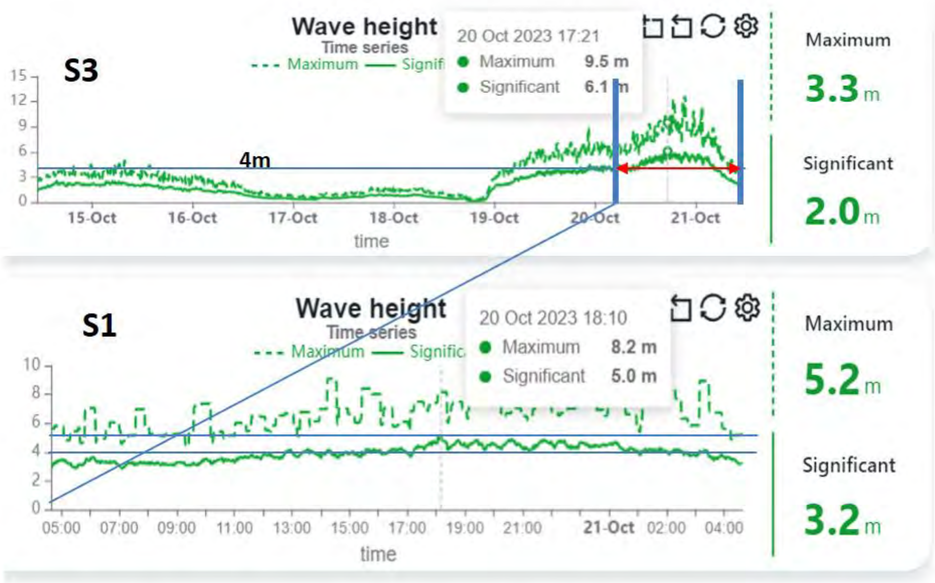
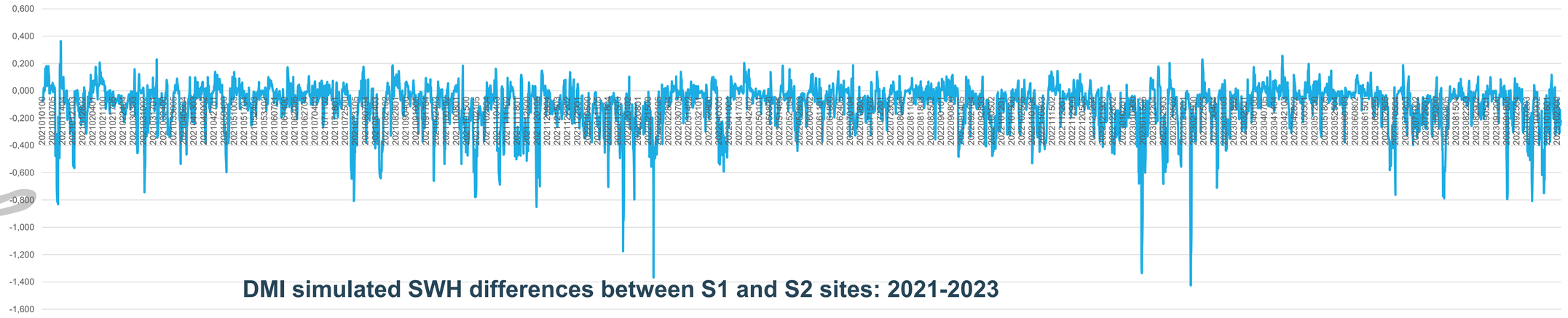
Wave variability within KF OWF



Vattenfall observations



- Vattenfall (Natacha et al) has made an observation study to investigate potential OWF impacts on the waves
- DMI has made wave modelling in KF and investigated small scale variability
- we suggest to have a joint DMI-Vattenfall research to investigate natural variability and OWF impacts (if possible to identify)



DMI simulated SWH differences between S1 and S2 sites: 2021-2023

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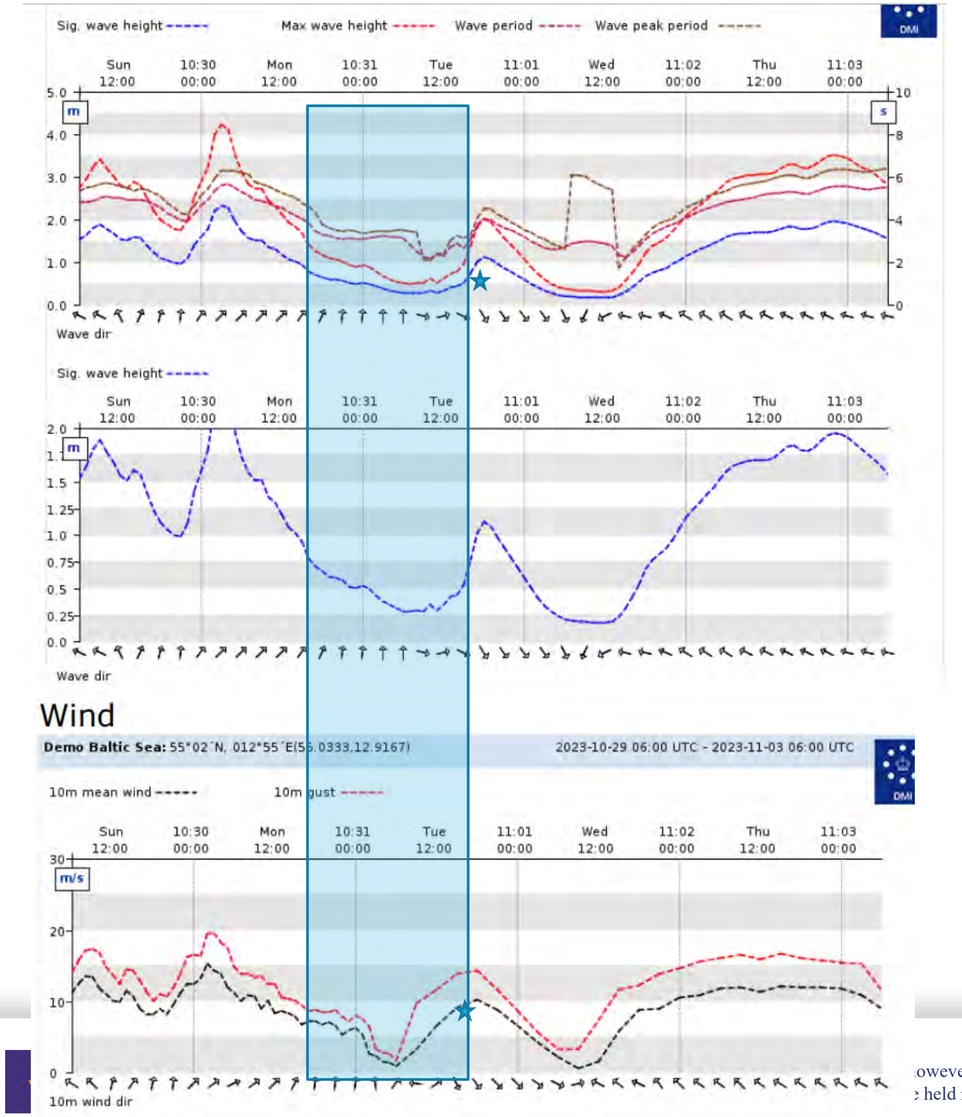
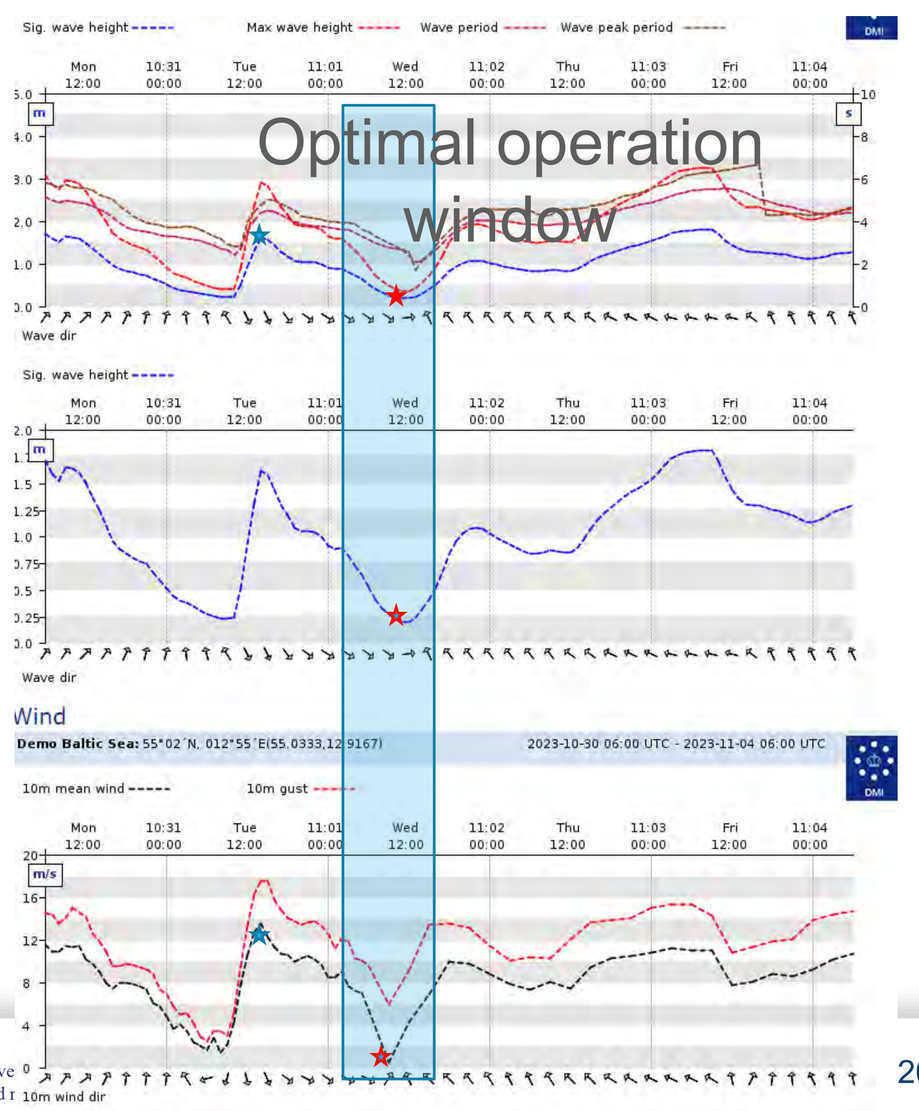
DMI information service for AU to plant seaweed at KF (operation window selection, 1 Nov. 2023)

DMI
Vejr, klima og hav

Forecast at 2023102906



Forecast at 2023103006



Work planned for 2024

Pilot 1

- Skarv & MR: Further development of sampling plans (WP4.2), ASV+UUV platform and system for remote robotic data collection, more sea trials in Trondheim (WP4.1)
- First LARS field test in Trondheim scheduled for end of January (MR & Skarv)
- Planning for first full scale field deployment May-June for Pilot site 1 (Helgoland, Skarv & MR)
- Experience from first field deployment will be used to guide further development of robotic systems
- HEREON X-band radar, waverider, FB and drone will be operated in spring 2024.

Pilot 2 (Spring 2024 survey):

- VOTO survey to be repeated, with more parameters (light, photo of biomass)?
- Vattenfall regular CTD in proximity to the aquaculture site (T/S)
- Camera registrering jellyfish
- Coupling to the Danish National Marine Monitoring Program (AU)

Pilot 3: Continue monitoring at 2 sites up to October 2024 (UT)

Model development

- High-resolution (200 m) ecosystem model for Kriegers site B will be implemented in 2024 incl farm parameterization (AU)
- Parameterization of turbine foundations in ocean and wave models (AU, DMI)
- Implementation of aquaculture species into the Physical-biogeochemical model (SCHISM-FABM-ECOSMO) (HEREON)
- Merging/coupling of SCHISM-WWM and SCHISM-FABM-ECOSMO simulations in (pre-)operational framework (HEREON)

Model demonstration (preparation phase)

- Model validation (AU, DMI, HEREON)
- Prepare model for operational demonstration (model validation and data handeling, DMI, HEREON))
- DMI: HARMONIE, HBM, WAM operational forecasting demonstration ready
- HEREON: SCHISM-WWM operational forecasting demonstration ready

(Joint) publications

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OLAMUR

Thank you!

Contributors:

DMI: Jun, Jens, Vilnis
AU: Marie, Anette, Janus et al.
HEREON: Joanna, Seyed, Johannes, Benjamin, Jochen
MR: Ivan et al.
Skarv: Trygve et al
UT: Jonne, Merli et al.
Vattenfall: Mathieu
VOTO: Anna, Martin, Louise et al.

Baseline survey by VOTO

- Cruise report available
- Data available

- Survey to be repeated 2024
- More parameters?
  - Light
  - Photo of biomass?
  - ??

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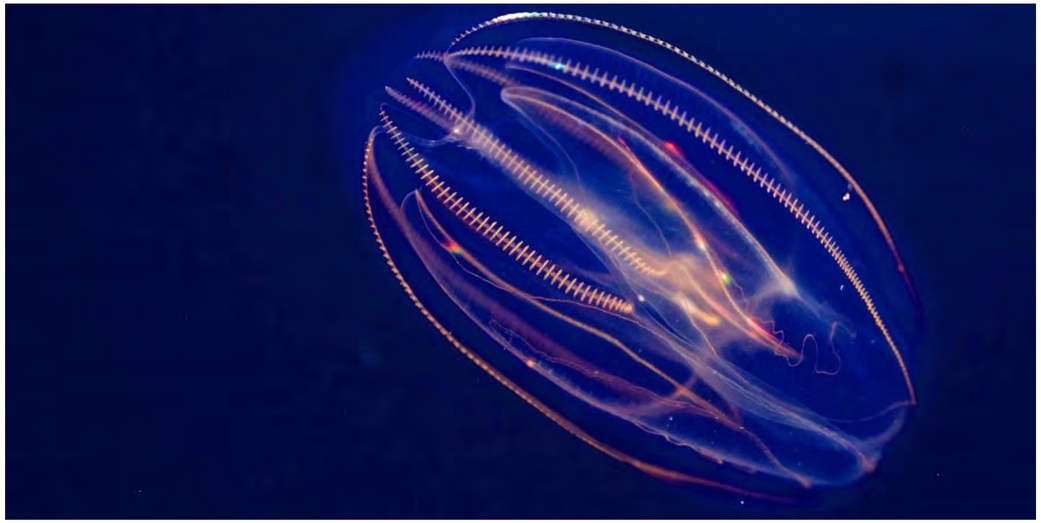
CTD casts by Vattenfall

- CTD in proximity to the aquaculture site
- Parameters: Temperature, salinity, depth
- Camera registrering jellyfish
- Coupling to the Danish National Marine Monitoring Program
- All to be running in spring 2024



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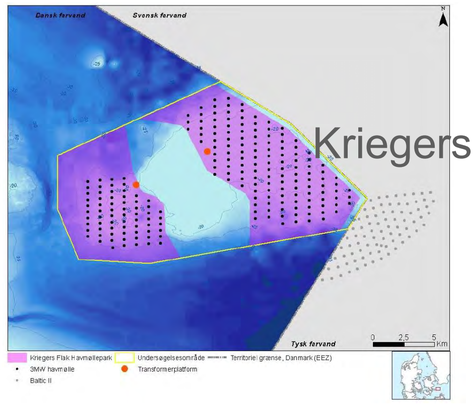
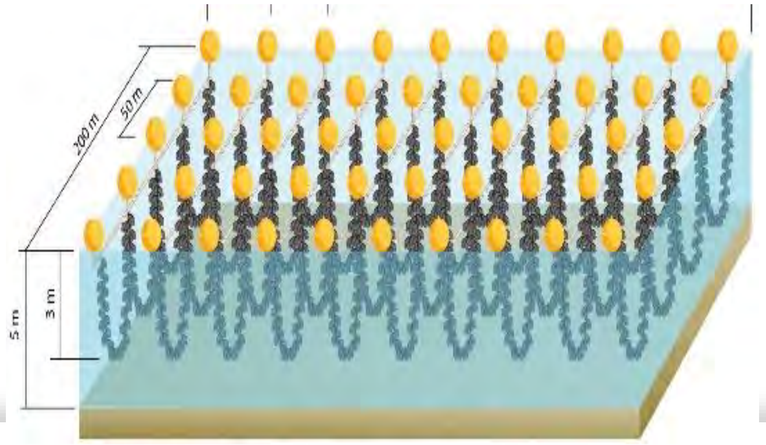
Wp4.4 Modeling activities at AU



Kriegers Flak

- High-resolution (200 m) ecosystem model for Kriegers site B will be implemented in 2024
- Workshop on Thursday to discuss mussel and seaweed farm scale models



Long-line mussel farm

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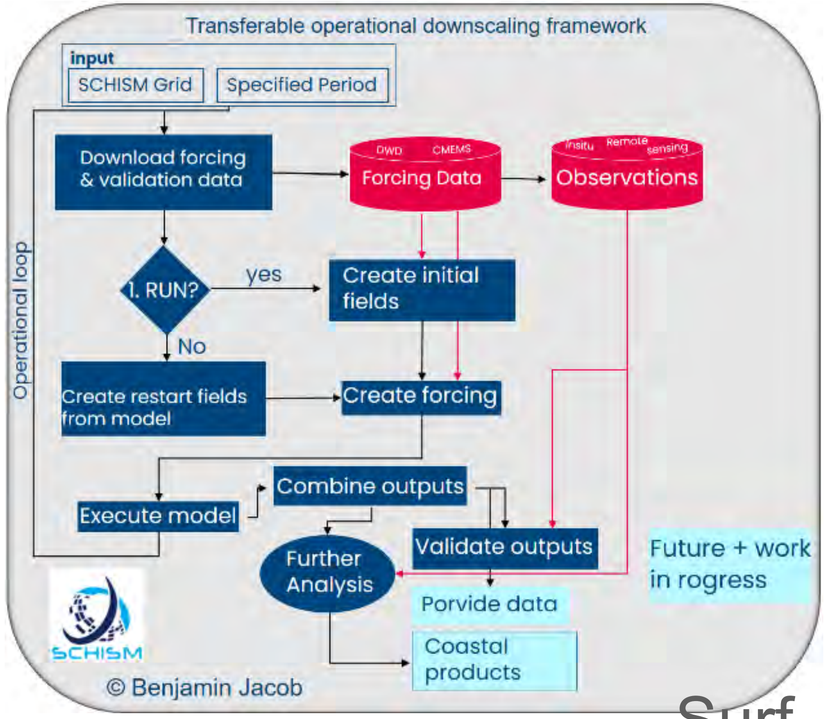
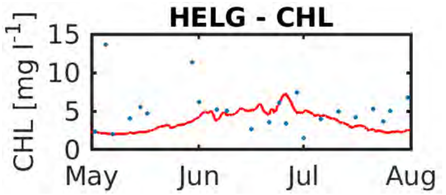
Forecasting development and model-based assessment Ongoing and planned works in 2024

- Further validation of coupled model against observational data from T4.3
- Integration of the German Bight plus OWF model into the operational framework (see top rhs)
- Implementation of coupled hydrodynamics-windwaves in operational framework (SCHISM-WWM)
- Implementation of aquaculture species into the Physical-biogeochemical model (SCHISM-FABM-ECOSMO)
- Merging/coupling of SCHISM-WWM and SCHISM-FABM-ECOSMO simulations in (pre-)operational framework

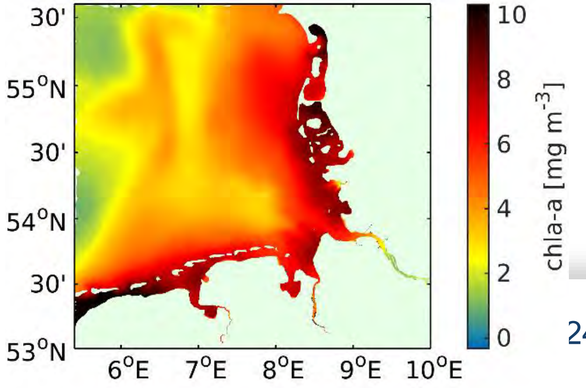


Left: Operational model work-flow

Surf. chlorophyll



Ecological simulation validation vs. satellite CHL obs. May-Aug. 2020 Helgoland area



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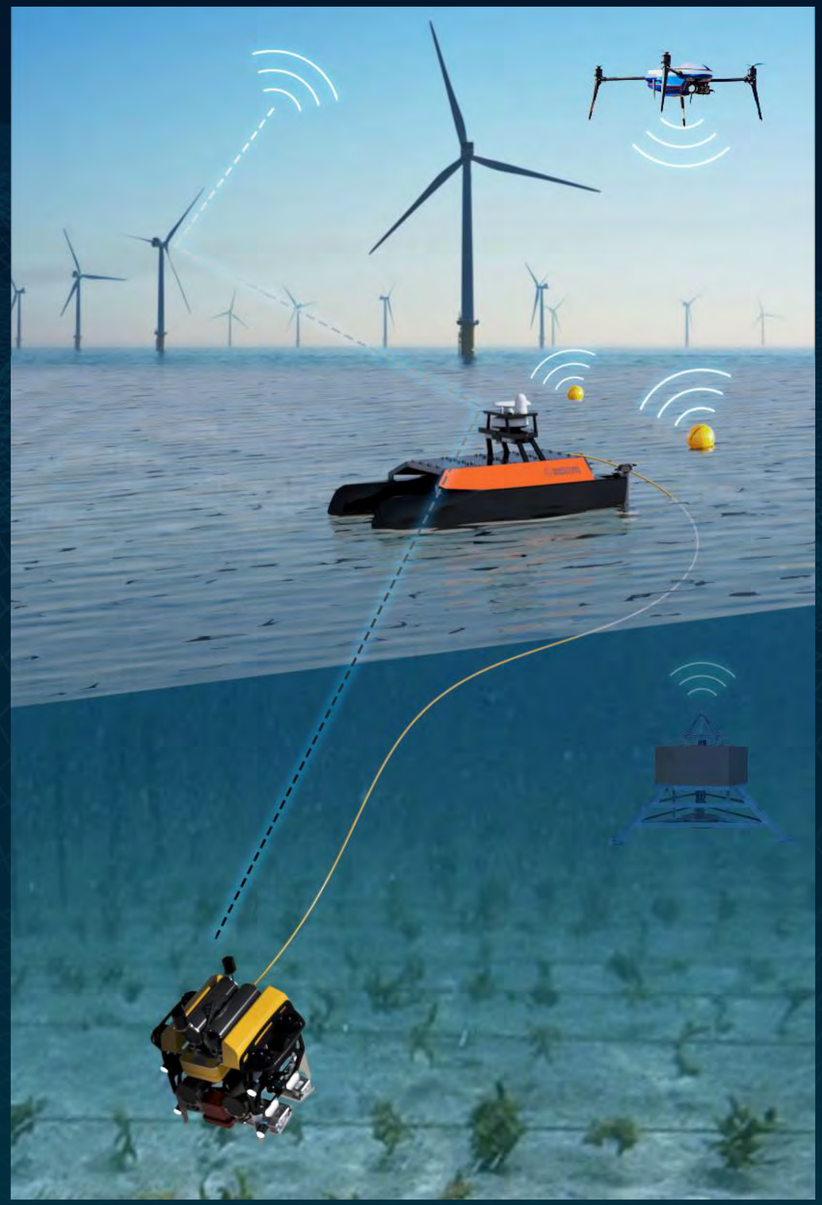
2nd year

- Planning for first full scale field deployment May-June together with Maritime Robotics for Pilot site 1 (Helgoland)

- Further development of system for remote robotic data collection together with Maritime Robotics (more sea trials in Trondheim)

- Experience from first field deployment will be used to guide further development of robotic systems



Maritime Robotics: Plans for 2nd year

- January: First field test with LARS prototype, Trondheim
- February - May: Further development of sampling plans (WP4.2), and ASV+UUV platform (WP4.1)
- May or june, field campaign pilot 1

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AARHUS UNIVERSITY

Site B
Danish Kriegers Flak

VATTENFALL

DTU Technical University of Denmark

Kerteminde Seafarm

UNIVERSITY OF COPENHAGEN

VELUX FONDEN

AAGE V. JENSEN CHARITY FOUNDATION

Kattegatcentret

European Commission

EU grant 101094065

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Site B

Danish Kriegers Flak Vindmøllepark

- Largest windfarm in Scandinavia
- 604 Mw (600.000 house holds)
- 72 turbines
- Turbine height: 188 m
- In function since 2021
- Owned and run by Vattenfall

Flak means ‘shallow reef’

Named by a Danish naval officer: Christian Krieger, who mapped the Baltic Sea in 1840

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GUARD

OLAMUR

WP5
Data-based service system

Annual meeting
08-11/01/2024

Lead: ETT
Co-Lead: IMR
Other partners: DTU, DMI, HEREON, MR, ST, KLU, AU
OLAMUR: Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas

Objectives and status update

Goals: Develop a data-based management support system for monitoring, data analysis and offering services to aquaculture producers

Tasks

- T5.1 Data management (M1-M48)
- T5.2 Targeted data service development (M1-M36)
  - 5.2.1: Event Warning Service (EWS)
  - 5.2.2: Offshore Operation Planner (OOP)
  - 5.2.3: Alien Species Risk (ASR)
  - 5.2.4: Disease Propagation Risk (DPR)
  - 5.2.5: Farm Performance Control (FPC)
- T5.3 Implementation of Data Service Modules (M12-M36)
  - 5.3.1 - Module 1: local farm design and planning
  - 5.3.2 - Module 2: deployment, operation and monitoring
  - 5.3.3 - Module 3: product, marketing and capacity building
  - 5.3.4 - Module 4: Large scale multi-use MSP and impact assessment
- T5.4 Demonstration and validation of Data Service Portal: KPIs will be given (M12-M36)

Deliverables

- D5.1 OLAMUR datasystem and service platform v.1.0 (M18) v.2.0 (M36) - DEC
- D5.2 Service tool Description (EWS, OOP, ASR, DPR, FPC) (M18) - R
- D5.3 OLAMUR Data Service Modules description (M24) - R
- D5.4 Definition of KPI (M24) + KPI monitoring report (M36) - R

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Task 5.1 Data management

Lead: IMR
Partners: AU, UT, MR, ST, KU, SINTEF, VOTO, DTU, ETT
M1-M48

Management of data from:

- Other WPs (WP 1, 2, 3, 4, 6, 7 and 9)
- Other sources (Copernicus - CMS, CAMS, C3S, EMODnet in-situ, ICES, Helcom, PANGAEA)

Appropriate controlled vocabularies for metadata and data description (e.g. CF convention, SeaDataNet vocabularies, etc.)

Data publishing systems: ERDDAP (and ncWMS) and GeoServer

Regular backups

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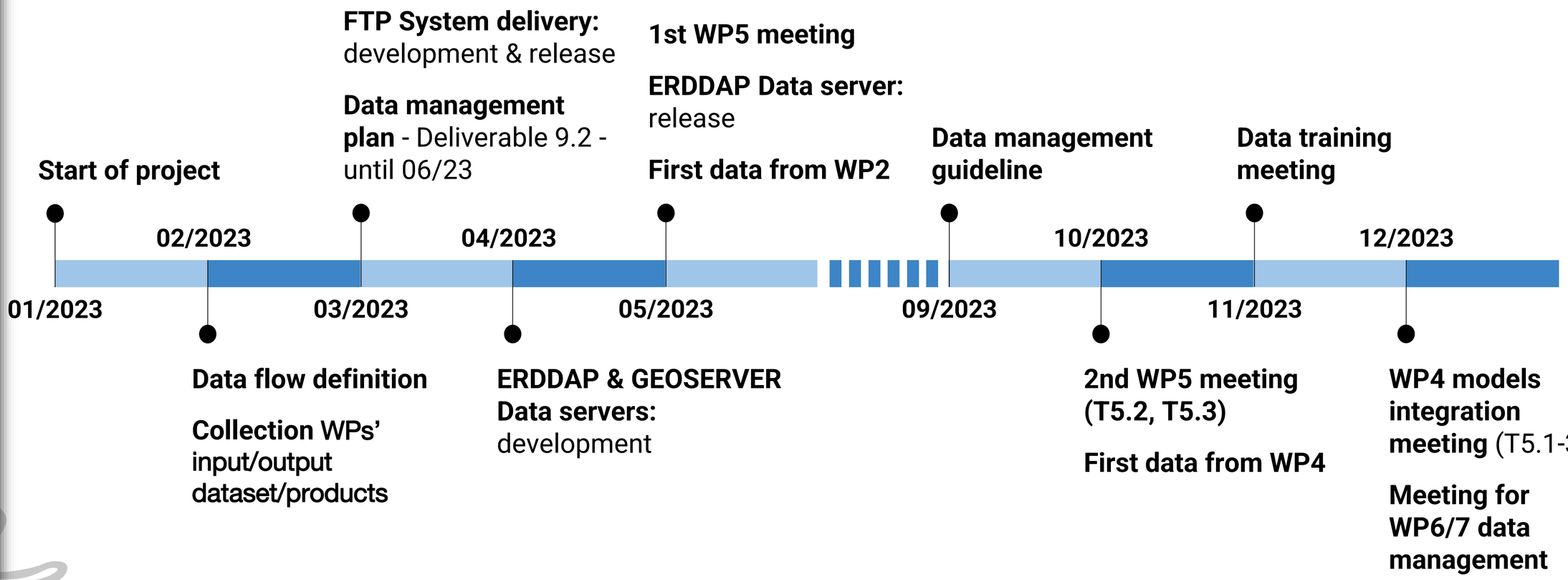
T5.1 Timeline



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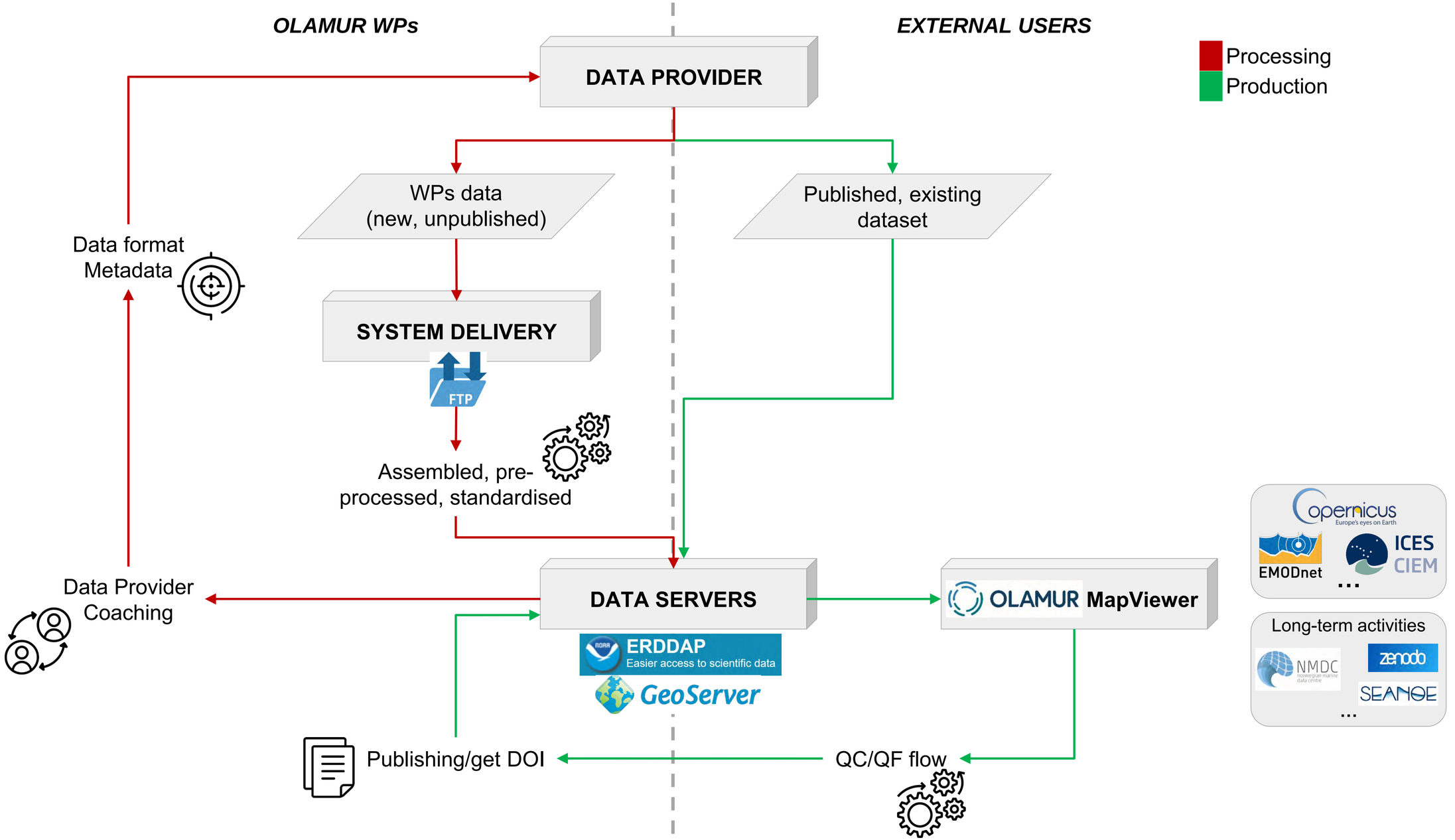
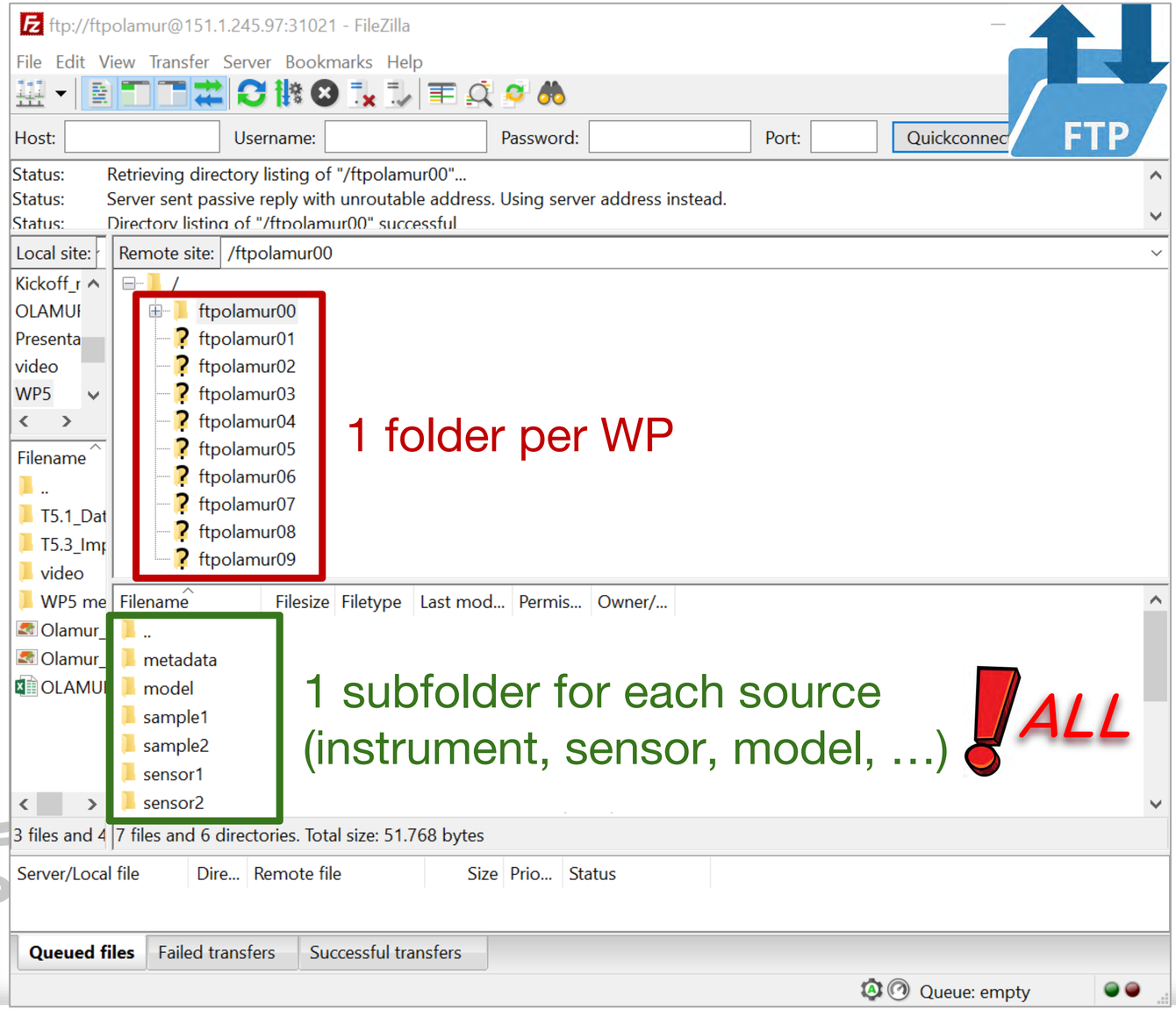
Data flow


OLAMUR WPs
EXTERNAL USERS
Processing
Production
DATA PROVIDER
WPs data
(new, unpublished)
Published, existing
dataset
Data format
Metadata
SYSTEM DELIVERY
FTP
Assembled, pre-
processed, standardised
Data Provider
Coaching
DATA SERVERS
OLAMUR MapViewer
ERDDAP
Easier access to scientific data
GeoServer
Publishing/get DOI
QC/QF flow
Copernicus
Europe's eyes on Earth
EMODnet
ICES
CIEM
...
Long-term activities
NMDC
zenodo
SEANOE
...

System delivery: FTP



Collection WPs' input/output datasets/products:

- Excel WP5 - WPs dataset
- Excel WP9 - DMP Dataset information form

Dataset standardised names
→ maintaining an organised and efficient data ecosystem

First data uploaded { **WP1** **WP2** **WP4**

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Metadata

interoperability

OLAMUR_Data_management_Metadata_Examples.xlsx
OLAMUR_Data_management_Metadata.xlsx

Metadata field	Vocabulary	Link to vocabulary	Vocabulary governance
Platform id - OLAMUR			
Platform id - preexisting			
Owner/provider institution	Yes	https://edmo.seadatanet.org/	SeaDataNet
DOI	*	doi	
Variable name	Yes	http://vocab.nerc.ac.uk/collection/P09/current/ http://vocab.nerc.ac.uk/collection/P02/current/ http://vocab.nerc.ac.uk/collection/P01/current/ http://vocab.nerc.ac.uk/collection/P07/current/ https://cfconventions.org/Data/cf-standard-names/79/build/cf-standard-name-table.html	BODC:NVS CF Standard Name Table v29
Unit	Yes	https://vocab.nerc.ac.uk/collection/P06/current/	SeaDataNet
Quality Flag Scheme	Yes	http://www.oceansites.org/docs/oceansites_data_format_reference_manual.pdf	OceanSites
Time	Yes	ISO 8601 / UTM	ISO
Datum	Yes	WGS84	ISO
Country	Yes	ISO 3166	ISO
Licence	Yes	https://creativecommons.org/	C
INSPIRE	Yes	ISO 19115 / ISO 19139	ISO/INSPIRE

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Metadata

Owner/provider institution

SeaDataNet — PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN & MARINE DATA MANAGEMENT — **EUROPEAN DIRECTORY OF MARINE ORGANISATIONS (EDMO)**

Research institutes, data holding centres, monitoring agencies, governmental and private organisations, that are engaged in oceanographic and marine research activities, data & information management and/or data acquisition activities

SeaDataNet — PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN & MARINE DATA MANAGEMENT — **EUROPEAN DIRECTORY OF MARINE ENVIRONMENTAL RESEARCH PROJECTS (EDMERP)**

Marine research projects, described as metadata factsheets with their most relevant aspects. Support users in identifying interesting research activities and in connecting them to involved research managers and organisations across Europe

Institution/Organisation	EDMO
IMR - Havforskningsinstituttet	1351
AWI - Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research	1368
DMI - Danmarks Meteorologiske Institut	469
AU - Aarhus Universitet	5580
GCF - Global Climate Forum EV	5905
HEREON - Helmholtz-Zentrum Hereon	5403
MR - Maritime Robotics AS	5893
VF - Vattenfall Europe Windkraft AS	5898
KC - Kattegatcentrets Driftsfond	5899
ST - Skarv Technologies AS	5891
SO - SINTEF Ocean AS	1547
WMW - WindMW GmbH	5902
KS - Kerteminde Seafarm Aps	5900
LS - Lerøy Seafood Group ASA	5892
RS - RedStorm OÜ	5895
UT - Tartu Ülikool	3138
DTU - Denmarks Tekniske Universitet	2195
ÖA - Ösel Aquafarm OÜ	5896
KU - Københavns Universitet	5897
VOTO - Stiftelsen Voice of the Ocean	5579
ETT - ETT Spa	2765
KLU - Klaipėdos Universitetas	5901/5014
EATiP - Platforme Technologique et de l'innovation de l'aquaculture Européenne ASBL	5894
NHS - Nordfriesische Seemuschel GmbH	5903
W8F - Wyk 8 Muschelfischereibetrieb GmbH	5904

OLAMUR
EDMERP id: 13724
https://edmerp.seadatanet.org/report/13724

Data servers: ERDDAP & GeoServer

OLAMUR

ERDDAP OLAMUR
Easier access to scientific data

Brought to you by OLAMUR

ERDDAP > List of All Datasets

72 matching datasets, listed in alphabetical order.

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	WMS	Source Data Files	Accessible	Title	Summary	FGDC, ISO, Metadata	Background Info	RSS	Email	Institution	Dataset ID
	set	data	graph			public	* The List of All Active Datasets in this ERDDAP *		M	background			Axiom Docker Install	allDatasets
data			graph	M		public	Baltic Sea - Biogeochemistry Analysis and Forecast Daily: Chl, Phy, NO3, Kd, O2, pH, PO4, Zoo, NH4, Diss C, Si - CMEMS ERGOM daily integrated model fields (cmems mod bal bgc anfc P1D-m) [time][depth][lat][lon], 2021-present - Copernicus		F I M	background	RSS		Baltic MFC, PU Sw...	s4olamur_erddap_aede_4150_e80b
data			graph			public	Baltic Sea - Biogeochemistry Analysis and Forecast Daily: Net primary production - CMEMS ERGOM accumulated daily NPP (cmems mod bal bgc-pp anfc P1D-i), 2021-present - Copernicus		F I M	background	RSS		Baltic MFC, PU Sw...	s4olamur_erddap_229c_5b4c_e839
data			graph	M		public	Baltic Sea - Biogeochemistry Analysis and Forecast Daily: ZSD, O2b, spCO2 - CMEMS ERGOM daily integrated model fields (cmems mod bal bgc anfc P1D-m) [time][lat][lon], 2021-present - Copernicus		F I M	background	RSS		Baltic MFC, PU Sw...	s4olamur_erddap_b27a_37e1_f917
data			graph	M		public	Baltic Sea - Biogeochemistry Analysis and Forecast Monthly: Chl, Phy, NO3, Kd, O2, pH, PO4, Zoo, NH4, Diss C, Si - CMEMS ERGOM monthly integrated model fields (cmems mod bal bgc anfc P1M-m) [time][depth][lat][lon], 2021-present - Copernicus		F I M	background	RSS		Baltic MFC, PU Sw...	s4olamur_erddap_23e5_fa24_71d1
data			graph	M		public	Baltic Sea - Biogeochemistry Analysis and Forecast Monthly: O2b, spCO2 - CMEMS ERGOM monthly integrated model fields (cmems mod bal bgc anfc P1M-m) [time][lat][lon], 2021-present - Copernicus		F I M	background	RSS		Baltic MFC, PU Sw...	s4olamur_erddap_05f0_2826_b3c1
data			graph	M		public	Baltic Sea - Biogeochemistry Reanalysis Daily: Chl, NH4, NO3, NPP, O2, pH, PO4 - CMEMS ERGOM daily integrated model fields (cmems mod bal bgc my P1D-m) [time][depth][lat][lon], 1993-2021 - Copernicus		F I M	background	RSS		Baltic MFC, PU Da...	s4olamur_erddap_2396_3abc_45aa
data			graph	M		public	Baltic Sea - Biogeochemistry Reanalysis Daily: O2b, spCO2, ZSD - CMEMS ERGOM daily integrated model fields (cmems mod bal bgc my P1D-m) [time][lat][lon], 1993-2021, Copernicus		F I M	background	RSS		Baltic MFC, PU Da...	s4olamur_erddap_e854_70ba_6fa6
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data			graph	M		public	Baltic Sea - Biogeochemistry Reanalysis Monthly: Chl, NH4, NO3, NPP, O2, pH, PO4 - CMEMS ERGOM monthly integrated model fields (cmems mod bal bgc my P1M-m) [time][depth][lat][lon], 1993-2021, Copernicus		F I M	background	RSS		Baltic MFC, PU Da...	s4olamur_erddap_8acc_db67_ce7a
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data			graph	M		public	Baltic Sea - Water body dissolved oxygen - DIVAnd 6-year seasonal analysis of Water body dissolved oxygen concentration 1980/2018 v2021 [time][depth][lat][lon], 0.1°, 1982-2015 - EMODnet		F I M	background	RSS		Swedish Meteorolo...	oceanbrowser_opendap_7e37_daa2_b7e5
data			graph	M		public	Baltic Sea - Water body phosphate - DIVAnd 6-year seasonal analysis of Water body phosphate 1980/2018 v2021 [time][depth][lat][lon], 0.1°, 1982-2015 - EMODnet		F I M	background	RSS		Swedish Meteorolo...	oceanbrowser_opendap_eeba_f434_fcbb
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data			graph	M	files	public	CORA: Coriolis Ocean database for ReAnalysis - Temperature in the Water Column (1960 - 2022)		F I M	background	RSS		OceanScope	INSITU_GLO_PHY_TS_OA_MY_013_052_TEMP
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data			graph	M	files	public	EMODnet Physics - Total Suspended Matter - GridSeriesObservation - Concentration of total suspended matter - BALTIC SEA		F I M	background	RSS		CNR	TSM_BALTICSEA
data			graph	M	files	public	EMODnet Physics - Total Suspended Matter - GridSeriesObservation - Concentration of total suspended matter - NORTH SEA		F I M	background	RSS		CNR	TSM_NORTHSEA
		data			files	public	Global Ocean - Fising activity - EMODnet		M	background	RSS		???	Data_1f19_0845_ed46
		data			files	public	Global Ocean - Wind - EMODnet Physics - in situ wind speed and direction - EMODnet		M	background	RSS		???	Data_63e8_5c21_88fc
data			graph	M		public	Global Ocean - Wind - Global Ocean, Wind, METOP-A ASCAT, 12km daily Ascending V2, 0.125°, 2016-2021 - Copernicus		F I M	background	RSS		EUMETSAT/OSI SAF/...	s4olamur_erddap_27cd_28c7_d582
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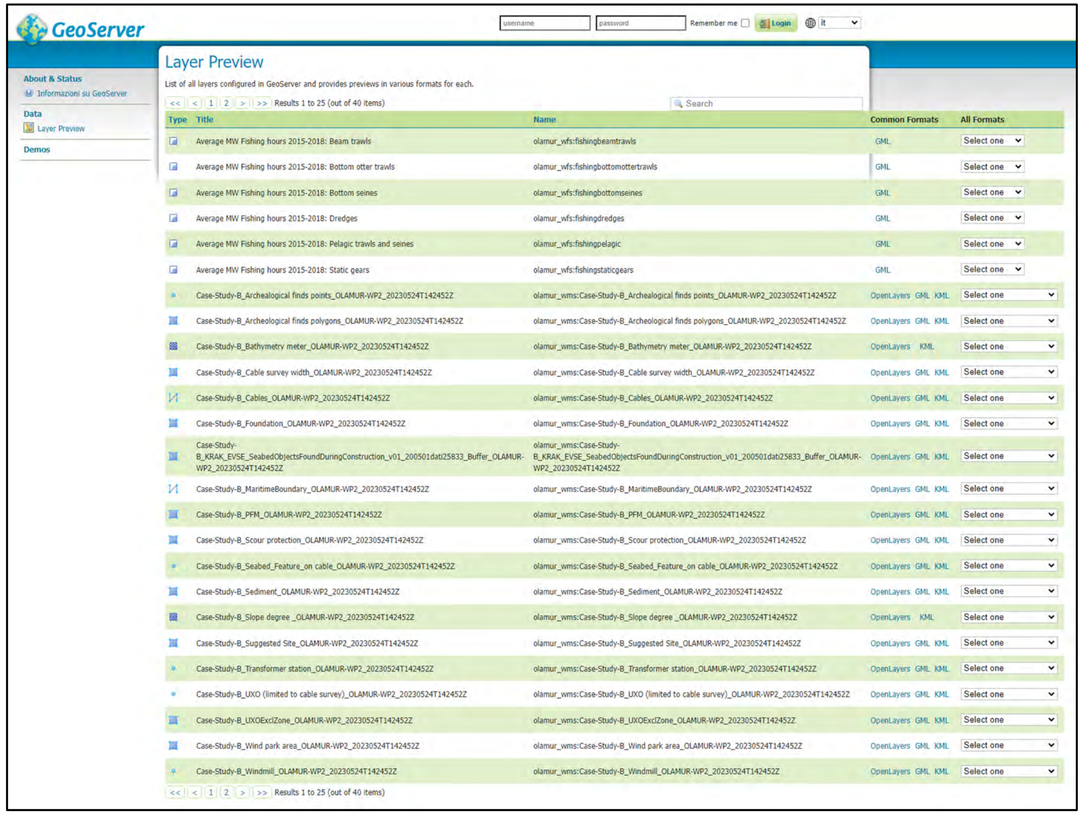
data			graph	M		public	Global Ocean - Wind - Global Ocean, Wind, METOP-B ASCAT, 12km daily Descending V2, 0.125°, 2016-present - Copernicus		F I M	background	RSS		EUMETSAT/OSI SAF/...	s4olamur_erddap_9fbf_91aa_6bd7
data			graph	M		public	Global Ocean - Wind - Global Ocean, Wind, METOP-C ASCAT, 12km daily Ascending V2, 0.125°, 2019-present - Copernicus		F I M	background	RSS		EUMETSAT/OSI SAF/...	s4olamur_erddap_4833_4183_da19
data			graph	M		public	Global Ocean - Wind - Global Ocean, Wind, METOP-C ASCAT, 12km daily Descending V2, 0.125°, 2019-present - Copernicus		F I M	background	RSS		EUMETSAT/OSI SAF/...	s4olamur_erddap_3cdf_354c_09c2
data			graph	M		public	Global Ocean - Wind and Stress - Global Ocean, Wind and Stress, Hourly, From Scatterometer and Model, 0.125°, 2020-present - Copernicus		F I M	background	RSS		KNMI	s4olamur_erddap_2cf1_a3c9_c339
data			graph	M		public	North Sea - Biogeochemistry Reanalysis : PO4 - monthly-mean phosphate (3D) (cmems mod nws bgc-po4 my 7km-3D P1M-m), 1993-2022 - Copernicus		F I M	background	RSS		UK Met Office	s4olamur_erddap_d098_7214_a161
data			graph	M		public	North Sea - Biogeochemistry Reanalysis Daily: Chl in diatoms - daily-mean chlorophyll concentration in diatoms (3D), 1993-2022 - Copernicus		F I M	background	RSS		UK Met Office	s4olamur_erddap_8a74_822e_56ff



GeoServer

Layer Preview

List of all layers configured in GeoServer and provides previews in various formats for each.

About & Status
Informazioni su GeoServer
Data
Layer Preview
Demos

Type	Title	Name	Common Formats	All Formats
	Average MW Fishing hours 2015-2018: Beam trawls	olamur_wfs:fishingbeamtrawls	GML	Select one
	Average MW Fishing hours 2015-2018: Bottom otter trawls	olamur_wfs:fishingbottomottertrawls	GML	Select one
	Average MW Fishing hours 2015-2018: Bottom seines	olamur_wfs:fishingbottomseines	GML	Select one
	Average MW Fishing hours 2015-2018: Dredges	olamur_wfs:fishingdredges	GML	Select one
	Average MW Fishing hours 2015-2018: Pelagic trawls and seines	olamur_wfs:fishingpelagic	GML	Select one
	Average MW Fishing hours 2015-2018: Static gears	olamur_wfs:fishingstaticgears	GML	Select one
	Case-Study-B_Archeological finds points_OLAMUR-WP2_20230524T142452Z	olamur_wms:Case-Study-B_Archeological finds points_OLAMUR-WP2_20230524T142452Z	OpenLayers GML KML	Select one
	Case-Study-B_Archeological finds polygons_OLAMUR-WP2_20230524T142452Z	olamur_wms:Case-Study-B_Archeological finds polygons_OLAMUR-WP2_20230524T142452Z	OpenLayers GML KML	Select one
	Case-Study-B_Bathymetry meter_OLAMUR-WP2_20230524T142452Z	olamur_wms:Case-Study-B_Bathymetry meter_OLAMUR-WP2_20230524T142452Z	OpenLayers KML	Select one
	Case-Study-B_Cable survey width_OLAMUR-WP2_20230524T142452Z	olamur_wms:Case-Study-B_Cable survey width_OLAMUR-WP2_20230524T142452Z	OpenLayers GML KML	Select one
	Case-Study-B_Cables_OLAMUR-WP2_20230524T142452Z	olamur_wms:Case-Study-B_Cables_OLAMUR-WP2_20230524T142452Z	OpenLayers GML KML	Select one
	Case-Study-B_Foundation_OLAMUR-WP2_20230524T142452Z	olamur_wms:Case-Study-B_Foundation_OLAMUR-WP2_20230524T142452Z	OpenLayers GML KML	Select one
	Case-Study-B_KRAK_EVSE_SeabedObjectsFoundDuringConstruction_v01_200501dati25833_Buffer_OLAMUR-WP2_20230524T142452Z	olamur_wms:Case-Study-B_KRAK_EVSE_SeabedObjectsFoundDuringConstruction_v01_200501dati25833_Buffer_OLAMUR-WP2_20230524T142452Z	OpenLayers GML KML	Select one
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	Case-Study-B_Seabed_Feature_on cable_OLAMUR-WP2_20230524T142452Z	olamur_wms:Case-Study-B_Seabed_Feature_on cable_OLAMUR-WP2_20230524T142452Z	OpenLayers GML KML	Select one
	Case-Study-B_Sediment_OLAMUR-WP2_20230524T142452Z	olamur_wms:Case-Study-B_Sediment_OLAMUR-WP2_20230524T142452Z	OpenLayers GML KML	Select one
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Results 1 to 25 (out of 40 items)

WP No.	WP1	WP2	WP3	WP4	WP5	WP6	WP7
Access	WP1	WP2	all	all	all	WP6	all

ALL + WP1 & WP6

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Data management guidelines

OLAMUR

Offshore Low-trophic Aquaculture in Multi-Use Scenario Realisation

Grant agreement number: 101094065
Topic: HORIZON-MISS-2021-OCEAN-04-01
Starting date: 1 January 2023
Duration: 48 months

Title: Guideline on Data management

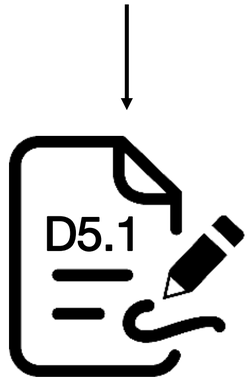
Date: 2023-09-20

Organisation name of lead participant for this document: ETT

OLAMUR

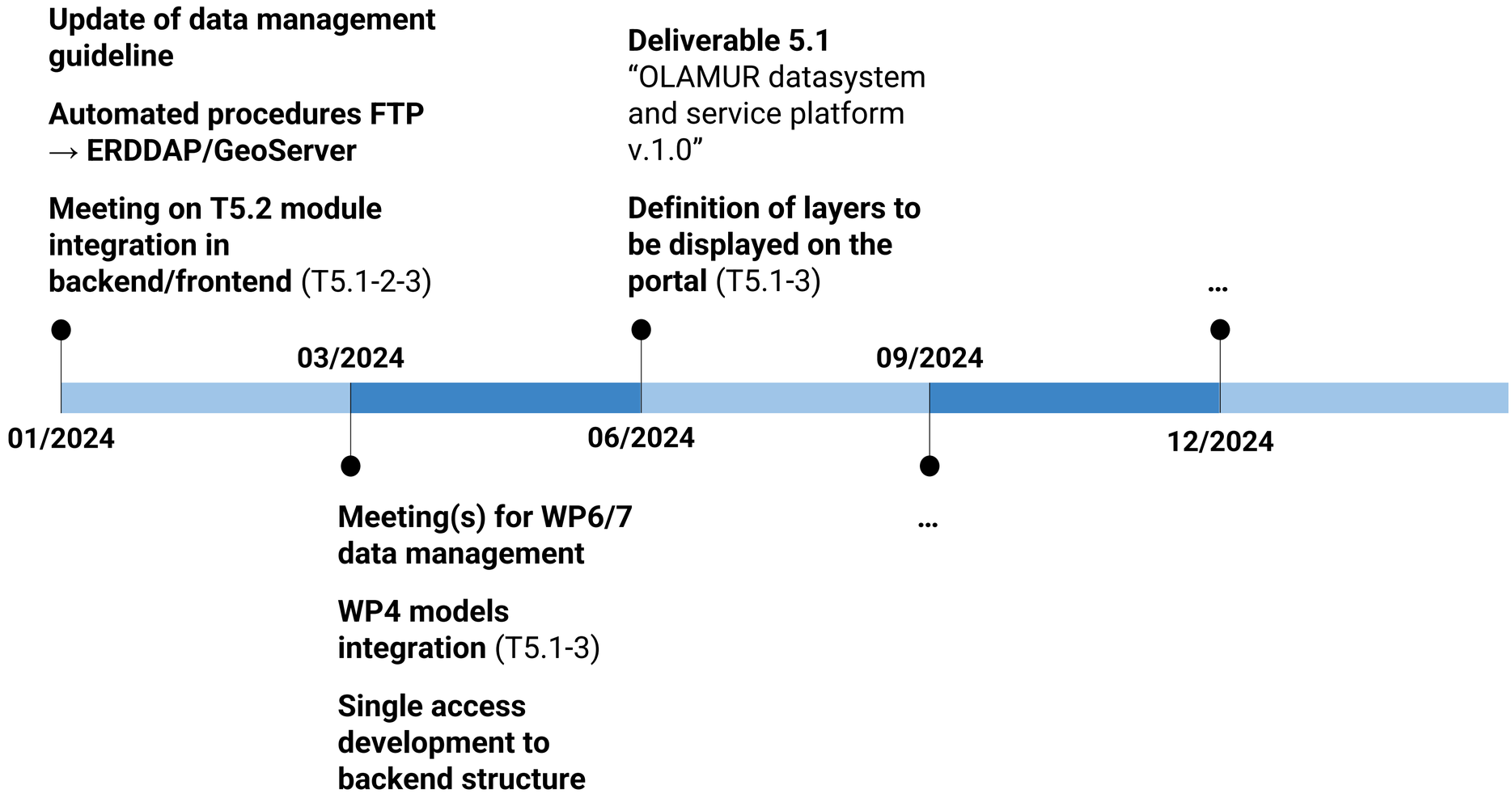
OLAMUR_Data_management_Guideline.pdf

Version 2…in progress!



Deliverable 5.1 "OLAMUR datasystem and service platform v.1.0" (M18)

T5.1 Future Timeline



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Information needed

1. FTP + ERDDAP & GeoServer *ALL*

- Names of the instruments/sensors/models/other data sources for FTP sub-folder (DMP Excel - column "Data source")
- Data examples for each sensor/instrument/model in order to manage the automated data transfer procedures: FTP → ERDDAP/GeoServer
- Data update frequency, if planned (e.g. data from sensors): FTP → ERDDAP/GeoServer

2. ERDDAP & GeoServer - Accessibility *WP1 & WP6*

WP No.	WP1	WP2	WP3	WP4	WP5	WP6	WP7
Access	WP1	WP2	all	all	all	WP6	all

3. Metadata - EDMO code *KLU*

KLU - Klaipėdos Universitetas

- Klaipèdos Universitetas 5901
- Marine Research Institute of Klaipeda University 5014

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T5.2 Targeted data service development

Lead: DTU
Partners: DMI, KLU, HEREON, ETT, IMR
M1-M36

Deliverable 5.2 “Service tool Description” (M18)

- This task develops a decisional support functionality applied in T5.3 to the WP5 web service
  - T5.2: scientific basis passed to T5.3 as encapsulated algorithms
  - T5.3: technical integration of modules from T5.2
- Each module consumes data and data-products made available on infrastructure (T5.1):
  - OLAMUR data products (WP1-WP4)
  - Public services EMODnet, CMEMS, ICES, HELCOM, PANGEA + targeted public products (e.g. AquaNIS)

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T5.2 Umbrella task

- Modules are developed in parallel – no direct interaction, but hopefully sharing of technical experiences

- Modules featured in WP5 web-service:
  - EWS - Event Warning Servic (DMI lead)
  - OOP - Offshore Operation Planner (DMI lead)
  - ASR - Alien Species Risk (DTU lead)
  - DPR - Disease Propagation Risk (DTU lead)
  - FPC - Farm Performance Control (IMR lead)

- API to T5.3 in current discussion for efficient development

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Module ASR - Alien Species Risk (DTU, KU_LT)

This tool will support farms to run alien species dispersal risk assessment. The module will build on the **AquaNIS**-information system on aquatic non-indigenous and cryptogenic species (covers HELCOM and OSPAR areas).

- Include input from WP3 and WP2 (e.g. for local connectivity assessment)

- Module target perspective:
  - EWS - Event Warning Service (DMI lead)
  - Alien Species → lower LTA production
  - *Not that* MU site acts as stepping stone for dispersal of LTA irrelevant HAOP that may damage local ecosystems

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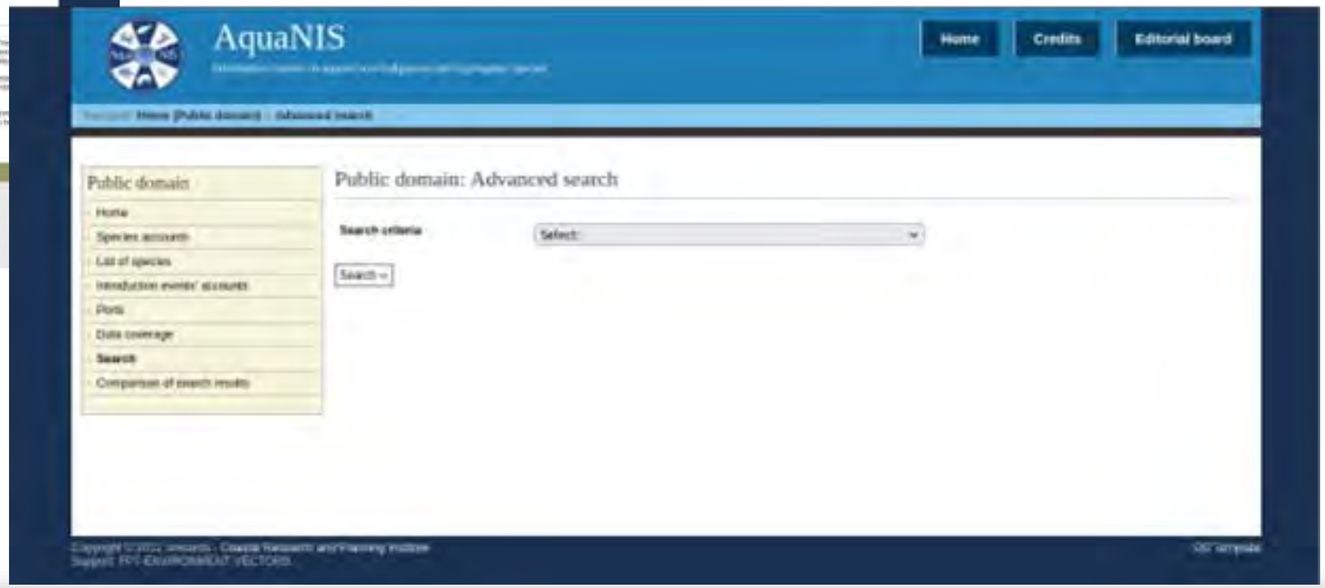
Module ASR - Alien Species Risk (DTU, KU_LT)

AquaNIS - http://www.corpi.ku.lt/databases/index.php/aquanis/: searchable database



Currently only manual queries possible

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Module ASR - Alien Species Risk (DTU, KU_LT)

- AquaNIS updated on ad hoc basis (i.e. **time lag** effect expected)
- Limited spatial resolution (LME region or port basis)
- Module tentative functionality:
  - Polling from AquaNIS to avoid manual processes → (species, where, when)
  - Add risk evaluation: local connectivity + species relevance (LTA interaction criterium)
  - Anticipated result: local risk per species (traffic light style/probability)

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Module ASR progress

- Experimentation with automated polling from AquaNIS portal
- Initial implementation in Python
- Initial test location: MU site Kriegers Flak – later generic version available to all MU sites
- Considerations on how to weight AquaNIS AS observations at a certain distance/direction from LTA site: propagation risk + propagation time scale based on local connectivity based on Lagrangian simulation, if biology of AS is sufficiently confined (we need at a least pelagic duration)

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Module DPR - Disease Propagation Risk (DTU)

This tool implements a spatial risk assessment and will be developed for aqua-farms for **selected** parasites. The goal of the module is to enable favorable site-layout and evaluation of alternative disease control options in relation to dynamic ocean conditions

- Relevant parasites for **sea weed** (Saccharina latissima):
  - *Pseudoalteromonas piscicida* (bleaching disease)
  - *Alteromonas* sp.
  - *Laminariocolax* sp.
  - *Laminarionema* sp.

- Relevant parasites for **bivalves**:
  - *Mytilicola orientalis*

- Tentative functionality:
  - SIR model for LTA geometry
  - Enable Propagation/mitigation control and layout design support

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Module DPR progress

- Start with identified important parasitic species – infection processes quite species dependent

- Literature study on biology of initially identified parasites in progress to enable local spatial simulation infection/propagation

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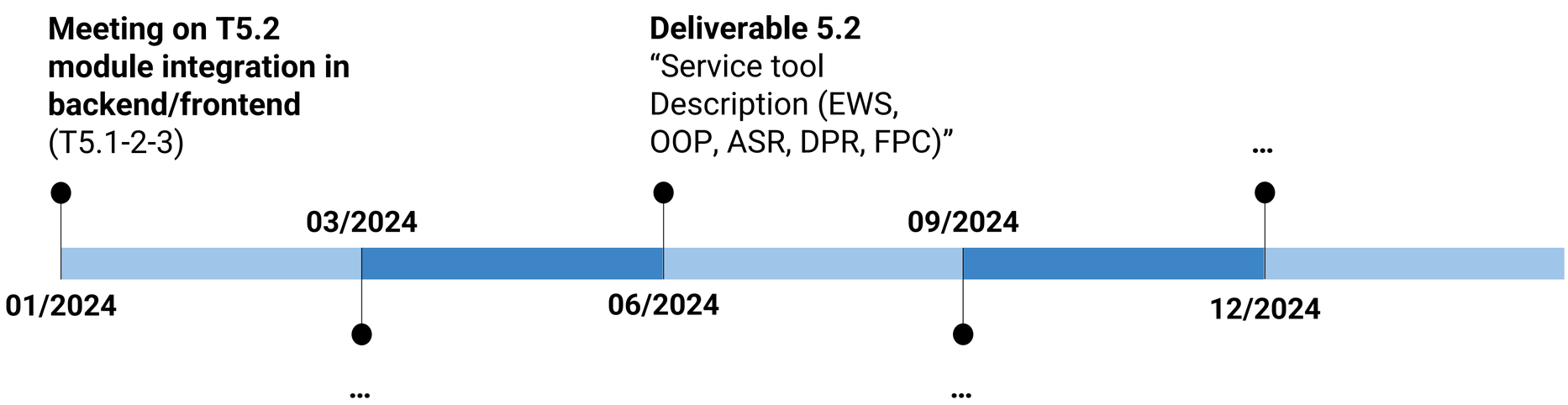
T5.2 Future Timeline



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T5.3 Implementation of data service modules

Lead: ETT
Partners: DMI, DTU, KLU, IMR, UT
M12-M36

Integration of T5.2 modules into a web system offering a user experience (frontend)

- Search, interact, download and visualize of pre-processed data (T5.1) and implementation of service protocols (T5.2 and other WPs)
- Selection of tools according to user's decisional support needs

4 modules:

- Local farm design and planning: implementation of products and protocols (WP2), sustainability, legal, administrative and policy related outcomes (WP6-7)
- Deployment, operation and monitoring: recommended farm and environment monitoring standards (WP1-3-4) in support of OLAMUR operators
- Product, marketing and capacity building: data and information on potential products, marketing, capacity building, LTA farm technologies, knowledge groups, training
- Large scale multi-use MSP and impact assessment: data and information on potential impacts of a LTA farm and MSP in support of stakeholders and policy makers

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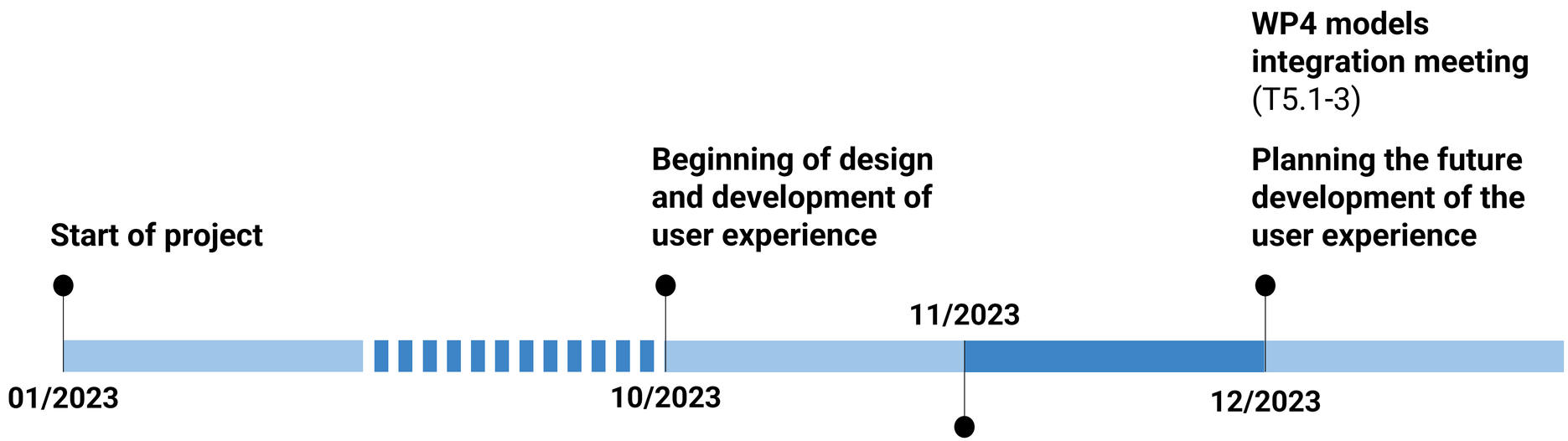
T5.3 Timeline



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User interface

http://s4olamur.eu/mapviewer/#/map

Level 1: Entry point

Map of the area and sites presentation/location
→ highlight on the 3 macro sites

Link to site-specific dashboards

Common layers/features

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User interface Mockup

Level 2: Site specific

Site-specific dashboard - View 1
→ Map of the sites

Link to site-specific dashboards

Link to site-specific views

Site-specific layers/features

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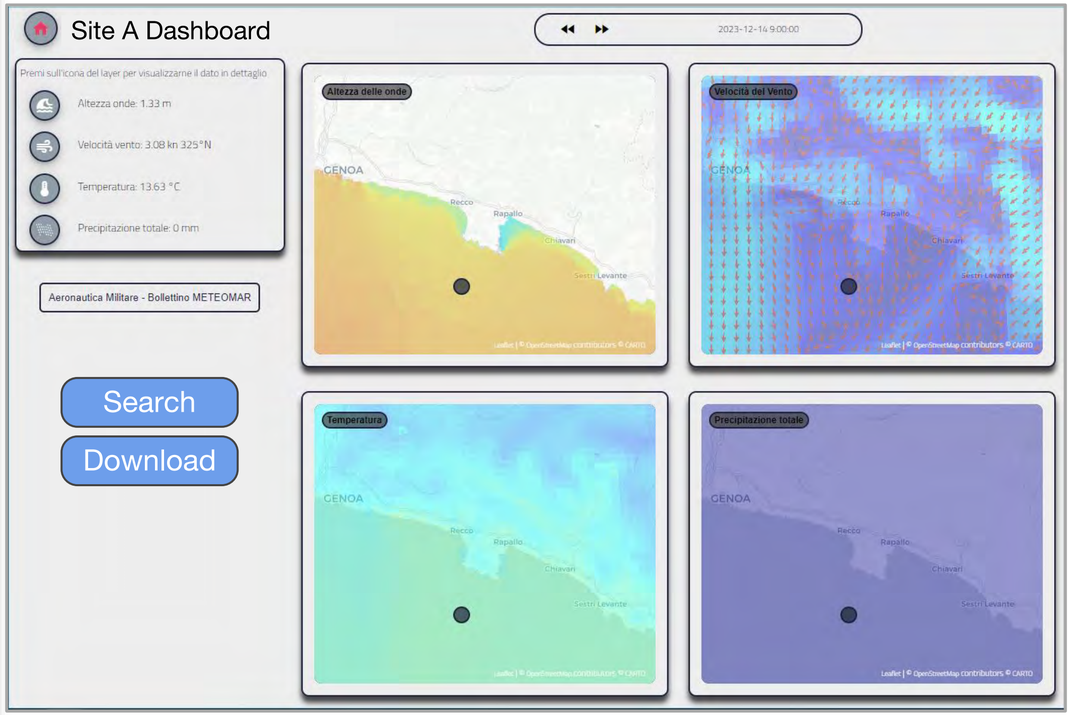
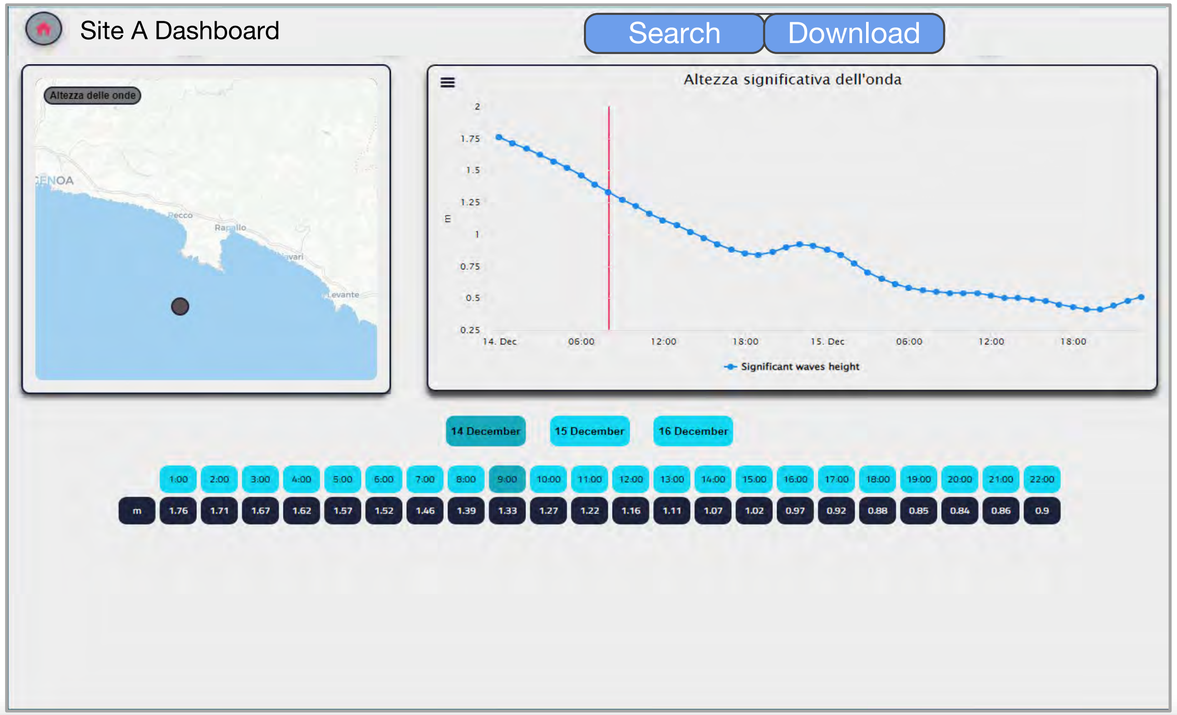
User interface Mockup

Level 2: Site specific



Site-specific dashboard - View 2
→ Models



Site-specific dashboard - View 3
→ Parameters

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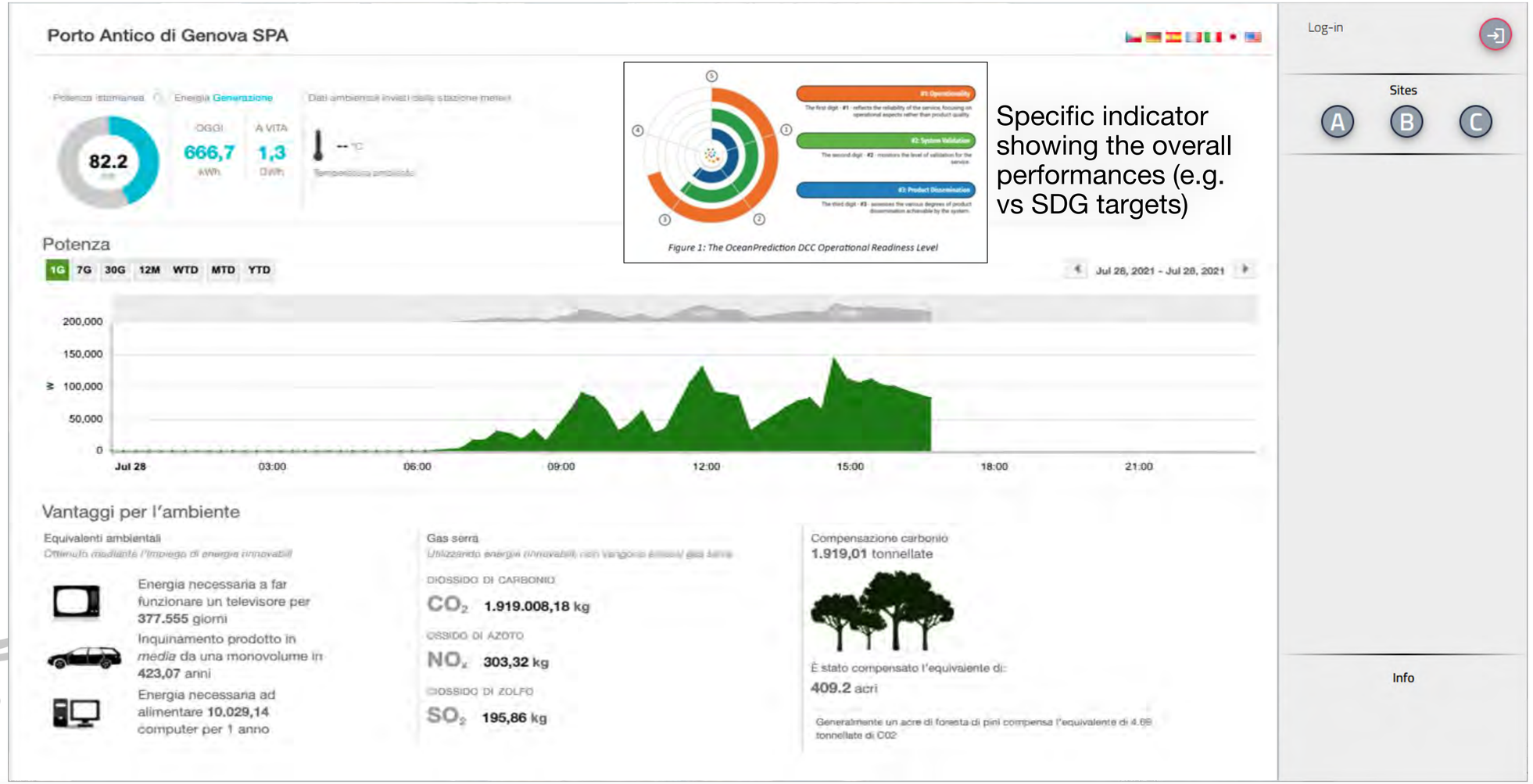
User interface Mockup

Level 3: Site performance

Performance of the site in terms of all productions (quarterly/annual granularity)



Specific indicator showing the overall performances (e.g. vs SDG targets)

Link to site-specific dashboards

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User interface Mockup

Level 4: Specific page

Dedicated page with forms and details

Search

Alien species

Log-in

Sites

A B C

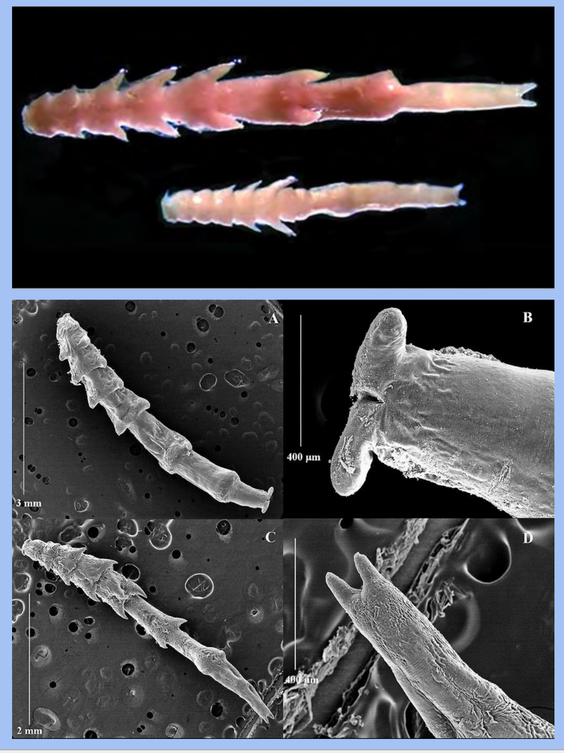
Info

Link to site-specific dashboards

Species *Mytilicola orientalis*

Details and information

……..



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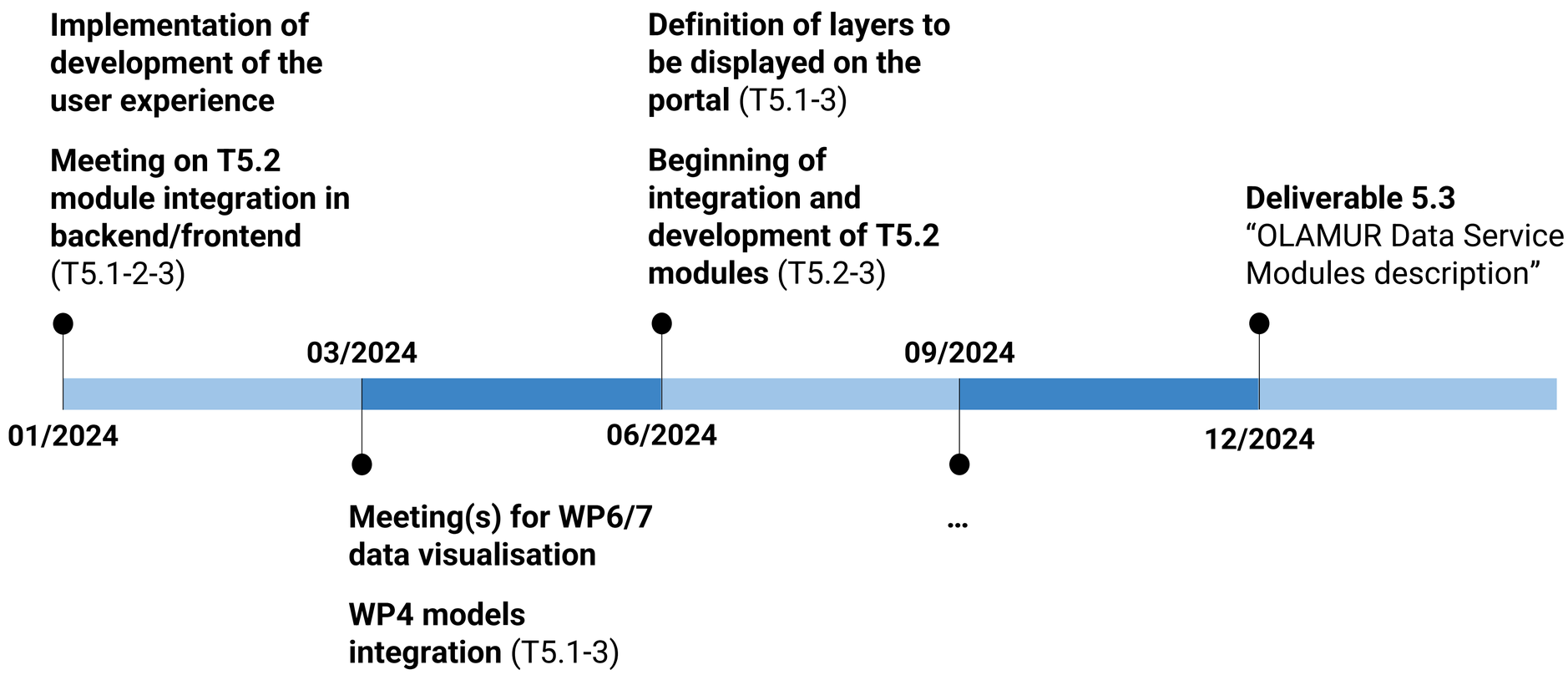
T5.3 Future Timeline



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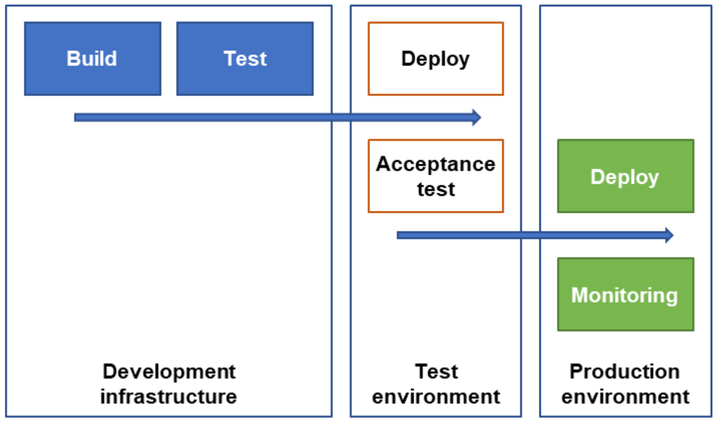
Task 5.4 Demonstration and validation of Data Service Portal: KPIs will be given

Lead: ETT
Partners: IMR, DTU
M12-M36

Move designed services into their production phase following an agile methodology where the service provider and stakeholders (other WPs and partners) continuously interact

The backend infrastructure will host both
a development /testing environment and
a production environment.



Development of KPIs for system validation with the users that will be provided an objective measure of the system performance.

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Key performance indicators (KPIs)

Different type of KPIs:

- Stakeholder-based evaluation KPIs → survey
- KPIs linked to data and their quantification

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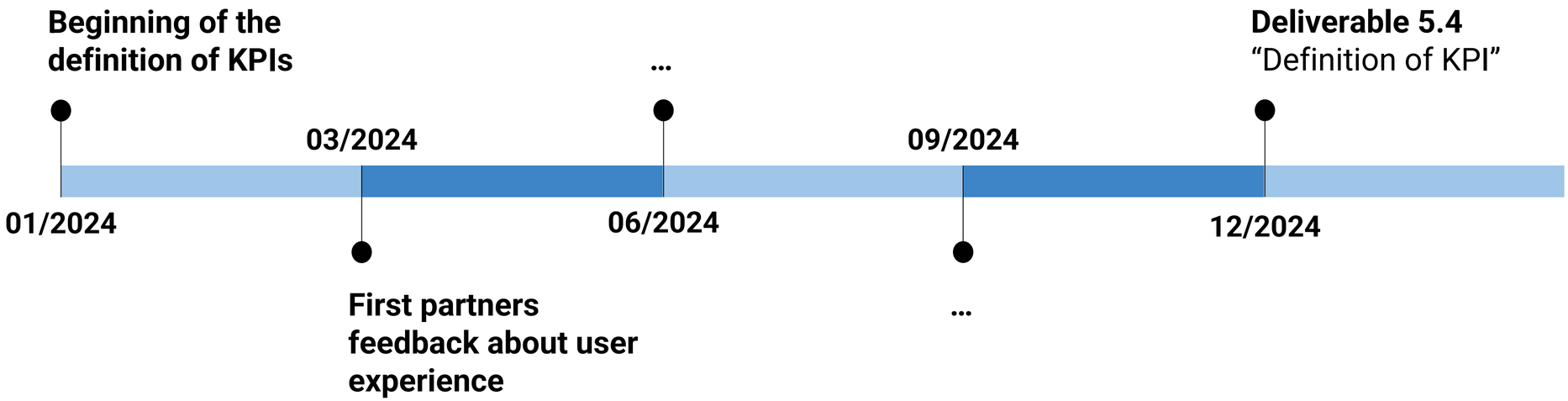
T5.4 Future Timeline



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Thanks for your attention

Giulia Dapueto: giulia.dapueto@grupposcai.it
Antonio Novellino: antonio.novellino@grupposcai.it
Beatrice Scotto: beatrice.scotto@grupposcai.it

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OLAMUR

ANNUAL MEETING 2024

Work Package 6
Sustainability

- *viable concepts on policy and marketing*
- *viable concepts for carbon neutral seafood production and market projections*

University of Copenhagen,
Lerøy Seafood Group ASA, Havforskningsinstituttet

OLAMUR : Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas

Introduction

KØBENHAVNS UNIVERSITET

PhD: Sustainability assessment brown seaweed cultivation and biorefinery systems designed according to the green chemistry principles

Host Institution: University of Copenhagen (Denmark)

Supervisors: Prof Marianne THOMSEN (PhD promoter)

Objectives: Design of a novel concept including ecosystem services in the Life Cycle Sustainability Assessment (LSCA) of seaweed cultivation and biorefinery systems

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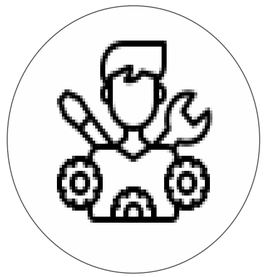
Project

SeaChem

Sustainability assessment brown seaweed cultivation and biorefinery systems designed according to the green chemistry principles



Technical

Economic

Environmental

Societal

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Work Plan

Paper 1 : A novel DPSIR framework with the ecosystem services approach for kelp aquaculture: from Pressure to Progress and from Reduce to Restore.

Paper 2 : Advanced techniques in enzymatic extraction technologies: Environmental sustainability and economic viability.

Paper 3 : Study of new pathways to make novel healthy food ingredients taste good: Combining food product development, Life-Cycle Analysis and consumer acceptance.

Paper 4 : A novel concept of how to include ecosystem services in life cycle sustainability assessment (LSCA) of seaweed cultivation and biorefinery systems – aligning impact categories with the SDGs and PBs.

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WP6 Objectives

i. to quantify the **restorative and regenerative services** from implementation of MU-LTA,

ii. deliver **business and policy decision support** in synergy with WP7

iii. hybrid-LCA approach aiming at quantifying the **cost and benefits** of innovative inclusive blue circular economy solutions

Figure 15. An ecosystem-based framework consisting of a triadic interrelationship between academia, industry and government with the common objective of implementing a sustainable blue economy delivering provisional (biorefinery products), supporting (nutrient recycling), and regulating (climate change mitigation) services, thereby restoring the balance between marine ecological integrity and ecosystem service utilization

Zhang, X., & Thomsen, M. (2019). Biomolecular composition and revenue explained by interactions between extrinsic factors and endogenous rhythms of Saccharina latissima. Marine drugs 17(2), 107. doi:10.3390/md17020107

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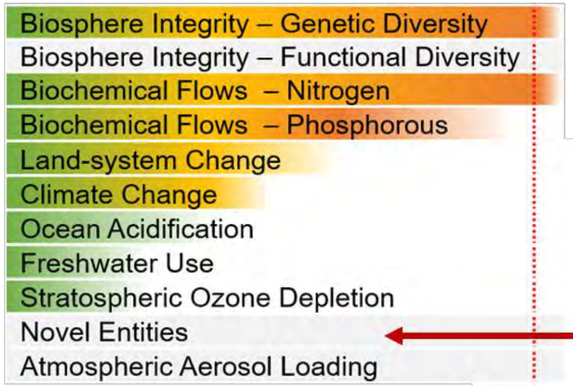
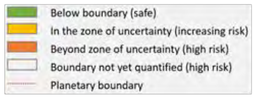
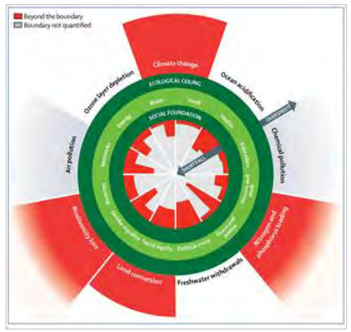
Task 6.1 Circular Business Models

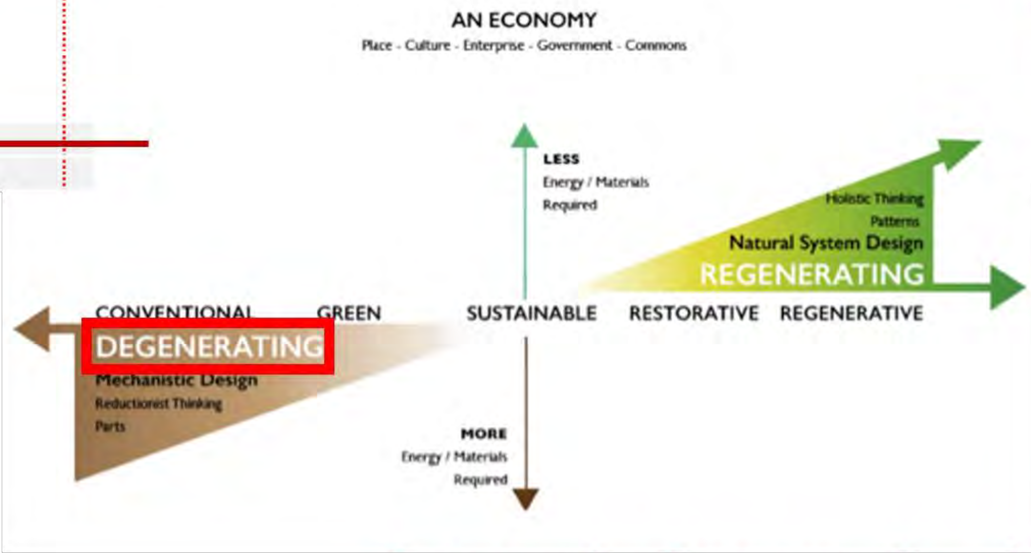
Circular Blue Food Systems Economies







A distributive economy



System value from growth positive targets

Thomsen, M., Ahrné, L., Ohlsson, A., 2023. Sustainability and Food Systems. Chapter 49 in Food Safety Management. Eds. Andersen, V., Lelieveld, H, Motarjemi, Y. ISBN: 9780323902090. https://www.elsevier.com/books/food-safety-management/andersen/978-0-12-820013-1

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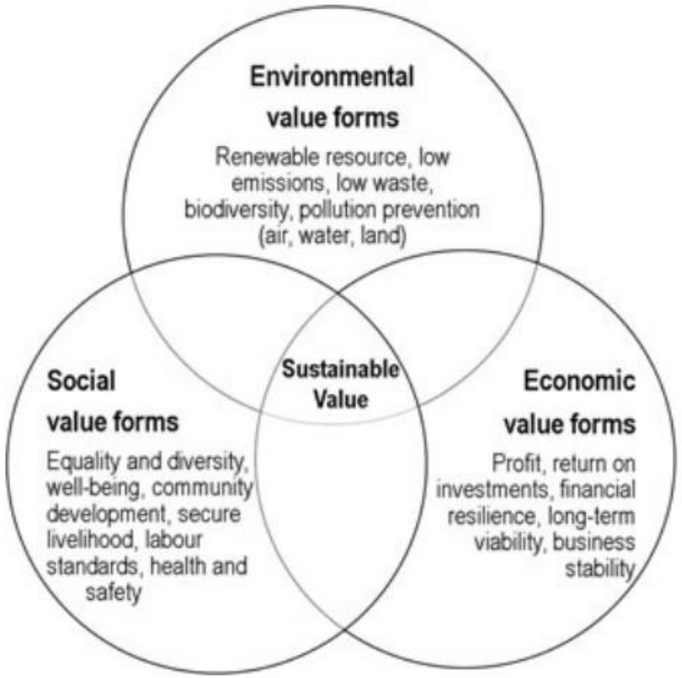
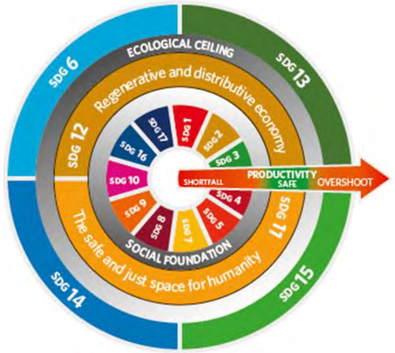
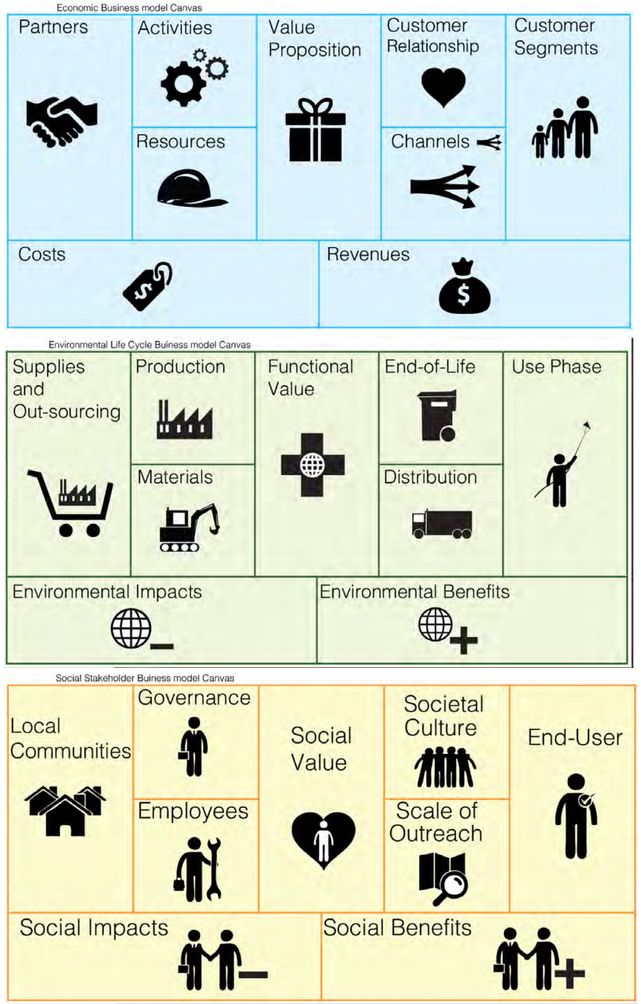
Task 6.1 Circular Business Models

A sustainable business model follows a sustainable economy, encouraging the minimization of consumption and maximizing societal and environmental benefit, rather than prioritizing economic growth





The Triple Layer Business Model Canvas



Joyce, A., Paquin, R., & Pigneur, Y. 2016. The triple layered business model canvas: a tool to design more sustainable business models. Journal of Cleaner Production 135, 1474-1486. https://doi.org/10.1016/j.jclepro.2016.06.067

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T6.2 Multi-criteria Sustainability Assessment

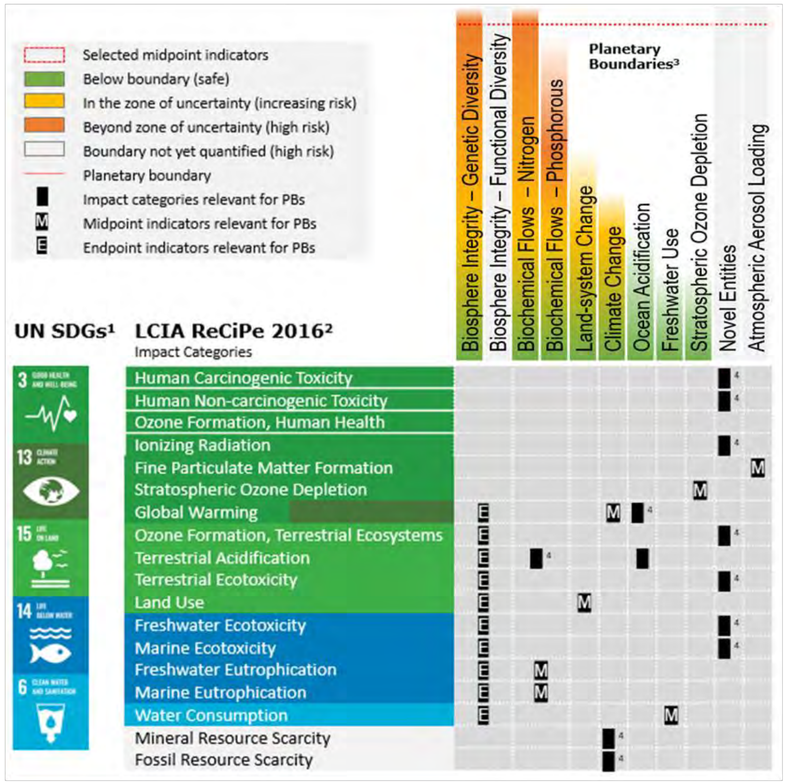
Identification of relevant Environmental Life Cycle Assessment Impact Categories

Absolute Sustainability Measures

- Connecting

1. LCIA impact categories
2. the Sustainable Development Goals (SDGs)
3. the planetary boundaries (PBs)

Adapted from Kate Raworth's 'Doughnut of social and planetary boundaries' (2017) www.kateraworth.com/doughnut



Modified from: Sala et al., 2020. Environmental sustainability of European production and consumption assessed against planetary boundaries. Journal of Environmental Management. Volume 269, 1 September 2020, 110686

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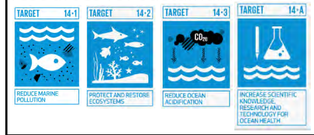
T6.2 Multi-criteria Sustainability Assessment

Relevant Environmental Life Cycle Assessment Impact Categories

SDG Goal and relevant targets	Relevant SDG Indicators	Relevant Impact category	Environmental mitiagtion through ECU
Goal 13. Take urgent action to combat climate change and its impacts	13.2.2: Total greenhouse gas emissions per year	Global Warming	Yes (scale dependent)
	13.3.1: Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment		
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development 	14.1.1: (a) Index of coastal eutrophication; and (b) plastic debris density		
	14.2.1: Number of countries using ecosystem-based approaches to managing marine areas		
	14.3.1: Average marine acidity (pH) measured at agreed suite of representative sampling stations	Ocean Acidification	Yes (scale dependent)
	14.a.1: Proportion of total research budget allocated to research in the field of marine technology	Marine Eutrophication	Yes (scale dependent)
Goal 6. Ensure availability and sustainable management of water and sanitation for all	6.3.1: Proportion of domestic and industrial wastewater flows safely treated		
	6.3.2: Proportion of bodies of water with good ambient water quality		
	6.4.1: Change in water-use efficiency over time		
	6.4.2: Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	Water Use	No
	6.5.1: Degree of integrated water resources management		
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	15.1.1: Forest area as a proportion of total land area	Land Use	Yes (indirect)
	15.8.1: Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species		
	15.9.1: (a) Number of countries that have established national targets in accordance with or similar to Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020 in their national biodiversity strategy and action plans and the progress reported towards these targets; and (b) integration of biodiversity into national accounting and reporting systems, defined as implementation of the System of Environmental-Economic Accounting		
	15.a.1: (a) Official development assistance on conservation and sustainable use of biodiversity; and (b) revenue generated and finance mobilized from biodiversity-relevant economic instruments		

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Task 6.3 Economic viability of environmental sustainable blue biomass value chains

Assessment of the monetary value of non-marketed services (e.g. water quality restoration and climate change mitigation)
Identify potential hotspots within the multi-actor circular business ecosystems that are in need of subsidies in the short term.
Net Present Value calculations include marketed and non-marketed value projections.

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Task 6.4 Market entry projections and dietary change transitions

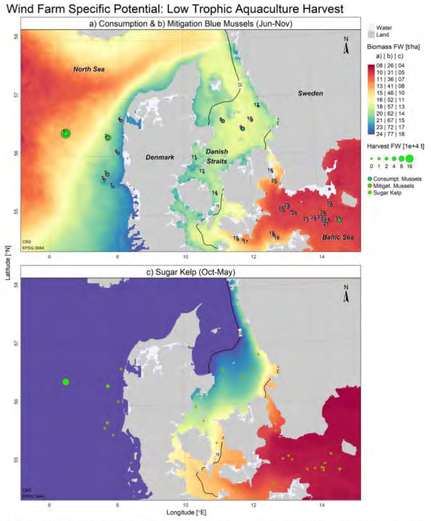
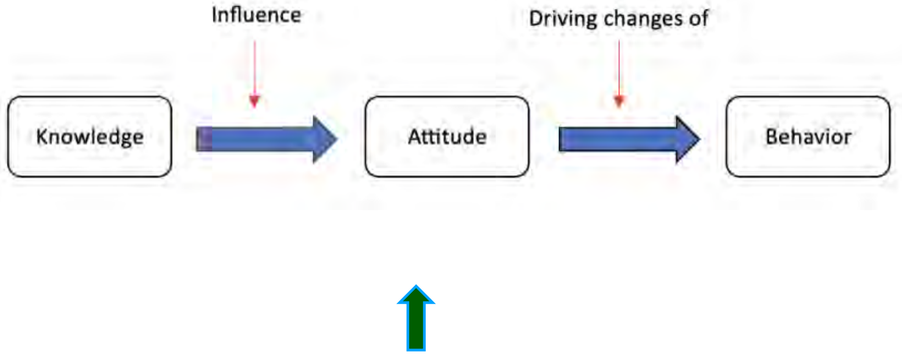


Fig. 2 Harvest potential in the study area. Maps showing the harvest potential (10^4 t-FW yr^{-1}) of (**a**) commercial mussel culture for consumption,

Maar, M., Holbach, A., Boderskov, T., Thomsen, M., Buck, B.H., Kotta, J. Bruhn, A., 2023. , Multi-use of offshore wind farms with low-trophic aquaculture can help achieve global sustainability goals. Commun Earth Environ 4, 447. https://doi.org/10.1038/s43247-023-01116-6



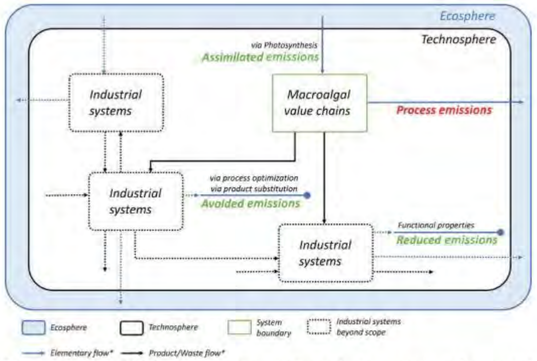


Fig. 6 Illustration of the four emission flows serving as the key to ensure carbon-neutral production systems and forming the basis for the quantification of systems' contribution to SDG 13.

Fig. 5 The key criterion for carbon-neutral industrial ecology systems; the assimilated emissions from engineered green infrastructural biomass producing farm system (As), the avoided emissions from the substitution of fossil-based products (Av) and/or the reduced emissions from process optimization (R) in sum is equal to or higher than the sum of all process emissions (P) in absolute terms. HDPE stands for high-density polyethylene.

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WP6 Deliverables

- D6.1 Catalog of circular blue bioeconomy opportunities towards climate neutral seafoods (M46)
- D6.2 Life cycle sustainability assessment of OLAMUR systems and associated restorative food production and supply systems (M44)
- D6.3 System value from growth positive targets - OLAMUR market entry scenarios (M48)

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ANNUAL MEETING 2024

Work Package 6 & 7

Triple-layer business model workshop

Marianne Thomsen ,University of Copenhagen (DK)
Dorothy Dankel, Anne Gaspers, Emily Cowan, SINTEF Ocean (NO)
Ian Overton, Palak Gupta, Jochen Hinkel, Global Climate Forum (DE)

OLAMUR : Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas

Agenda of the workshop presentation

- **[Dorothy]** Storyline from Task 7.1 SDG Target Relevance-Tracing Workshop
- **[Dorothy]** Linking the SDGs to other sustainability frameworks
- **[Marianne]** Introduction to the Canvas
- **[Marianne]** The solution matching section: Mapping relevant SDG Targets to the Canvas
- **[Ian]** The canvas exploration and exploitation: Linking to our future Replication Partners and the explicit link to multi-level Governance
- **[Plenary]** Reflection and feedback

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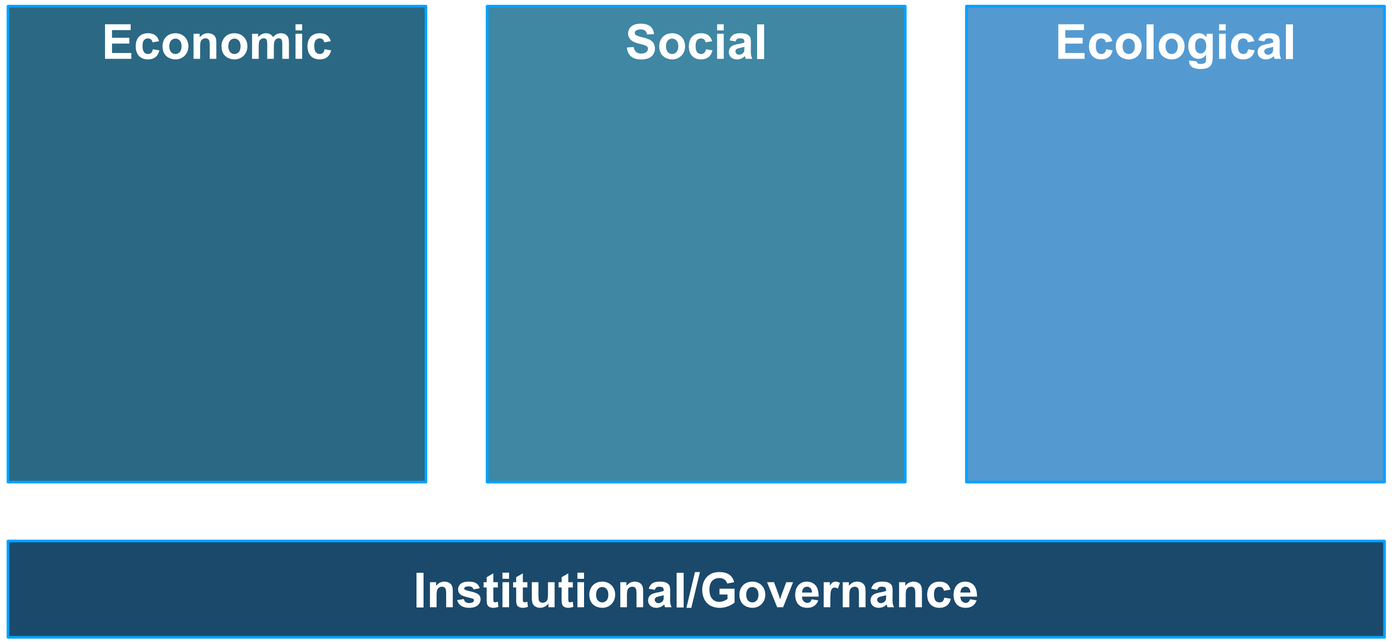
OLAMUR is a research and innovation project about sustainable use of ocean space for energy and food production

The 3 pillars of sustainability



Related concepts, initiatives and agendas

UN Sustainable Development Goals

Circular Economy
European Green Deal
EU Taxonomy
Social Equity and Justice
Sustainable Finance Directive (Article 9&10)
Renewable Energy Transition/Directive
Farm to Fork
Corporate Social Responsibility
EU Emission Trading System
Fair Trade
EU Missions
Diversity, Equity and Inclusion (DEI)
Biodiversity Strategy 2030
Triple Bottom Line

WP6 & WP7 synergistic work

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OLAMUR WP6 & WP7 Flow Chart

Task 7.1 SDG Target Relevance-Tracing Workshop

Mission: To identify which of the 169 Targets and associated indicators are relevant for each OLAMUR demo site

Joint WP6&7 Peer-Review Paper on our experiences and insights from applying the SDG and Triple Layer Business Model Canvas ot the OLAMUR demo sites

Task 6.1 Triple Layer Business Model Canvas Workshop

Mission: To map relevant targets and indicators to the Business Model Canvas to plan operationalization of sustainability targets

Replication Sites

Mission: To jump-start a sustainable business based on the Business Model Canvas, using insights from OLAMUR and specific policy needs for sucessful multi-use planning

Tasks 7.2 & 7.4 Governance Analyses

Mission: deriving an in-depth understanding on how marine spatial planning operates in the demo sites, both in terms of legal arrangements as well as prevalent planning conditions, as well as interest groups and politics involved. Describe conditions of their applicability and transferability, as well as barriers and enablers encountered.

Joint OLAMUR White Paper (WP8) on policy recommendations on governance models that give incentives for multi-use sites applying the SDG and Triple Layer Business Model Canvas

Task 7.3 Event Ethnography

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WP7 Task 7.1: SDG Target Relevance-Tracing: Kriegers Flak Multi-Use Demo October 2023, Roskilde

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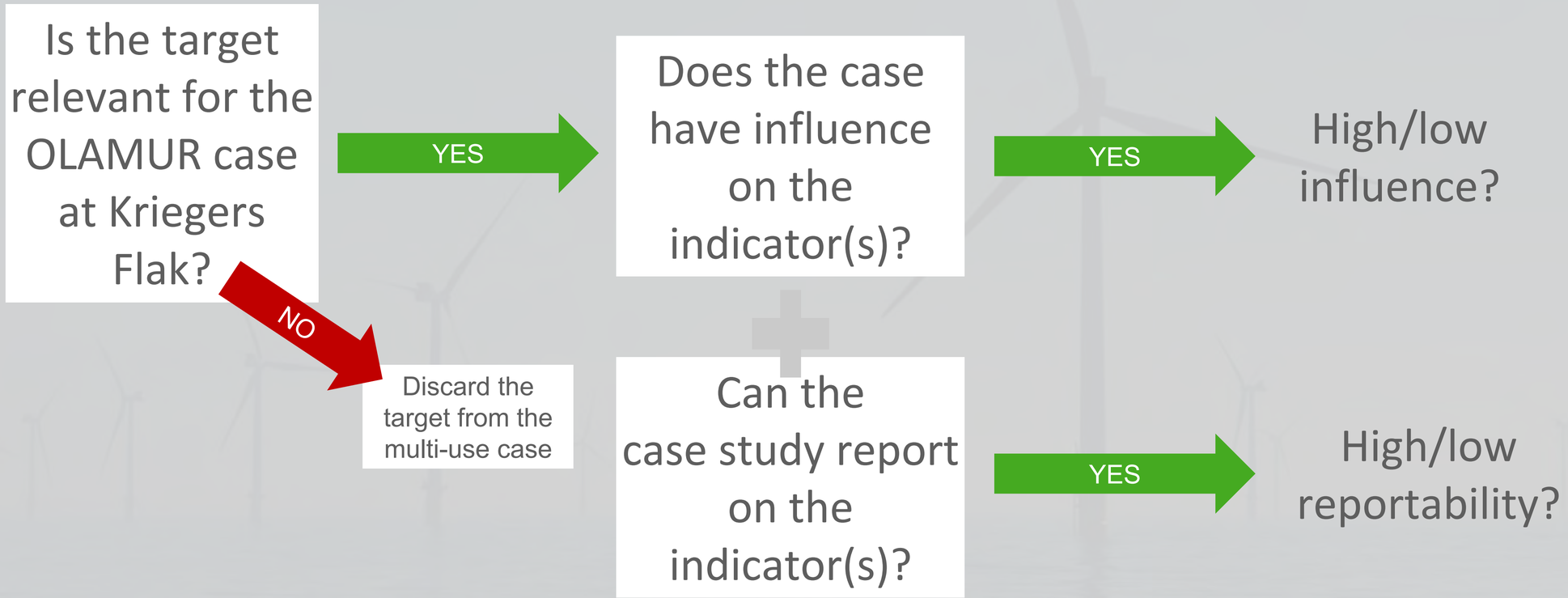
17 SUSTAINABLE DEVELOPMENT GOALS | 169 TARGETS | 247 INDICATORS



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Example

SDG Target 12.2 By 2030, achieve the sustainable management and efficient use of natural resources

Is the target relevant for the OLAMUR multi-use study? → YES

SDG Indicator 12.2.1 Material footprint, material footprint per capita, and material footprint per GDP

Can the OLAMUR case study report on the indicator(s)? → YES → High reportability + Can the OLAMUR case study influence the indicator(s)? → YES → Record and map the indicator(s)

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High 'reportability' on indicator

Low influence on indicator

High influence on indicator

Low 'reportability' on indicator

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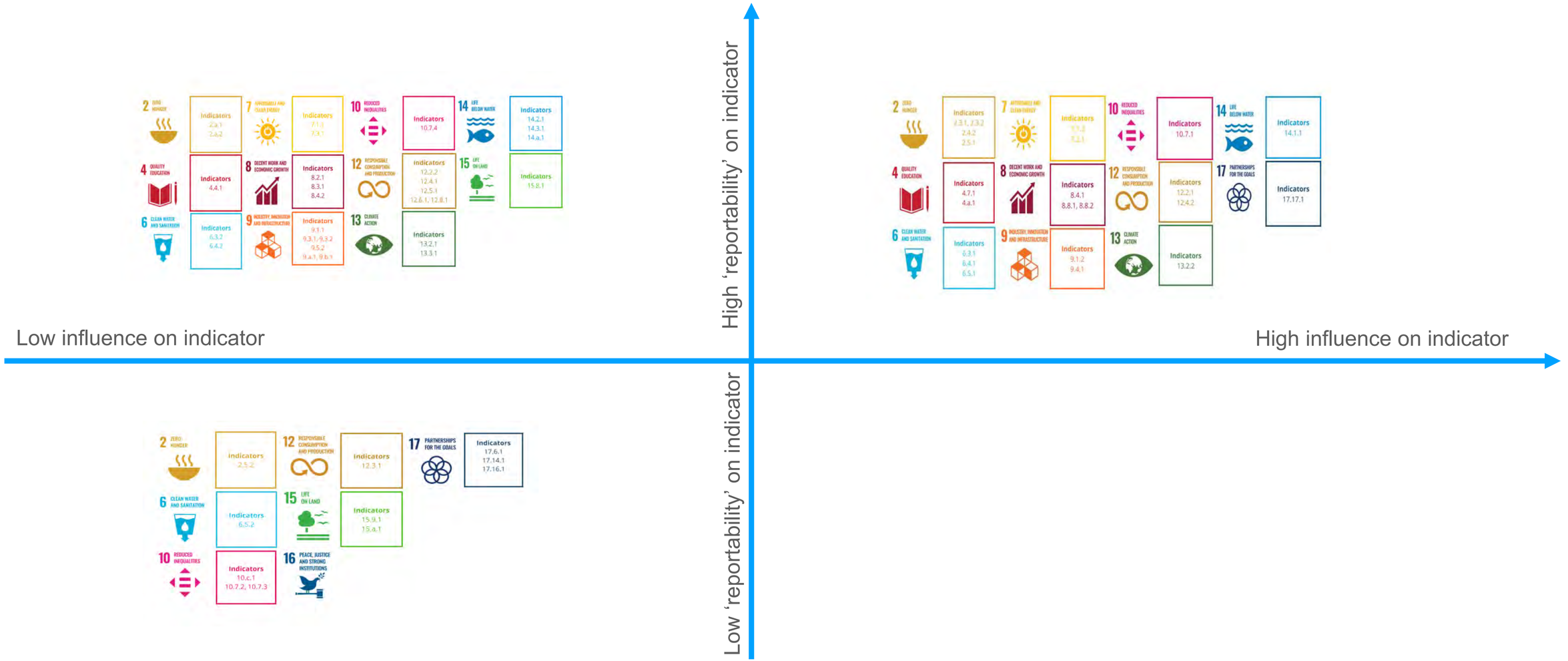

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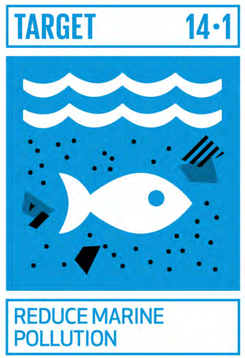
Data from OLAMUR Task 7.1
SDG Target & Indicator Relevance-Tracing Workshop
Kriegers Flak demo site

Relevant SDG Target Cluster with UN Indicators

13.2.1 Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)



14.1.1 Index of coastal eutrophication and floating plastic debris density

4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill

17.14.1 Number of countries with mechanisms in place to enhance policy coherence of sustainable development

8.4.1 Material footprint, material footprint per capita, and material footprint per GDP
8.4.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP

How do we operationalize this SDG cluster?

How do we operationalize these elements of sustainability that we know we can and should attain?

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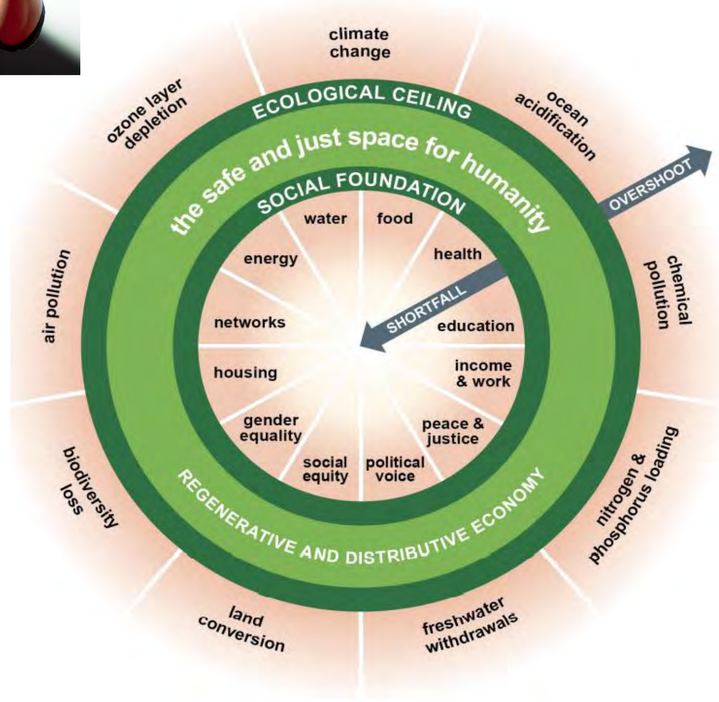
A Doughnut for the Anthropocene: humanity's compass in the 21st century

Kate Raworth
Environmental Change Institute, Oxford University, Oxford



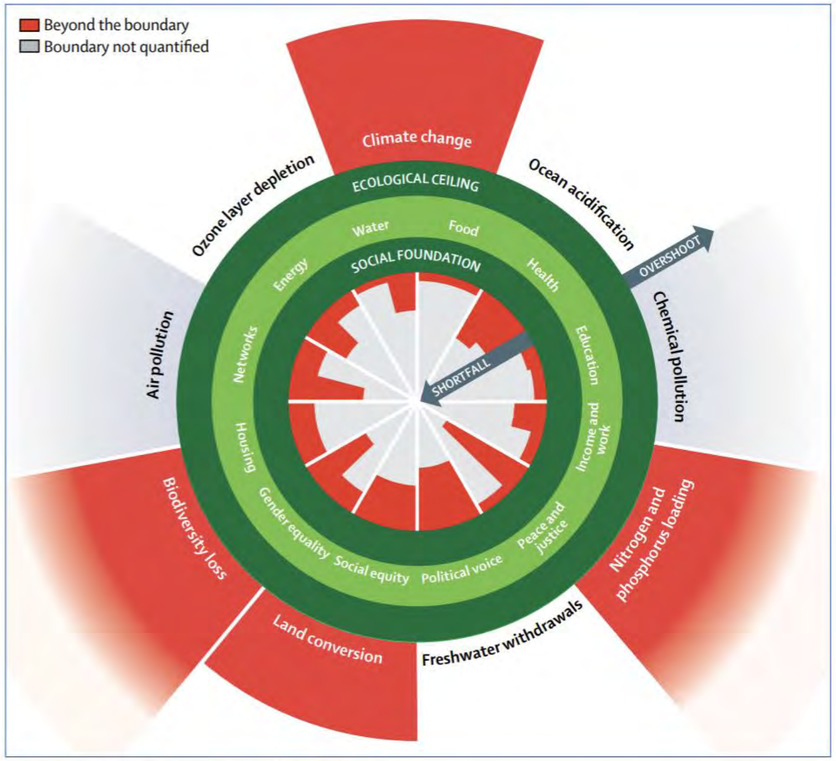


Figure: **Shortfalls and overshoot in the Doughnut**
Dark green circles show the social foundation and ecological ceiling, encompassing a safe and just space for humanity. Red wedges show shortfalls in the social foundation or overshoot of the ecological ceiling. The extent of pressure on planetary boundaries that are not currently being overshot is not shown here (see appendix for all graphics).

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What is Triple layer business model?

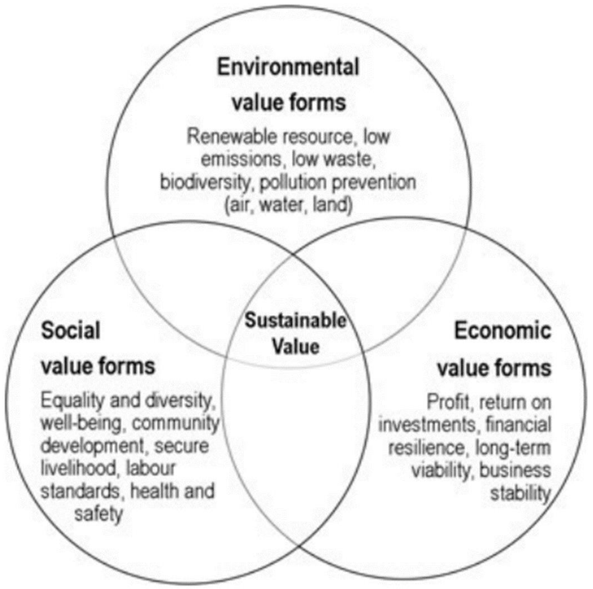
“A business model describes the rationale of how an organization creates, delivers and captures value.”

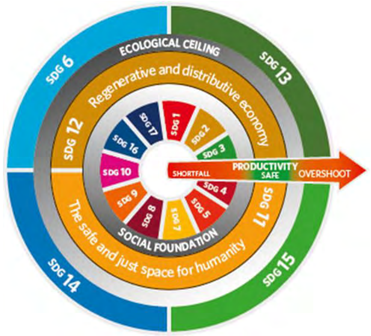
Osterwalder and Pigneur, 2010

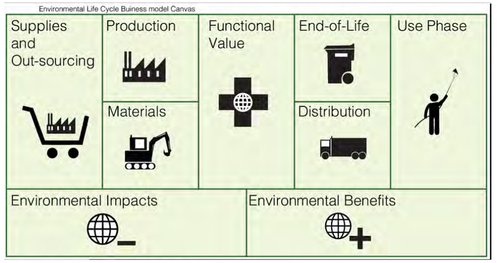
“A sustainable business model as the rationale of how an organization creates, delivers and captures economic, environmental and social forms of value simultaneously.”

Joyse et al. 2015

J







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Economic Business Model Canvas

Partners

All OLAMUR partners

Activities

- Training and educational service
- Low trophic cultivation
- Deployment, maintenance, harvesting, processing

Resources

- Technical skills (Know-how) & Human Resources
- License/Certificate (governance)
- Market Intelligence

Value Proposition

- Localized sustainability
- Low environmental footprint of seafood
- Zero waste Food Supply Chains
- Empowering people
- Restoring Planetary Boundaries from Public-Private Partnerships business model

Customer Relationship

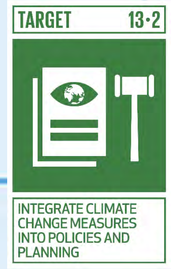
- Social Network of end-users to capture social value of the business
- Organic certification schemes
- Showcasing (visits, presentations of e.g. through last mile solutions)
- Social media

Channels

- Direct sales
- Online store

Customer Segments

- Human food consumers
- Retail stores
- Direct sale to Restaurants
- Ingredients suppliers (feed ingredient producers, Lerøy, ++)
- Governments supporting coastal restoration



Costs

- Capital expenditures associated to investment in technological solutions (e.g. food waste prevention and surplus food upcycling technologies)
- Operational expenses for technological (maintenance) and non-technological (labor) solutions; Logistics & Salaries
- Website and related services

Revenues

- Sales of seafood
- Emission capture revenues
- Habitat restoration “revenues”

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Social Stakeholder Business Model Canvas

Local Communities

Community development through investment in infrastructure development, education, healthcare, and social programs.

Governance

Spill-over effects from stakeholder workshops and awareness raising campaigns

Employees

- Shared responsibility
- Part of the solution

Social Value

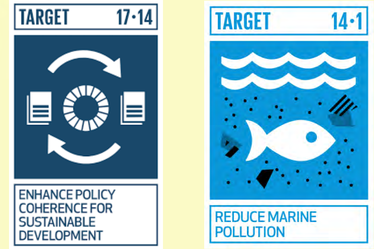
- To provide solutions to the planetary crises / global societal challenges
- To provide a way for employees and customers to get involved and contribute to solving challenges

Societal Culture

Promote dietary improvements and quatro-helix collaboration culture

Scale of Outreach

Replication of the quadro-helix ecosystem-based management framework and implementation of regenerative MUPs

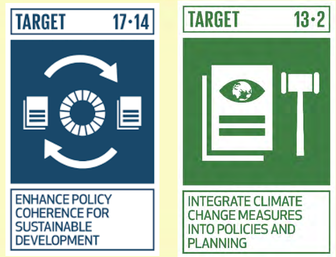


End-User

1. Involving civil society in the planetary health diet agenda
2. Access to local sustainable seafood

Social Impacts

- Employment opportunities
- Income generation



Social Benefits

- Changing dietary habits
- Positive externalities such as climate change mitigation
- Skills development for uneducated people
- Social and environmental restoration profits

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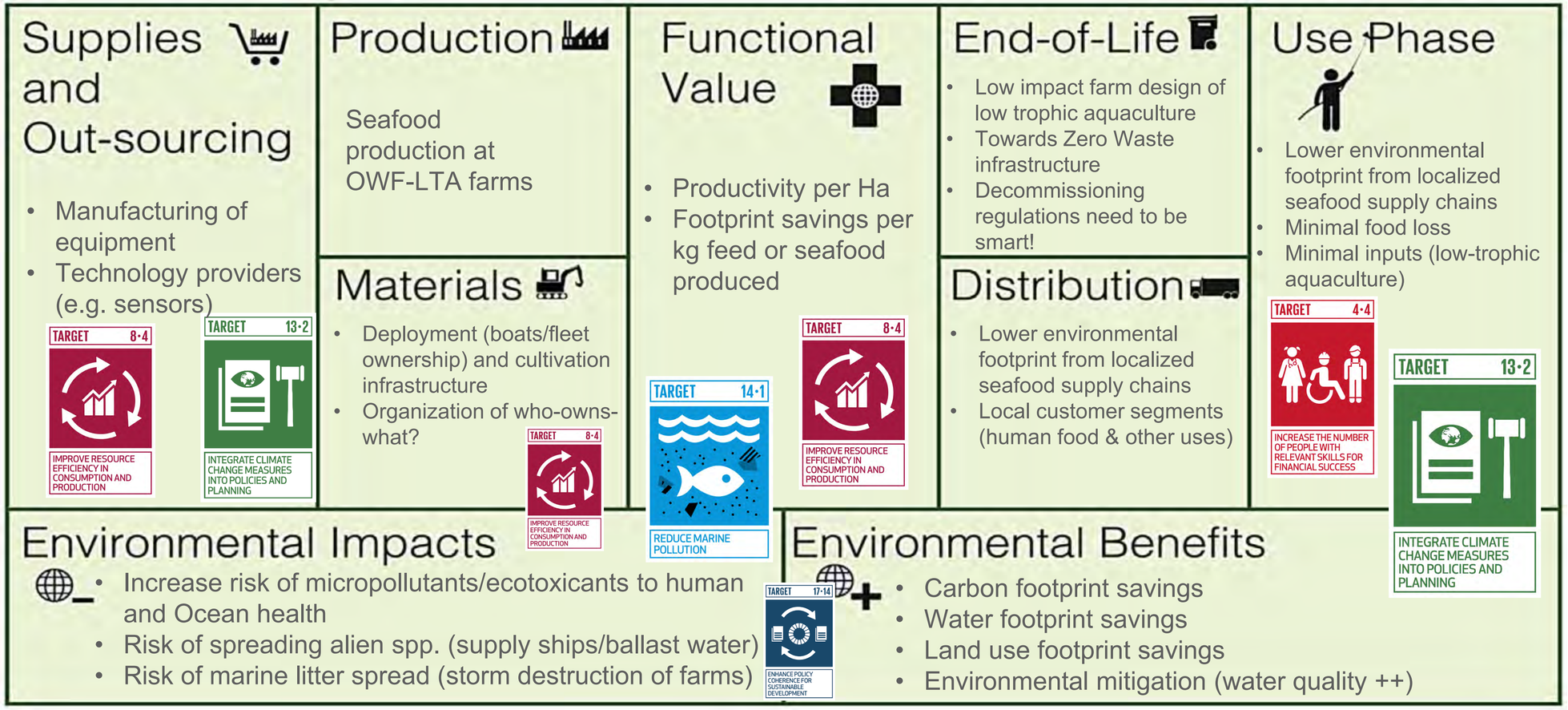
Environmental Life Cycle Business Model Canvas



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OLAMUR WP6 & WP7 Flow Chart

Task 7.1 SDG Target Relevance-Tracing Workshop

Mission: To identify which of the 169 Targets and associated indicators are relevant for each OLAMUR demo site

Task 6.1 Triple Layer Business Model Canvas Workshop

Mission: To map relevant targets and indicators to the Business Model Canvas to plan operationalization of sustainability targets

Replication Sites

Mission: To jump-start a sustainable business based on the Business Model Canvas, using insights from OLAMUR and specific policy needs for sucessful multi-use planning

Joint WP6&7 Peer-Review Paper on our experiences and insights from applying the SDG and Triple Layer Business Model Canvas ot the OLAMUR demo sites

Task 7.2 & 7.4 Governance Analyses

Mission: deriving an in-depth understanding on how marine spatial planning operates in the demo sites, both in terms of legal arrangements as well as prevalent planning conditions, as well as interest groups and politics involved. Describe conditions of their applicability and transferability, as well as barriers and enablers encountered.

Joint OLAMUR White Paper (WP8) on policy recommendations on governance models that give incentives for multi-use sites applying the SDG and Triple Layer Business Model Canvas

Task 7.3 Event Ethnography

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T7.2: Comparative governance in pilots

- Consider both **formal** (e.g. laws, policies, market conditions) and **informal** institutions (norms and conventions)
- Evaluate governance structures regarding **coherence between policy goals and instruments**
- Derive an in-depth understanding on **how marine spatial planning operates** in the three cases/countries
- Review **innovative cases** from around the world

Results:
- Comparative report of governance arrangements (D7.2)
- Review of governance instruments that **effectively foster LIMA & MPMS** in a sustainable way

OLAMUR DOA, p. 18

T7.4: Multi-level governance

- Propose solutions for holistic Multi-level governance fostering sustainable multi-use OWF and Low-trophic aquaculture

Results:
- White paper on sustainable co-developed innovative multi-level governance models for LIMA and MPMS (D7.4)

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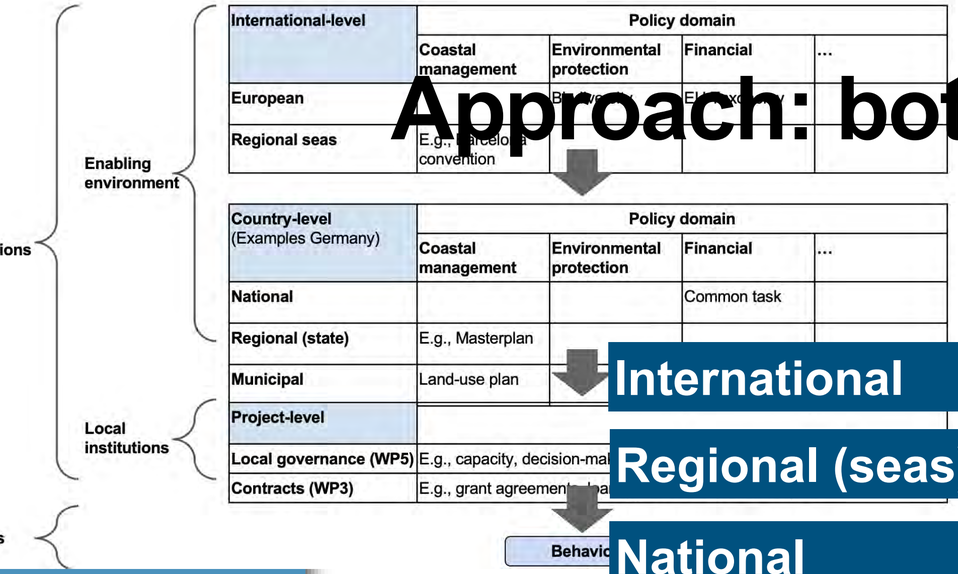
Approach: bottom-up



International

e.g. OSPAR, EU Marine Strategy Framework Directive

National

e.g. Germany

Regional (state)

e.g. state government

Municiple

e.g. local government

Project governance

e.g. advisory board

Contracts (WP1)

e.g. third party vendors

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OLAMUR

Thanks for your attention

Contact Details:
Tel.nr:
Email:

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Work Package 7

Governance of integrated socio-ecological-technical system

Dorothy Dankel, Anne Gaspers, Emily Cowan, SINTEF Ocean (NO)
Ian Overton, Palak Gupta, Jochen Hinkel, Global Climate Forum (DE)

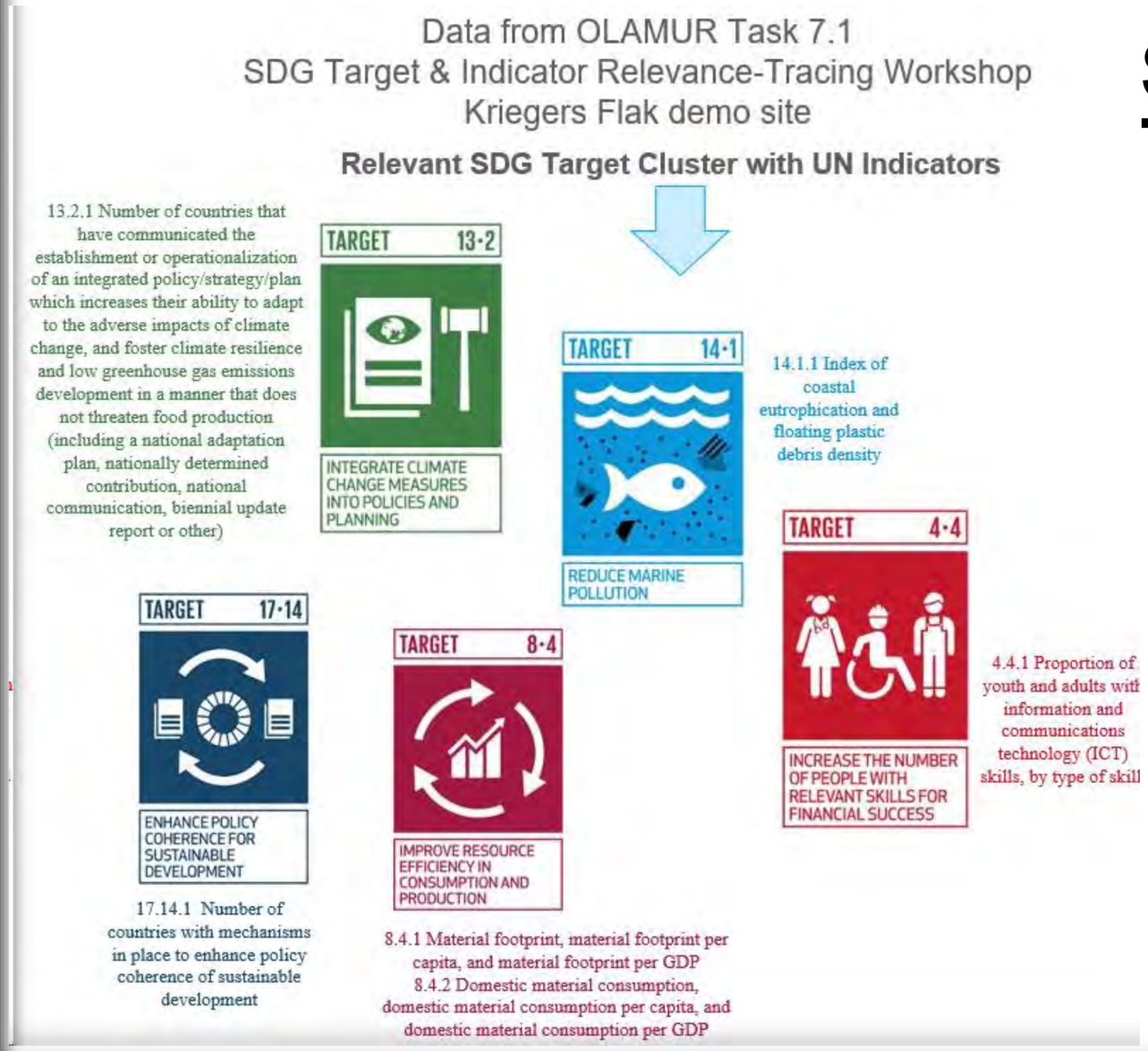
OLAMUR : Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas

ANNUAL MEETING 11.01.2024

Photo: Adobe
@emilycco

Co-create holistic multi-level governance solutions for innovations in offshore seaweed and shellfish farming in the three pilot sites.

T7.1
SDG Target Relevance-Tracing Workshop



- To identify which of the 169 Targets and associated indicators are relevant for each OLAMUR demo sites

Results:

- Workshop report/joint results publication with WP6 – M28

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WP7 Task 7.1: SDG Target Relevance-Tracing: Kriegers Flak Multi-Use Demo October 2023, Roskilde

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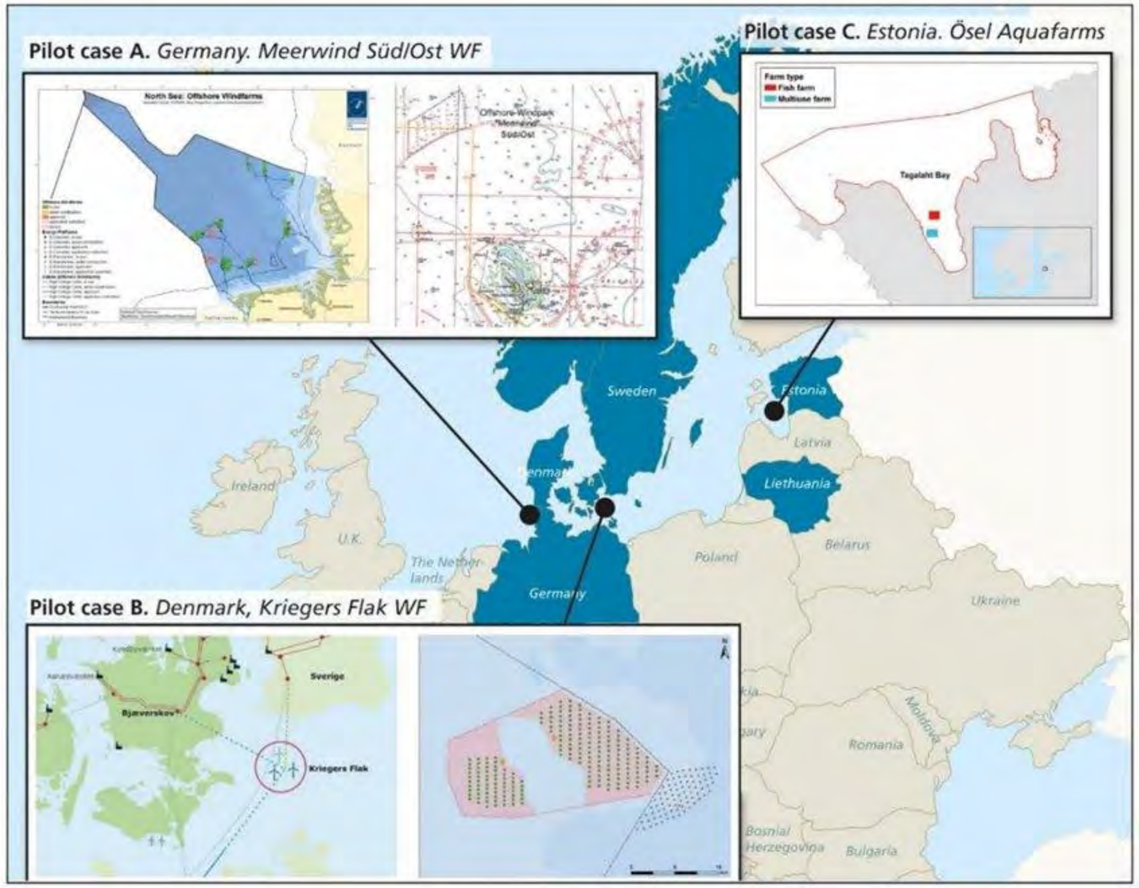
SINTEF

TENTATIVE

	DENMARK	ESTONIA	GERMANY	REPORT
Spring 2023	Stakeholder mapping all case areas			
September 2023	Preparations			
October 2023	Stakeholder workshop (1-2)			
November 2023	Analysis			
December 2023				
January 2024				
February 2024				
March 2024		Stakeholder workshop (1-2)		
April 2024		Analysis		
May 2024			Stakeholder workshop (1-2)	
SUMMER 2024			Analysis	Results summary
September 2024 - April 2025	Submit Report (M28)			

T7.2 Comparative governance in pilots



- Consider both **formal** (e.g. laws, policies, market conditions) and **informal** institutions (norms and conventions)
- Evaluate governance structures regarding **coherence between policy goals and instruments**
- Derive an in-depth understanding on **how marine spatial planning operates** in the three cases/countries
- Review **innovative cases** from around the world

Results:

- Comparative report of governance arrangements (D7.2)
- Review of governance instruments that **effectively foster low trophic aquaculture (LTA) and marine planning in multi-use scenarios (MPMS)** in a sustainable way

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Approach: bottom-up

	Step	Action
1	Select governance framework (e.g. layers of governance within the project)	**Review governance structure frameworks** from other (EU Horizons) science research projects, businesses (e.g. RESTCOAST EU project, etc.) Consider frameworks for **non-market value** in business model (e.g. SDG, EU Taxonomy, etc.) - **WP6**
2	Establish basic business models and existing governance systems of pilots (lowest levels)	**Focus groups** with WP1 participants Develop **proto-business models** and associated economic, social and environmental value generated
3	Identify higher institutions relevant to the pilots (e.g. **formal** laws and policy instruments, as well as **informal** market conditions, norms, etc.)	**Document analysis:** what applies to the pilots / future businesses? Which institutions support / hinder?
4+	**Evaluate policy coherence** between goals and instruments	**D7.2** Comparison of governance in the three pilots

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T7.4 Multi-level governance

- Propose solutions for holistic Multi-level governance fostering sustainable multi-use OWF and Low-trophic aquaculture

Results:

- White paper on sustainable co-developed innovative multi-level governance models for **LIMA** and **MPMS** (D7.4)

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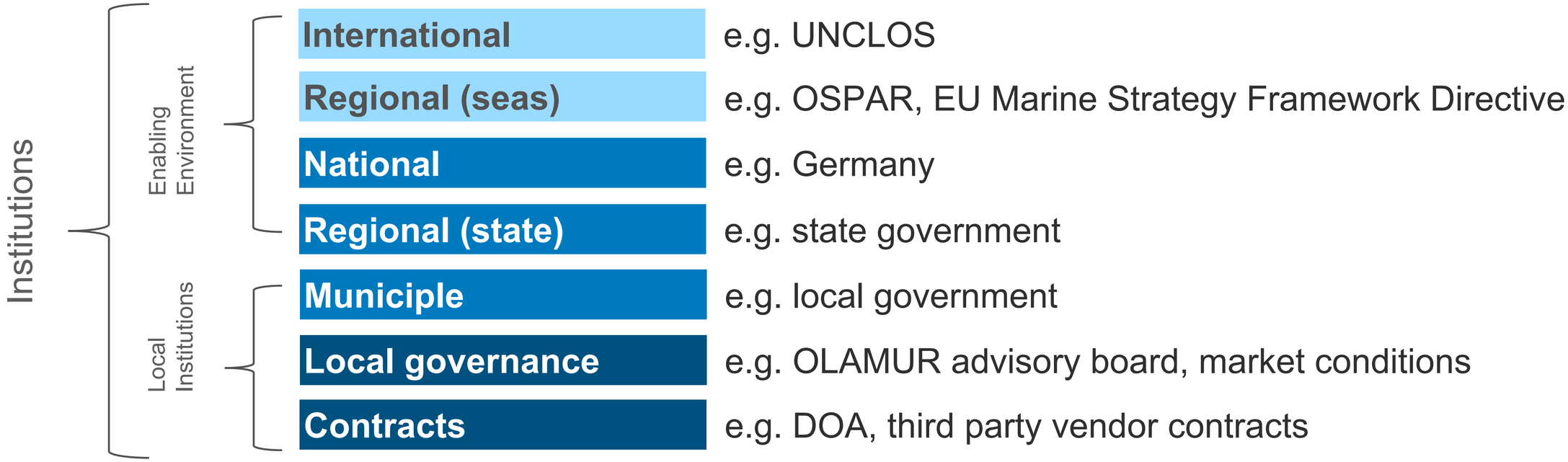
Approach: bottom-up



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Socio-ecological-technical systems

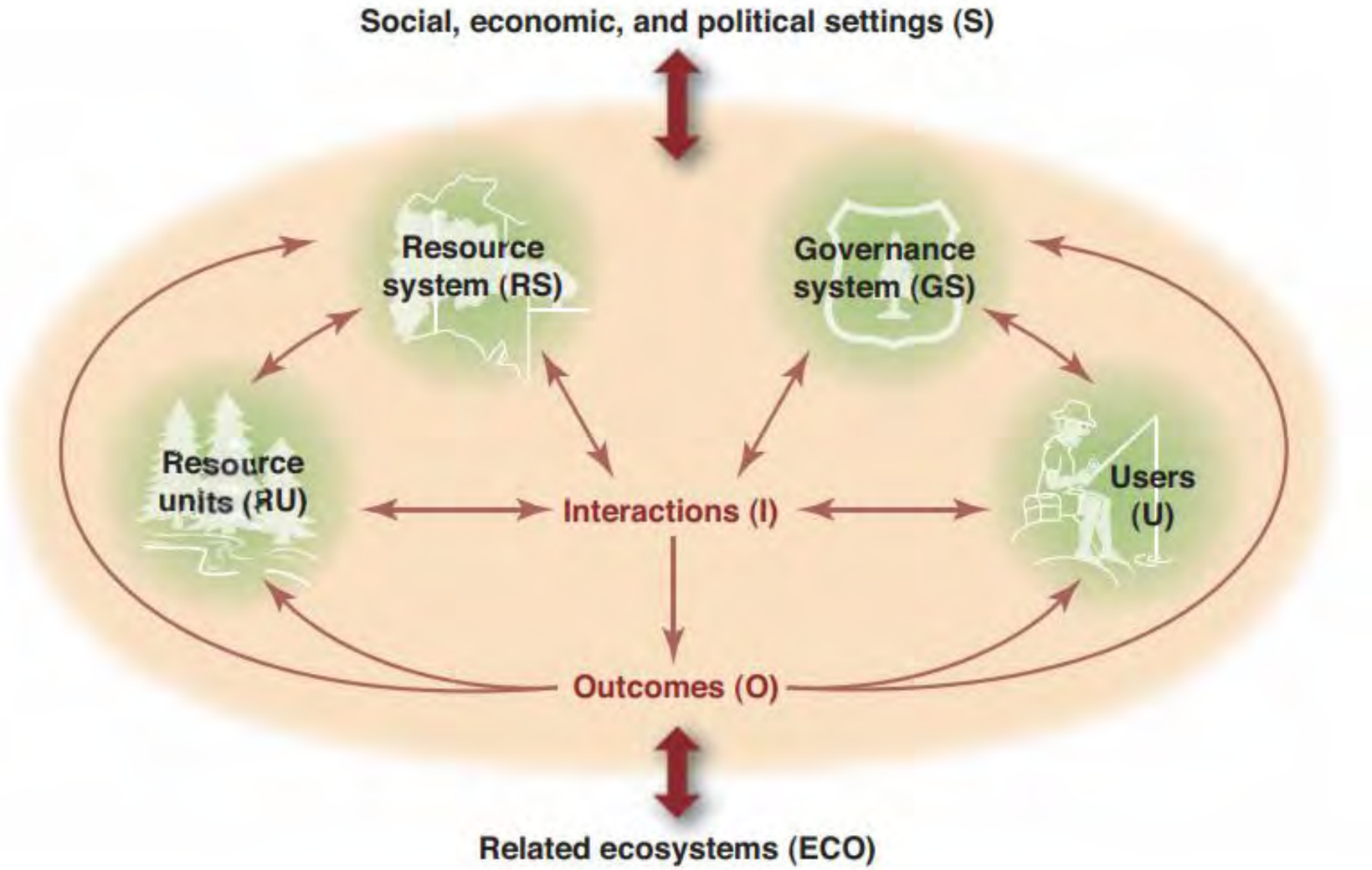

Fig. 1. The core subsystems in a framework for analyzing social-ecological systems.

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T7.3 Collaborative Event Ethnography

Focus Arenas:

- Convention on Biological Diversity 30X30
- International Panel on Biodiversity and Ecosystem Services (IPBES)

Methodology: Event ethnography to study science-industry-government interfaces and political dynamics in international negotiations.

Results:

- A journal article on the findings from COP16 and IPBES negotiations will inform the development of multi-level governance structures, supporting the assessment and development of biodiversity targets and sustainable development goals in the case areas and beyond. (D7.3)

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Teknologi for et bedre samfunn

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L2

Welcome to the opening ceremony. Honoured by the presence of officials among us. At this INC more than 160 countries are registered and more than 2325 delegates, which also includes large reps of over 1000 reps from civil society, industry and IGO. Before we move to the formal opening we are privileged to have music from Uruguay to start of ceremony with cultural performance. (music stops) session declared open to develop ILBI on PP including in the marine envi. I call to order its first plenary, and invite Mr. Luis pres of the Republic of Uruguay.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Country	(O)nline	Organization/NGO or similar	M/F	Name/Title	MTG - INC - COP nr	Date	Year	Session - plenary? High level?	Order	Notes	General opening statements	Align opinions with	Agenda Item 2	Agenda Item 4: Opening statemen	Scope & objectives and broad	Options for potential elements	Elements to support implemen	Sub item 3	sub item 3	Sub item 4	Sub item 5	Final Plenary
2			UNEP	F	Jyoti Mathur-Filipp, Exec	INC-1	nov.28	2022	Plenary mo	1		Welcome to the opening ceremony. Honoured by the presence of officials among us. At this INC more than 160 countries are registered an											
3	Uruguay			M	Mr. Luis Lacalle Pou, Pre	INC-1	nov.28	2022	Plenary	2		I wish to welcome you to our country, I hope that you will have a bit of time to get acquainted with our country. You often don't have the t											
4			UNEP	F	Jyoti Mathur-Filipp, Exec	INC-1	nov.28	2022	Plenary	3		Thank you president for setting the goals for us, now I invite Inger anderson											
5			UNEP	F	Inger Andersen, Under-S	INC-1	nov.28	2022	Plenary	4		Mr. President, its a great honor to be here in your beautiful country. (thank yous) (welcomes...) This is now the first INC hat will embarck on											
6			UNEP	F	Jyoti Mathur-Filipp, Exec	INC-1	nov.28	2022	Plenary	5		Thank you for your aspirational words, now we call upon his excellences mr. Agelin pena, mr of envi											
7	Uruguay			M	Mr. Agelin Pena, Ministe	INC-1	nov.28	2022	Plenary	6		Thanks yous.. Welcomes... Honor to host... prepare instrument to end PP. We are grateful to you for having chosen Uruguay. Today we kick											
8			UNEP	F	Jyoti Mathur-Filipp, Exec	INC-1	nov.28	2022	Plenary	7		Thank yous... Challenges	Upon election the chair will preside over committe. The following nominations : African states: julian cabarial fron											
9	Columbia		GRULAC	M		INC-1	nov.28	2022	Plenary	8			GRULAC	We present the following agreement endorsed by our regional group. GRULAC endorses an agreement between E										
10			UNEP	F	Jyoti Mathur-Filipp, Exec	INC-1	nov.28	2022	Plenary	9				Taking into account the previous statement, confirms the nominations from GRULAC. Now Peru takes over proce										
11			UNEP	M	Mr. Gustavo Adolfo Mez	INC-1	nov.28	2022	Plenary	10		Thank you to my regional group that I am today elected as chair. I interpret this decision as a sign of trust with my country Peru. You can co											

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UN Convention on Biological Diversity (CBD) & the Global Biodiversity Framework (GBF)

- COP28 is NOT COP16
- Unofficially known as the 'Paris Agreement for Nature'
- GBF focus on 5 drivers of BD loss
  - Pollution
  - Invasive species
  - Change in area use
  - Extraction
  - Climate change

Targets to follow during COP16 21 October to 1 November 2024

Event:

- Governments will be tasked with reviewing the state of implementation of the GBF and developing the monitoring framework

Related Targets: 5/23

- **T1** Plan and manage all areas to reduce BD loss
- **T3** 30x30 land-sea conservation
- **T6** Reduce invasive alien species by 50%
- **T10** Enhance BD and sustainability in aquaculture and fisheries
- **T15** Business Assess, disclose and reduce BD-related risks and negative impacts

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OLAMUR WP6 & WP7 Flow Chart

Task 7.1 SDG Target Relevance-Tracing Workshop

Mission: To identify which of the 169 Targets and associated indicators are relevant for each OLAMUR demo site

Task 6.1 Triple Layer Business Model Canvas Workshop

Mission: To map relevant targets and indicators to the Business Model Canvas to plan the operationalization of sustainability targets

Replication Sites

Mission: To jump-start a sustainable business based on the Business Model Canvas, using insights from OLAMUR and specific policy needs for sucessful multi-use planning

Joint WP6&7 Peer-Review Paper on our experiences and insights from applying the SDG and Triple Layer Business Model Canvas ot the OLAMUR demo sites

Task 7.2 & 7.4 Governance Analyses

Mission: deriving an in-depth understanding on how marine spatial planning operates in the demo sites, both in terms of legal arrangements as well as prevalent planning conditions, as well as interest groups and politics involved. Describe conditions of their applicability and transferability, as well as barriers and enablers encountered.

Joint OLAMUR White Paper (WP8) on policy recommendations on governance models that give incentives for multi-use sites applying the SDG and Triple Layer Business Model Canvas

Task 7.3 Event Ethnography

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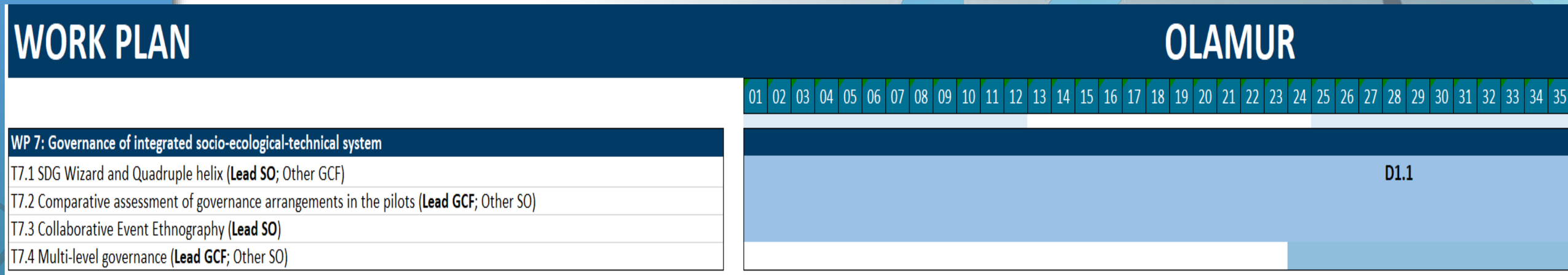
OLAMUR

WORK PLAN

OLAMUR



D7.1	Workshop Report of the SDG Target Relevance-Tracing across all three pilot sites	7	SO	R
D7.2	Comparative report of governance systems in the Pilots	7	GFC	R
D7.3	White-paper: Mapping of significance of international negotiations and development of global treaties for areas of co-existence of OWF and low-impact aquaculture.	7	SO	R
D7.4	White-paper: innovative sustainable multi-level governance models for multi-trophic aquaculture	7	GFC	R

OLAMUR

Thanks for your attention

Contact Details:
Tel.nr:
Email:

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WP8: Communication, Dissemination, Exploitation

Annual Project Meeting
10 January 2024

David Bassett, Pamela Ernstberger - EATiP

OLAMUR : Offshore Low-Trophic Aquaculture in Multi-use Scenario Realisation in North and Baltic Seas

Remember! Partner CDE Responsibilities for WP8

- Communication, Dissemination & Exploitation actions are often considered as an additional, non-essential or least important activity within partner activities.
- All Partners are reminded that all a range of PM allocations for CDE activities during the lifetime of the project is included within the project design.
- Such activities are as integral to partner responsibilities within the GA as any scientific and research actions.
- EU project assessment places **significant** focus on project outreach, impact and CDE.

WP number	8	Lead beneficiary	EATiP	Co-Lead	GCF														
Work package title	Communication, Dissemination & Exploitation																		
Participant #	22	1	3	4	5	6	7	9	10	13	15	16	17	18	20	21	23	24	TOTAL
Short name	EATiP	IMR	DMI	AU	GCF	HEREON	MR	KCD	Skarv	KS	RS	UT	DTU	ÖAF	ETT	KU_LT	NFS	WYK8	
PMs	36	4	2,5	2	2	3	5	1	5	1	1	2	2	1	4	1	2	2	76,5
Start month	1	End month 48					48												

Associated with document Ref. Ares(2022)845851 - 08/12/2022

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Deliverables & Objectives: Progress Update

OLAMUR CDE Deliverables

D8.1 Project DEP and plan for communication infrastructure completed (M6)

D8.2 Associated regions identified and assigned (M18) (Lead Partner IMR – will report on this separately)

D8.3 Stakeholder Engagement Report, including workshop/seminar reports & CD&E log, including recommendations and suggestions for remaining project activities. (M24)

D8.4 Stakeholder Engagement Report, including workshop/seminar reports & CD&E log (M47)

D8.5 Evaluation of the project (M47)

D8.6 Draft call text associated partners submitted to EC (M7)

D8.7 Document on how OLAMUR will actively engage and use interest groups in the project (M2)

OLAMUR CDE Objectives: taking a **multi-stakeholder approach**, engaging all relevant actors in the **blue economy quadruple helix**. WP8 will:

- Establish an active online and social media presence for the OLAMUR project
- Promote visibility of OLAMUR actions through involvement in dissemination events
- Organise multi-stakeholder workshops; sites visits, field trips and pertinent, identified training needs, stakeholder consultations and surveys
- Gather stakeholder feedback on (draft) project results / initiatives / protocol development through consultations among established 3rd party networks (e.g. aquaculture associations FEAP, EMPA, EAS, Mirror Platforms alongside the AAC in addition to like minded multi stakeholder organisations such as European Technology & Innovation Platform Wind Energy , Wind Europe and the European MSP Platform
- Undertake outreach activities at regional level
- Engage in an appropriate fashion with the European Partnerships, specifically those relating to the Blue Economy, Sustainable Food Systems
- Engage in an appropriate fashion with the Smart Specialisation (S3) Platform for aquaculture, created as part of the EU Blue Economy Strategy (currently in development / consideration with EC DG MARE)
- Interact with linked and established blue economy networks – e.g. Blue BioEconomy CoFund, EFARO, JPI Oceans etc.

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Agreed Communication Channels:

Channel (Target Audience)	Purpose	Key performance indicators
Project website (ALL)	Key communication tool to support OLAMUR, providing an overview of the project,, news and resources.	Due: M6; Target: Over 8000 visits by the end of the project
Social media e.g. Twitter/LinkedIn (ALL)	To build an online community and to raise awareness among followers	Due: M8 -M48; Target: At least 200 subscribers on Twitter and 80 followers on LinkedIn by the end of the project.
Infographics and factsheets (ALL)	To appeal to a wide audience and present results in a visually attractive way	Due: M12-M48; Target: Over 200 views by the end of the project
Scientific publications (A)	To disseminate the project results within the research and scientific community	Due: M3-M48; Target: At least 25 journal and 25 conference contributions by the end of the project.
Workshops, Webinars (ALL)	A series of workshops and webinars will be held to address key outputs from across the 7 WPs of the OLAMUR project,	Due - M24 - 48 Target; x7 events across all WPs with a reach of 75 - 150 participants per event (depending on thematic area.)
Project Reporting (ALL)	To present project findings, outputs and recommendations	Due: M48; Target: At least 200 participants
Events (IND, STU, A, DM)	Key events: EMD, AE, Baltic Science etc.	Due: M24 – 48 Target: Participation during event programmes, network enlargement and information communication.

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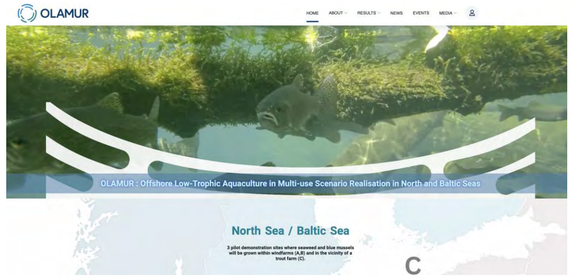
Project Infrastructure

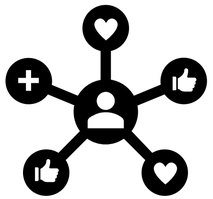
Infrastructure created to date:

- Website
- Social Media Channels
- Templates
- Letterhead & Poster formats
- Leaflets / Roll Ups / Flyers
- Video montage

Question(s)

- Are partners aware of what is available and how to access it?
- Are you using it?
- What is missing from the current suite of tools you might like to add?





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Engagement & Interaction – Social Media

Questions:

- Have you supplied your organizational social media and contact details?
- Have you updated them? Are they still valid further to kick off last year?
- We will re-run the social media mapping exercise! Please reply!

- Are you following us on social media?

(75 on Instagram)
(28 on Twitter)
(104 on Linkedin)

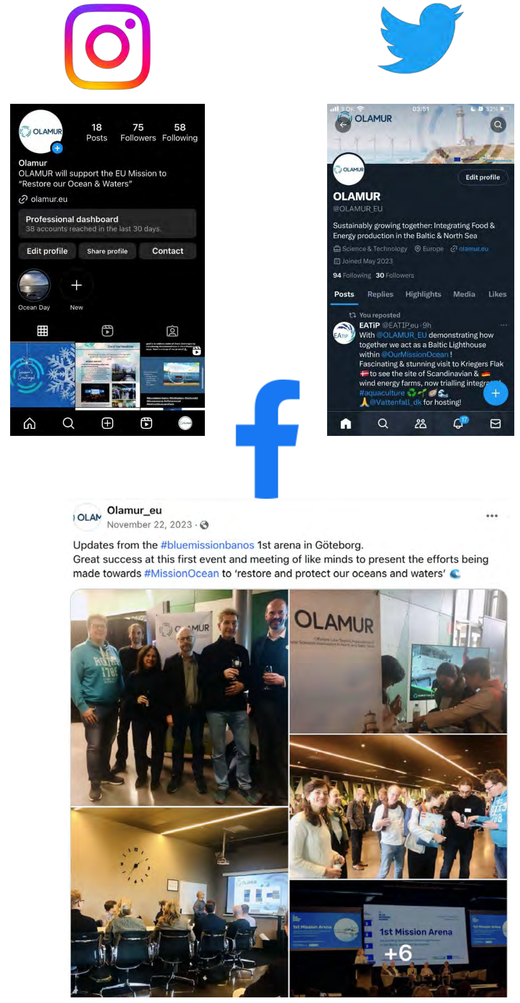
- Have you subscribed to the Newsletter?

(25 subscribers)

- Are you promoting the project on Social Media (Linkedin / X…)

If so (or not?) do you need a guide for tags, handles and aligned projects / partners?

(FYI: We are thinking about a plan b for “X / Twitter”… but… might be best just to remain on Linkedin. The jury is a bit out on that one at the moment…)



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Communication, Dissemination & Exploitation Log: Reporting, Impact & Continuous Reporting

- A CDE log is required as part of **Deliverable 8.3** due in **M24**.
- Furthermore, CDE activities are necessary as part of the **continuous reporting** required on Participants Portal (undertaken by the Coordinator but with information supplied by partners). This is mandatory.
- CDE activities are a key part of project impact measures and an indicator that will be considered by the project officer.
- The level of detail required might be considered time consuming and pedantic / onerous. However, it is important to capture all outputs – from publications to individual social media posts.
- Examples of CDE logs can be provided.

Questions:

- What are your thoughts / comments / questions?
- Are partners aware of what is required?
- Are partners remembering to set aside time for this?

You will have to complete and use any template!

Dissemination & Communication Activities

The information you will provide below will be added to the Continuous Reporting area of the EC Funding & Tender Opportunities Portal (SEDIA), and reported on in the Periodic Report to the EC, so please ensure to ir

Mandatory fields in red

ID #	Type of dissemination and communication activities	Project Partner participating in the	Contact person	Title of contribution	Title of event or publishing medium	Description of activity
	Select from drop-down list (see also TYPES above)	Select from drop-down list	Name and email address	E.g. presentation/poster title, name of article etc.	E.g. name of conference, magazine, blog, website, etc	Very short description of the activ
						identify good practice in terms of and sustainability.
AquaTT 8	Exhibition	8- Third Parties: AquaTT	Marieke Reuver (marieke@aquatt.ie)	Project Factsheet	Aquaculture Europe 2017	Distribution of project factsheet a Aquaculture Europe 2017
AquaTT 9	Participation to a Conference	8- Third Parties: AquaTT	Marieke Reuver (marieke@aquatt.ie)	**Presentation** of the EURASTIP Exchange Programme at the special EURASTIP session at the Aquaculture Europe 2017 event: **EURASTIP Exchange Programme: Opportunities for industry, researchers and educators**	Special EURASTIP session at the Aquaculture Europe 2017 event	Oral presentation about the EURA aquaculture event in Europe
AquaTT 10	Participation to a Conference	8- Third Parties: AquaTT	Marieke Reuver (marieke@aquatt.ie)	**Presentation and launch of the EURASTIP Exchange Programme at the special EURASTIP session** at the International Fisheries Symposium 2017	Special EURASTIP session at the International Fisheries Symposium 2017	Oral presentation about, and laun biggest aquaculture education eve

Examples of templates under consideration

Table 2: Dissemination & Communication Activities

During the 2nd period of the project (01/05/2022 - 31/10/2023)

Please check that all Dissemination & Communication Activities of your institution during the 1st Reporting Period of the project are listed in the table below.

Type of activities [1] A drop down list allows choosing the dissemination or communication activity	Partner participating in the dissemination activity	Contact person (name and email address)	Title of event or publishing medium (e.g. name of conference, magazine, blog, website)	Title of contribution (e.g. presentation/poster title, name of article etc.)	Date (dd/mm/yyyy)
2. Organisation of a Workshop	EATIP	Alexandra Neyts(Alexandra@eatip.(	EATIP Forum - On The Horizon (OTH)	Solutions to control and optimize aqua	12/05/2022
1. Organisation of a Conference	EATIP	Alexandra Neyts(Alexandra@eatip.(	Aquaculture Europe '22 Innovaton Fo	From Policy to Solutions	29/09/2022
5. Exhibition	EATIP	Catherine Pons (Catherine@eatip.eu	Aquaculture Europe '22	EATIP EC booth	27-30.09.2022

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Challenges & Questions

Challenge to partners!

- Some of you are supplying images and videos. For which – many thanks!
- However… We lack the narrative to explain what is happening and what is going on. Please, when providing content, also **provide a few lines of explanatory text**, as one would provide to a school visit or local news reporter / planning application, explaining the key messages you wish the visuals to convey in relation to your WP actions.

OLAMUR Website: Question to partners!

Members area created – at the request of the WP Leaders. This was an additional cost to the project not pre-planned. But at present**, no one is using it**.

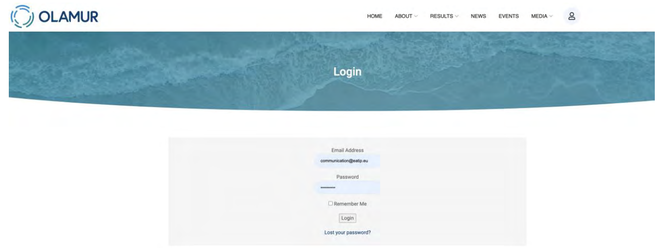
- What would you like to do?

- Direct request from a WP Leader for a Deliverables timeline / calendar / due dates to be included in the members area.
- Overview timeline created and more detailed ones required for each WP – most have been presented.
- Deliverables timeline to be included.
- Possible to include on a layered basis?
- Will you use this? How could this be helpful to you?

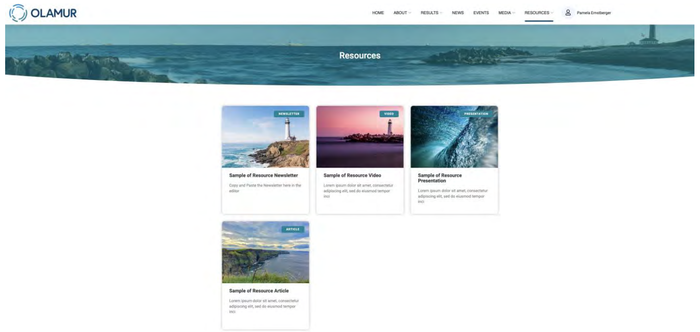
Events and Activities

We are engaging with the EU Mission Ocean “echo chamber” – Blue Banos, Prep4Blue, EU Mission Forum & Charter etc.

- However… Who else would you like us to engage with from an industry or research perspective. Think about your network and events schedule.



https://olamur.eu/login/



Members login platform

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Internal Communication Questions

This year, mid term reporting alongside Deliverable 8.3 is going to make the focus on CDE activities much more important. Your feedback and input will be required. We can work out internal timetables / deadlines / reminders for you. But:

Questions :

- How would you like to communicate with you?
  - e-mails from us?
  - e-mails from IMR?

We do not have a Basecamp system, we use Sharepoint which does not have a communication function. However, is there merit in creating this…?

You will be required to respond and interact, how best might we do this to suit your needs and preferred working methodology.
(Different options can be pursued with different partners!)

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And to play WP8 out…!

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Thanks for your attention

OLAMUR

david@eatip.eu
communication@eatip.eu

@olamur_eu
eu_olamar
www.olamur.eu

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Annexes:

CDE Measures and Detailed description of tasks 8.1 – 8.3

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Target Audiences:

- **Five associated regions**
- **Decision Makers**
- **LTA Industry**
- **Research Institutes / Academia**
- **University and High School Students**
- **General Public**

CDE Measures

- National and international stakeholder involvement integrating knowledge needs and knowledge produced into policies on co-use of maritime space. Workshops, webinars, dialogue meetings. Policy briefs.
- Target group dissemination to LTA actors on technology development - workshops, expo’s, conference stands
- Target group dissemination to WF operators/aquaculture operators on technology development,
- Target group and public dissemination of potentials for using LTA and artificial reefs as Nature-based Solutions in co-use areas
- Training of WF/LTA operators in monitoring of LTA at different levels, enabling synergy in human resources
- Involvement, dialogue and dissemination to associated regions
- Website with news, contact info, calendar of events
- Breakout session(s) at conferences
- Scientific publications
- Social media updates for the project, and via consortium partner's social media channels

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Task 8.1:
Establish Communication Infrastructure
Lead: EATIP – Contributors, All Partners, M1 – 48

- A range of communication tools (including: project website (M6), project social media channel (M8) and relevant information updates throughout the lifetime of the project including newsletters, infographics, video clips / podcasts (M12-48)
- Dissemination and Exploitation Plan (DEP) (intended for the use of OLAMUR partners)
- Communication Mapping (both of partners, associated networks and including wider civil society & stakeholders working on CO2 reducing measures along the feed/food value chain)
- The DEP will be reviewed at project meetings to ensure it remains a dynamic document accommodating those engaging with the Baltic Lighthouse development process.
- A CD&E log (to be updated by all partners) will record and monitor CD&E activities including estimated reach and impact of WP activities
- The DEP is required consider aspects of gender balance and wider equality issues to ensure the communication and dissemination of project outputs in an equitable and accessible way.

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Task 8.2:
Establishment & Assignation of Associated Regions
Lead: IMR - Contributors: All Partners, M6- M48:

- To ensure that CD&E remains a dynamic and engaged process rather than a top down supply of retrospective information, 5 associated regions will be invited to engage in project activities, to allow for transfer of information and experience to other geographical regions, networks and stakeholders

- Associated regions will be based both within Europe (i.e. Mission Basins including Black Sea / Mediterranean / Atlantic) but also on a wider global basis.

- Aim to ensure a broad information exchange both within and external to the project consortium, maximising opportunities for identifying best practice, innovations and shared knowledge.

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Task 8.3:
Stakeholder Engagement & Stakeholder Workshops
Lead: EATIP – Contributors, All Partners M1 – 48)

"…OLAMUR partners will engage in specific stakeholder engagement activities to ensure outreach to an appropriate and relevant multi-stakeholder network of interested parties, in addition to ensuring wider citizen engagement…"

- 8.3.1 (Lead – EATIP, Contributors: All Partners) European Events: European Maritime Day, Industry Events Aquaculture Europe, Wind Europe Technology Workshops / Baltic Sea Science Congress.
- Regional events and activities: considered by the EATiP Mirror Platform network, specifically NO, DE, DK, BE, UK and cross referenced to mirror platform networks of other linked European technology platforms.
- OLAMUR project partners, through development of the DEP, will lead on agreed CD&E activities within their own organisation reach and network, including the identification of a calendar of events to be incorporated into the DEP

- 8.3.2 (Contributors: AWI, WMW, NFS, WYK 8, AU, VATTENFALL, KERTEMINDE, KCD, UTARTU, Redstorm OÜ, ÖAF, HEREON, DTU) Outputs of WP1 will be addressed by a series of site visits/technical tours, made open and accessible to the network of the consortium partners and associated regions.

- 8.3.3 (Contributors: AU, UTARTU, DTU, GCF, IMR, AWI, ETT SPA) D2.3 (M24), an event including application of the report on micro siting and pilot mapping / co location scenarios D2.2 (M36) and the application of the protocol developed within D2.1 (M36) relating to multi use planning for stakeholders. Invited participants identified through WP2 will present and consider findings to an open workshop to provide recommendations for future use

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Task 8.3: - continued.
Stakeholder Engagement & Stakeholder Workshops
Lead: EATIP – Contributors, All Partners M1 – 48)

- *8.3.4* (Contributors: IMR, AU, HEREON, AWI, UTARTU, ETT SPA, VATTENFALL) D 3.1 – 3.5 An industry led, multi-stakeholder event (M 38) will address aspects of the aquatic environment and aquatic food production in relation to IMTA,

- *8.3.5* (Contributors: DMI, HEREON, MR, SKARV, AWI, UTARTU, AU, ETT SPA, VOTO, IMR, UCPH) D4.1 – 4.4 will be shared through appropriate online / in person webinar / seminar event(s) with identified industry stakeholders in addition to being made openly available to a wider audience.

- *8.3.6 (*Contributors: ETT SPA, IMR, DMI, HEREON, MR, SKARV, DTU, UCPH, UTARTU, KU_LT, SO, AU) WP5 During the second half of the project (M36) data services developed by the OLAMUR consortium within WP5 will be considered at a specifically focused workshop.

- *8.3.7 (KU, LS) WP 6 – D 6.1 – 6.3* stakeholder engagement will be undertaken to consider circular blue economy aspects of climate neutral, low carbon aquatic foods, including aspects of LCA and market potential.

- *8.3.8 (SINTEF, GCF) WP7 – D7.1 – 7.4 – by invitation event, liaison with MSP Platform, AAC and others.*

CD&E activity will be reviewed (M24) and optimised during the second phase of the project (M25 - 48).

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EATIP OLAMUR

Thank you!

WP9
Management and coordination
Status annual partner meeting 8-11 january 2024

Anita Jacobsen, Øivind Bergh, Turid Loddengaard,
Rocio C. Primo

OLAMUR : Offshore Low-Trophic Aquaculture in
Multi-use Scenario Realisation in North and Baltic Seas

Task 9.1 Operational and financial project management and reporting

- Daily running of the project
- Interaction with EC
- Amendments and other legal issues
- Reporting (will come back to this later)

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Task 9.2 Scientific management and monitoring project progress

- Overall monitoring of WP progress
- Monthly Executive committee (ExC) meetings to assess progress
- The ExC consist of the WP leads and co-leads and will act on any deviation to work plan and initiate mitigation strategies when necessary.
- Any changes in the work plan (DoA, Annex 1 in GA) must be reported to PMT - must be approved before you go ahead

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Task 9.3 Project meetings

- Kick-off meeting - completed
- 4 annual project meetings (with Governing Council, Advisory Boards) **M13,** M25, M37, M46
- Executive committee (ExC) meetings: monthly Teams meetings

- Minutes from the meetings can be found on SharePoint: WP9/meetings

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Task 9.4 Data management plan (DMP)

- The DMP was drafted at the start of the project (M6) and will be updated at the end of the project (M48).
- DMP was submitted on time (M6) and has been accepted – D9.2
- Work lead by Rocio Castano Primo (IMR)
- Partners to designate a Data Protection Officer, and fill the DMP commitment (email to follow)
- Published (!) datasets are subject to Periodic Reporting

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Deliverables

	Title	Type	Dissemination level	Due date	Status
D9.1	Minutes from the projects kickoff meeting with updated and complete project working plan	R	Sen	3	Accepted
D9.2	Data Management Plan 1	DMP	PU	6	Accepted
D9.3	Minutes of GC meeting year 1	R	SEN	14	In prep

Milestones

#	Title	Means of verification	Due (M)
27	Project workspace established	Workspace is up and running	3

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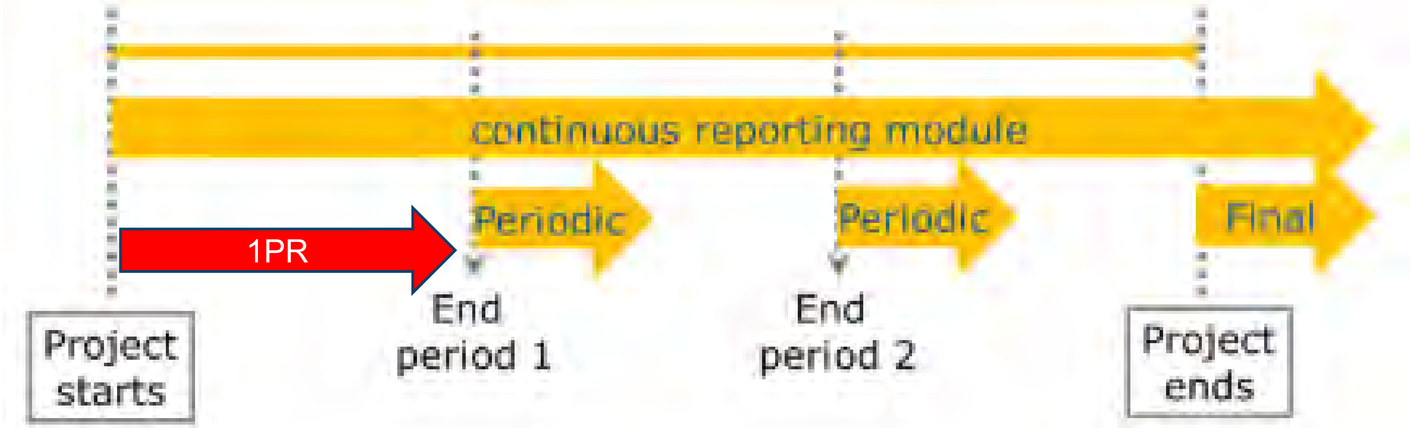
Reporting

- *Continuous reporting module*
- *Periodic reporting module*



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Reporting in the Continuous Reporting Module

During the project, you are expected to provide regular updates on the status of the project:

- progress in achieving **milestones (coordinator, all)**
- **Deliverables (coordinator)**
- updates to the **publishable summary (coordinator)**
- response to **critical risks, publications, communications activities, IPRs (coordinator, all)**
- Update any changes in research personnel **(each partner)**

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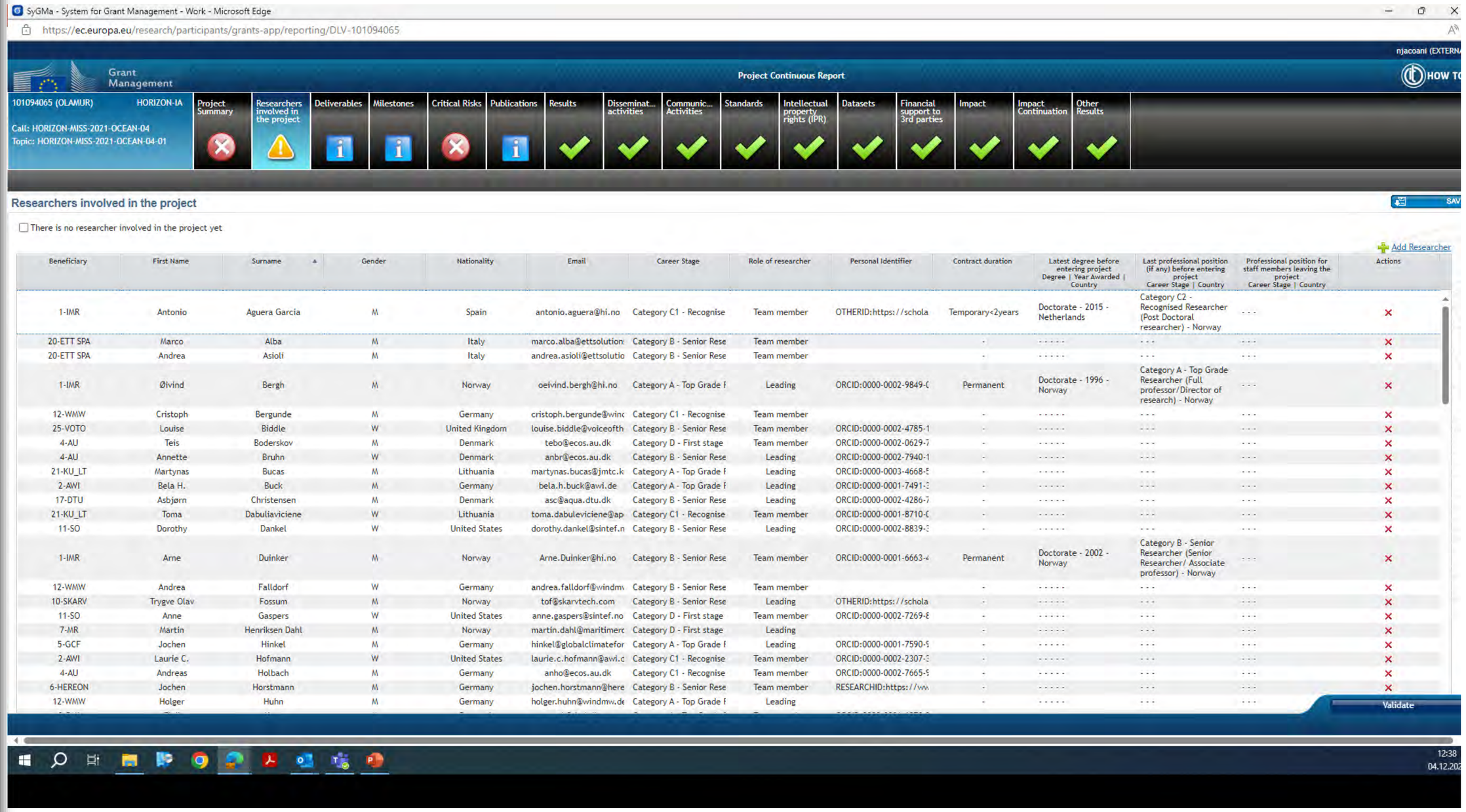

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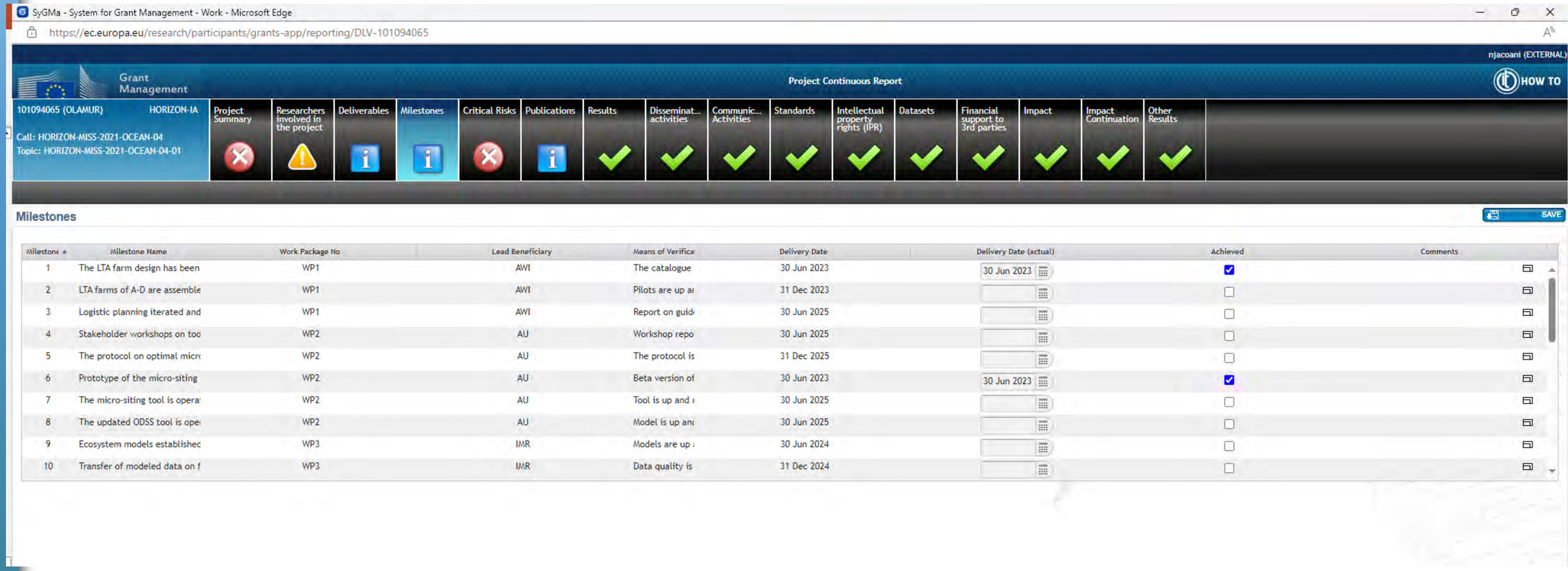

Milestone	Milestone Name	Work Package No	Lead Beneficiary	Means of Verifica	Delivery Date	Delivery Date (actual)	Achieved	Comments
1	The LTA farm design has been	WP1	AWI	The catalogue	30 Jun 2023	30 Jun 2023	☑	
2	LTA farms of A-D are assemble	WP1	AWI	Pilots are up ar	31 Dec 2023		☐	
3	Logistic planning iterated and	WP1	AWI	Report on guid	30 Jun 2025		☐	
4	Stakeholder workshops on too	WP2	AU	Workshop repo	30 Jun 2025		☐	
5	The protocol on optimal micr	WP2	AU	The protocol is	31 Dec 2025		☐	
6	Prototype of the micro-siting	WP2	AU	Beta version of	30 Jun 2023	30 Jun 2023	☑	
7	The micro-siting tool is opera	WP2	AU	Tool is up and r	30 Jun 2025		☐	
8	The updated ODSS tool is ope	WP2	AU	Model is up an	30 Jun 2025		☐	
9	Ecosystem models establishec	WP3	IMR	Models are up	30 Jun 2024		☐	
10	Transfer of modeled data on f	WP3	IMR	Data quality is	31 Dec 2024		☐	

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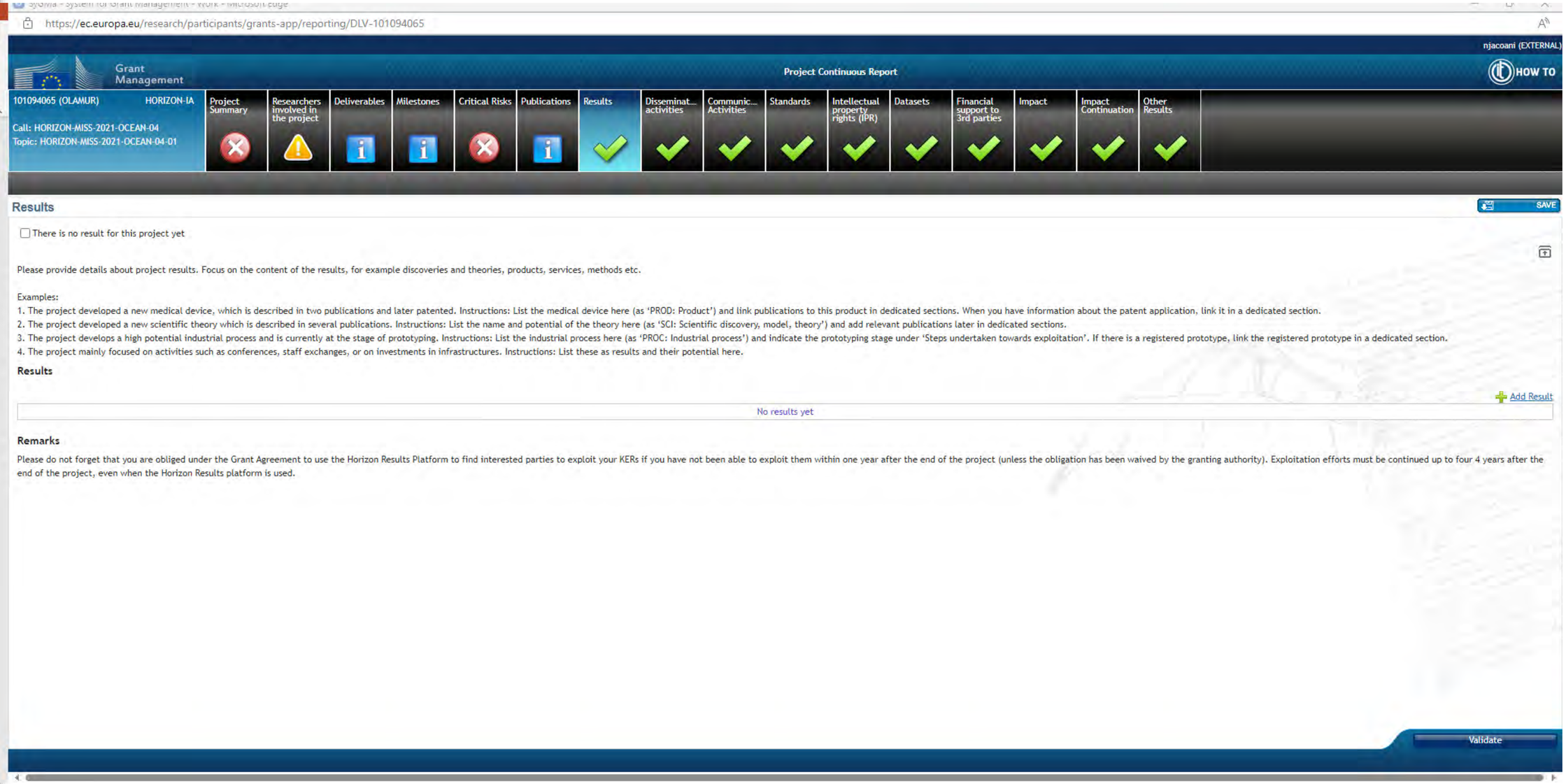

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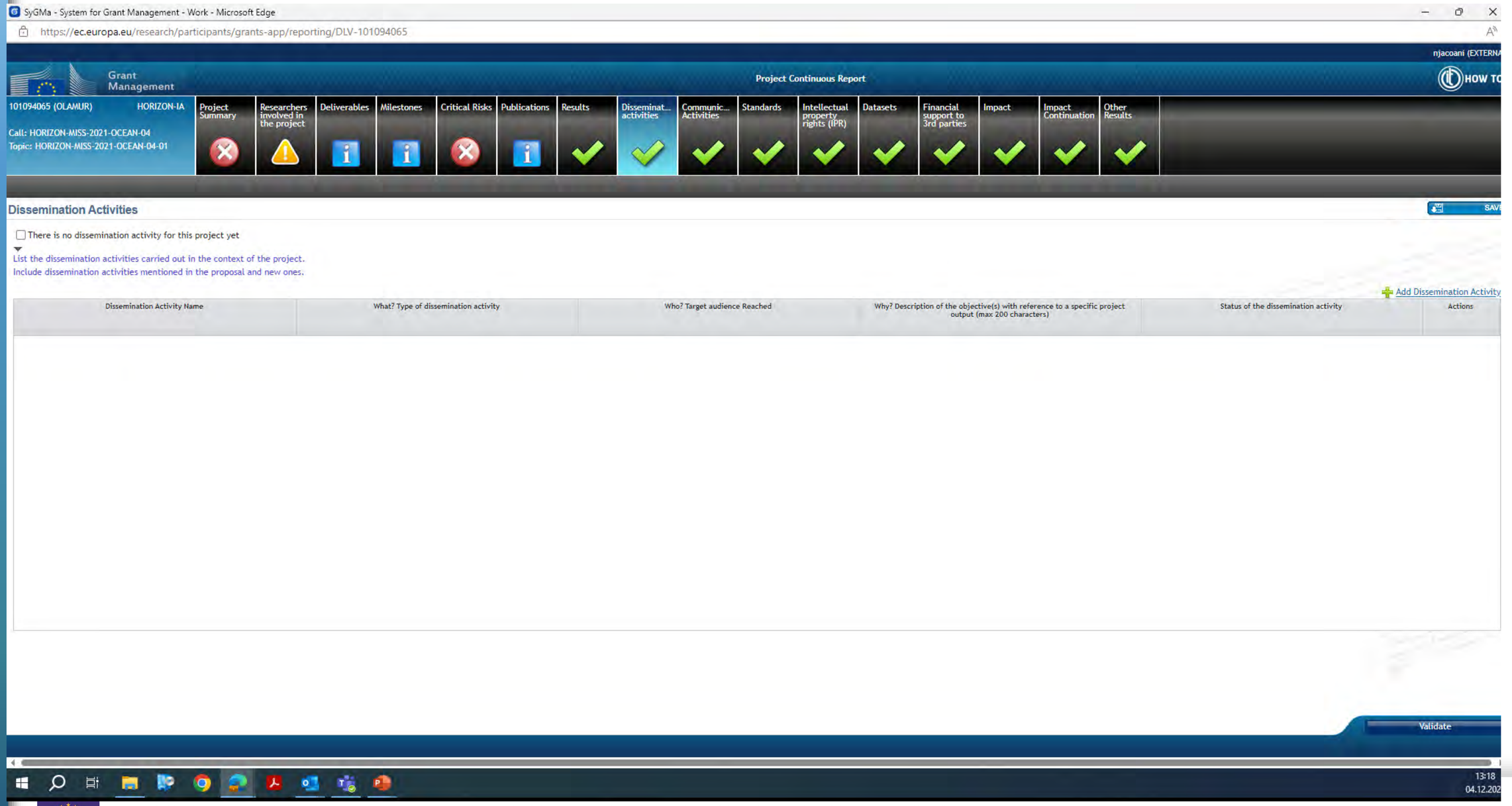

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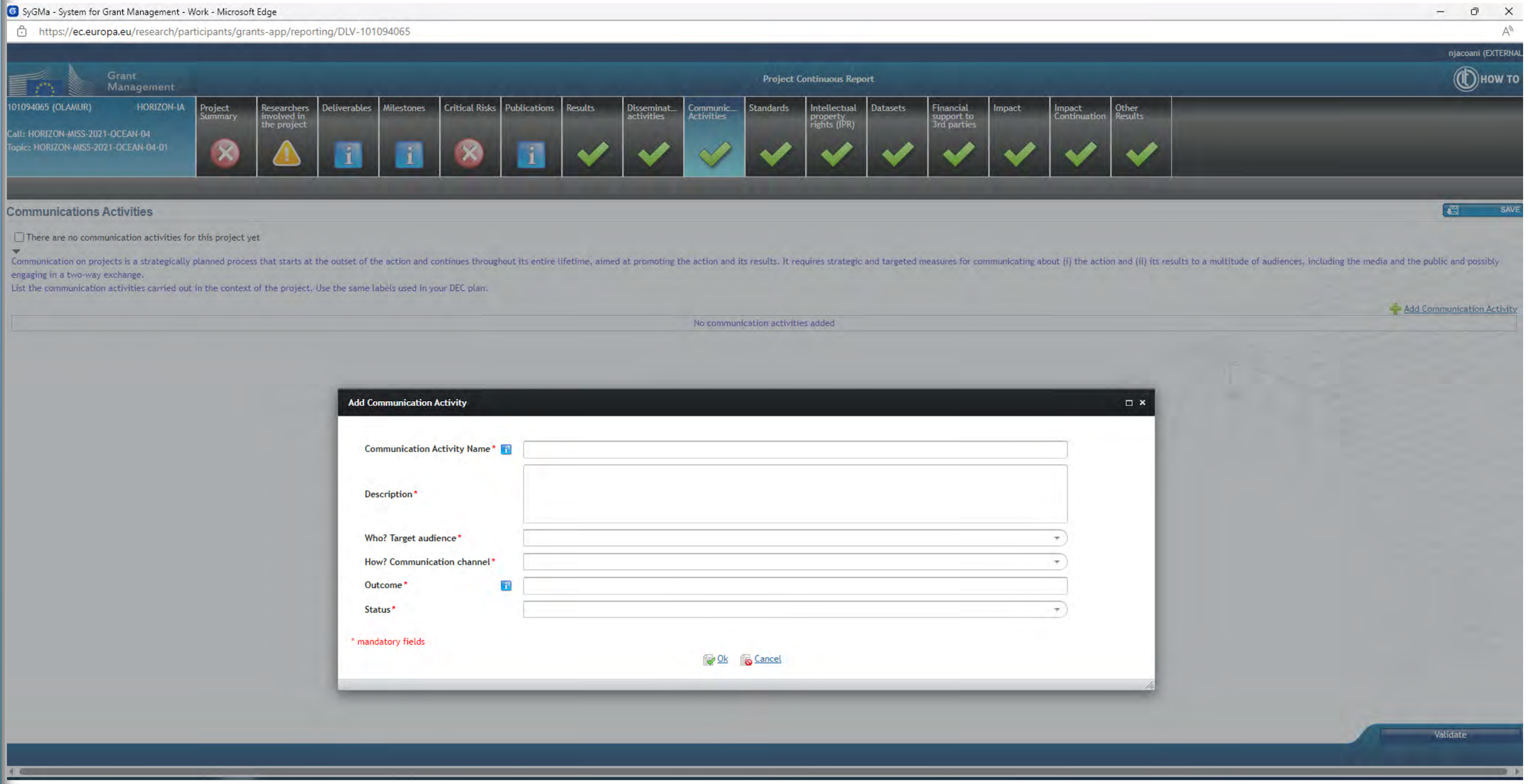

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1st Periodic Report – 1PR

1st reporting period: from 1 Jan 2023 - 30 June 2024 (18 months)

Reporting deadline partners: 02 August 2024

Reporting deadline for coordinator: 31 Aug 2024 (60 days following the end of the reporting period)

We will come back with more detailed information in June when 1PR is approaching

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Periodic report: Technical Report (Part A and B) and Financial Report

The **Technical Report** is divided in two parts, Part A and B:

- Part A: online - contains the structured tables with project information (continuous reporting).
- Part B (the narrative part): requires the participants to report on work carried out and differences *(any deviation to DoA etc.)* Uploaded as PDF document.

The **Financial Report** consists of individual Financial Statements from each partner

- Explanation of the use of resources, subcontracting and in-kind contributions
- The technical report Part A and the financial report is generated automatically based on the data input online; Part B needs to be prepared outside the tools and then uploaded as PDF (together with Annexes, if any).

All participants must contribute, but it is the Coordinator who will have to submit them as a single report.

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Information needed in the portal regarding Financial Report

- Personnel costs + person months (PMs) per WP
- Direct cost of subcontracting (if applicable)
- Other direct cost the costs have to be split into cost categories as travel, equipment (only depreciation costs), other goods & services. The costs must include a short decription and the related WP.
- Please note – If “Other direct costs” are equal to or less than 15% of the personnel you do not need to provide an explanation *(though you must still keep all the proof you have of any costs you declare as eligible, in case you are audited).*

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OLAMUR open call for Associated Regions

- We will launch a call for Associated Regions to participate in the project

- 5 Associated Regions will be selected

  - maximum financial support of EUR 100 000 each.

- Call will open 1st of February – deadline 31st March

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- We will provide the selected Associated Regions with **technical assistance** to develop **roadmaps and plans** for low-impact marine aquaculture and multi-purpose use of marine space addressing possible barriers and showing the feasibility of implementing innovative solutions in the region.

- The Associated Regions will be able to follow the OLAMUR project and its demonstration activities and the OLAMUR partners will proactively reach out to the associated regions to enable them to follow closely the project and its demonstration activities.

- The outcomes and knowledge will be shared with the associated regions and technical assistance to build capacity and to implement solutions for low-impact marine aquaculture and multi-purpose use of marine space in their territory to ensure that Mission objectives can be achieved.

- Deliverable D8.6 – (guidelines for applicants and proposal template)

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OLAMUR

Thanks for your attention

Contact: olamur@hi.no

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OLAMUR Annual Meeting

Overview of ULTFARMS

ULTFARMS

This project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No 101093888. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held repsonsible for them.

Project Mission

- ULTFARMS will demonstrate a **profitable, sustainable, and eco-friendly low-trophic aquaculture** (mollusks & seaweed) production from offshore activities shared within **wind farms** in the **North Sea and Baltic Sea**.

- Move beyond the current LTA systems with novel **engineering, technical, ecological and biological processes** for harsh **offshore conditions** and **low-salinities** with Offshore Wind Farms.

- Offer **services** to aquaculture producers for **monitoring and minimizing diseases** and **alien species**, managing inputs, optimizing **sustainable production** and **demand management** including **risk analysis.**

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Project Objectives

ULTFARMS

- Enhance **solutions to LTA farming** in combined space with **OWF for an optimal use of marine space** and synchronized offshore activities in compliance with spatial planning targets and to **demonstrate offshore LTA systems in OWF**

- To implement **efficient and cost-effective monitoring strategies** for aquaculture industry within **unified LTA systems**

- To ensure the share of **renewable energy consumption along the full value chain** of aquaculture

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Project Objectives

ULTFARMS

- To **exploit project results**, paving the way for further commercialization and ensuring **swift market penetration** of the **LTA cultivation in windfarms and use of products**
- To sustain **biodiversity** and to provide **suitable habitats** for fish and other biota through the inclusion of **nature restoration efforts**
- To ensure **replicability, transferability, training and capacity** building in other basins supported by a roadmap of **guidance for solution roll-out**

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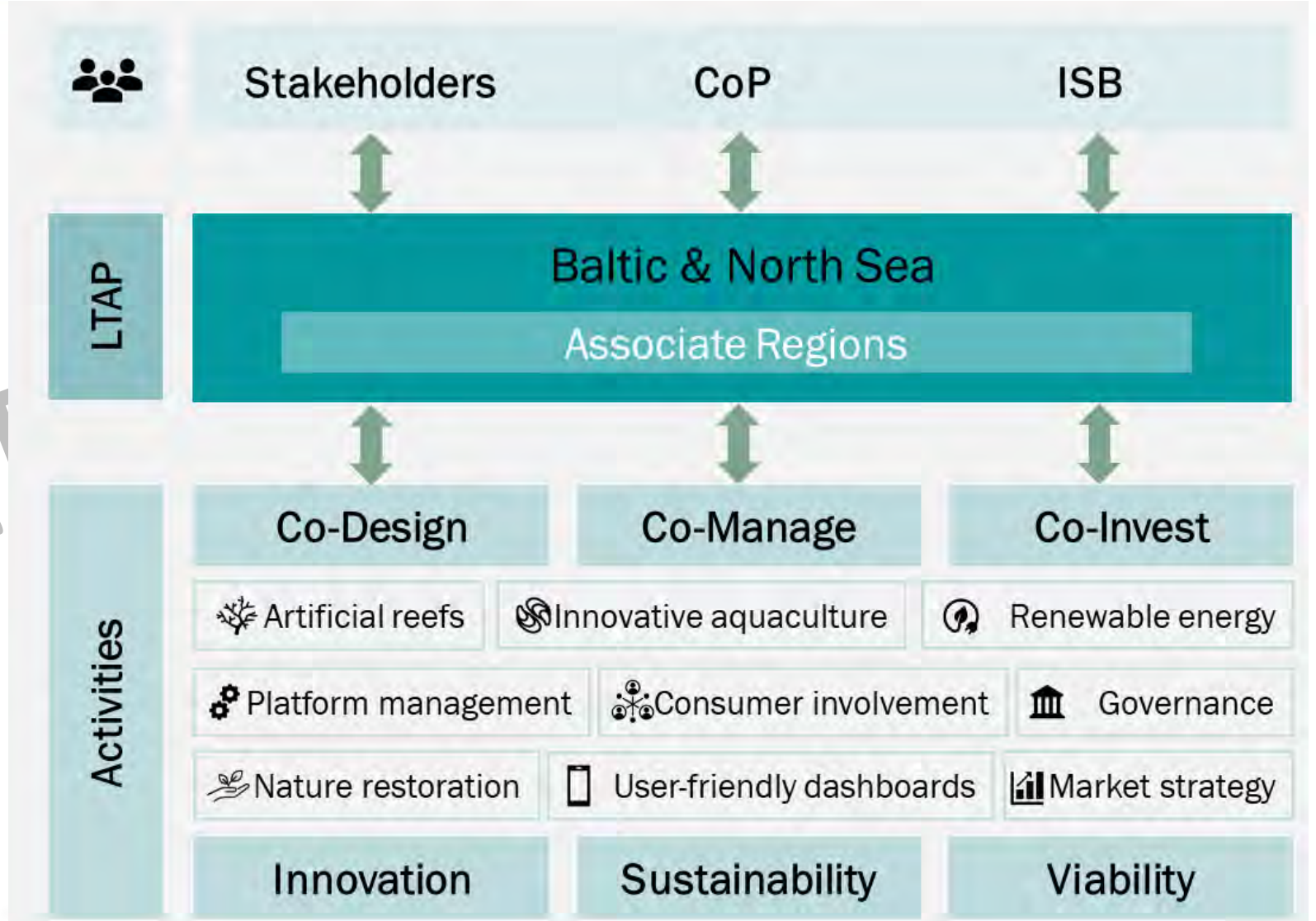
Project General Overview



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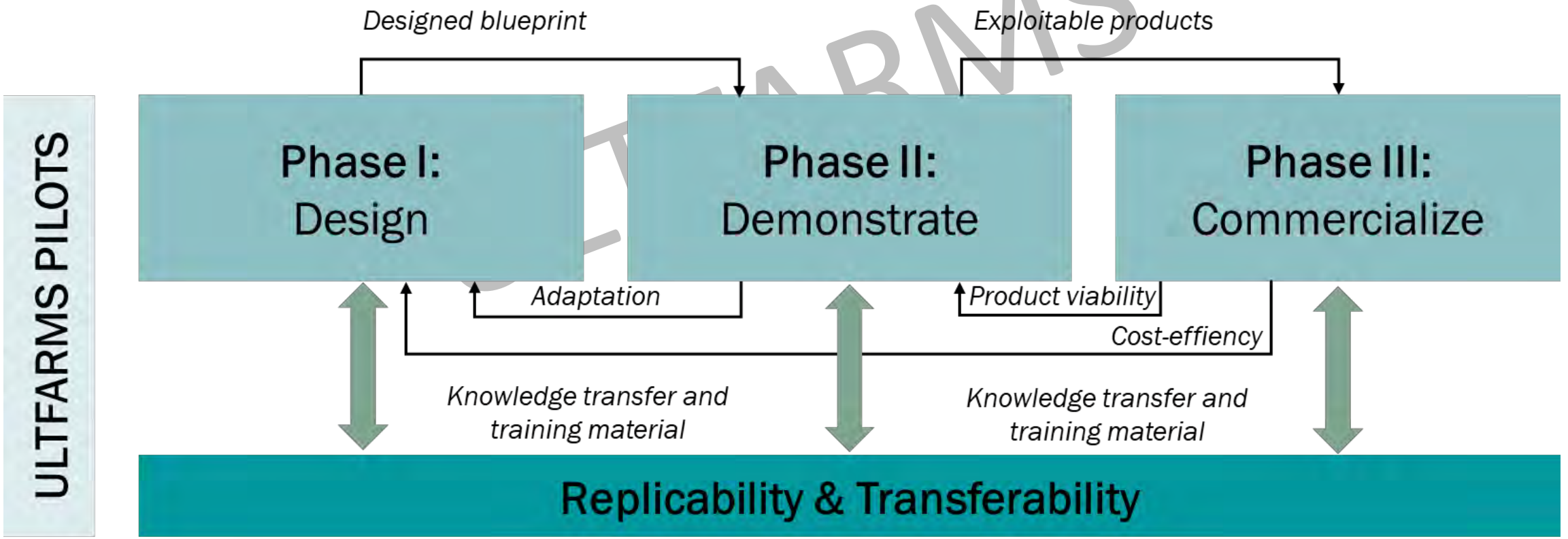
Concept Connections



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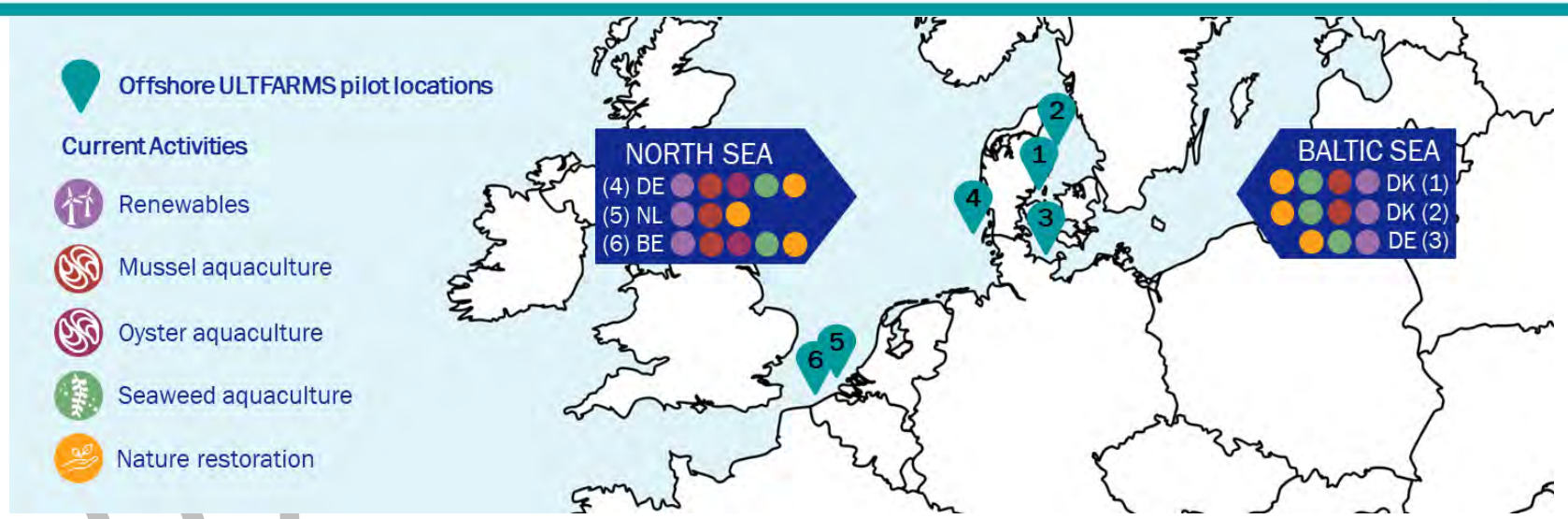
Pilots



Seaweed (S); mussels (M); oyster (O), present TRL (P) and foreseen TRL at the end of the project (E), and partners involved

Country	Basin	Pilot	LTA species	TRL		Partners
				P	E	
Denmark	Baltic	Samsø	***S-M***	5	8	**DTU**, BBM, ØST, NSF
	Baltic	Anholt	***S-M***	5	7	**DTU**, BBM, ØST, NSF
Germany	Baltic	FINO2	***S***	6	8	**FuE**, SUB, KMF, DNV, UG, NSF, DTU, BBE
	North	FINO3	***S-M-O***	6	8	**FuE**, KMF, HOR, BBE
The Netherlands	North	Borssele	***M***	6	9	**WR**, OOS, UGent, SAS
Belgium	North	Belwind	***S-M-O***	6	8	**UGent**

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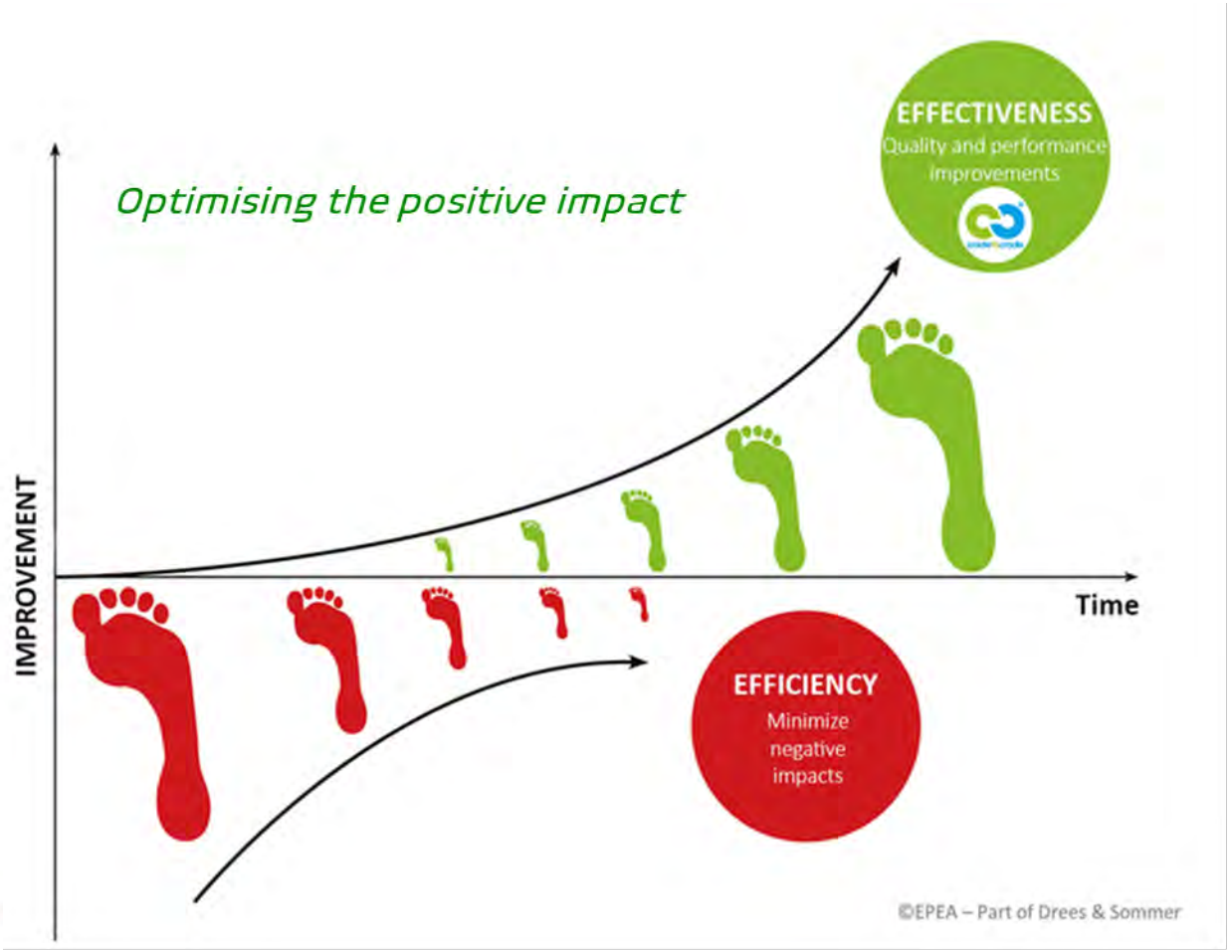
Self-reinforcing feedback loops accelerate the processes



Fundamental change towards **Regeneration:** Creating more and more life

Efficiency: Produce more with less - of a selected source

Leads to more resource use and more waste, when looking at the complete picture

WAGENINGEN UNIVERSITY & RESEARCH

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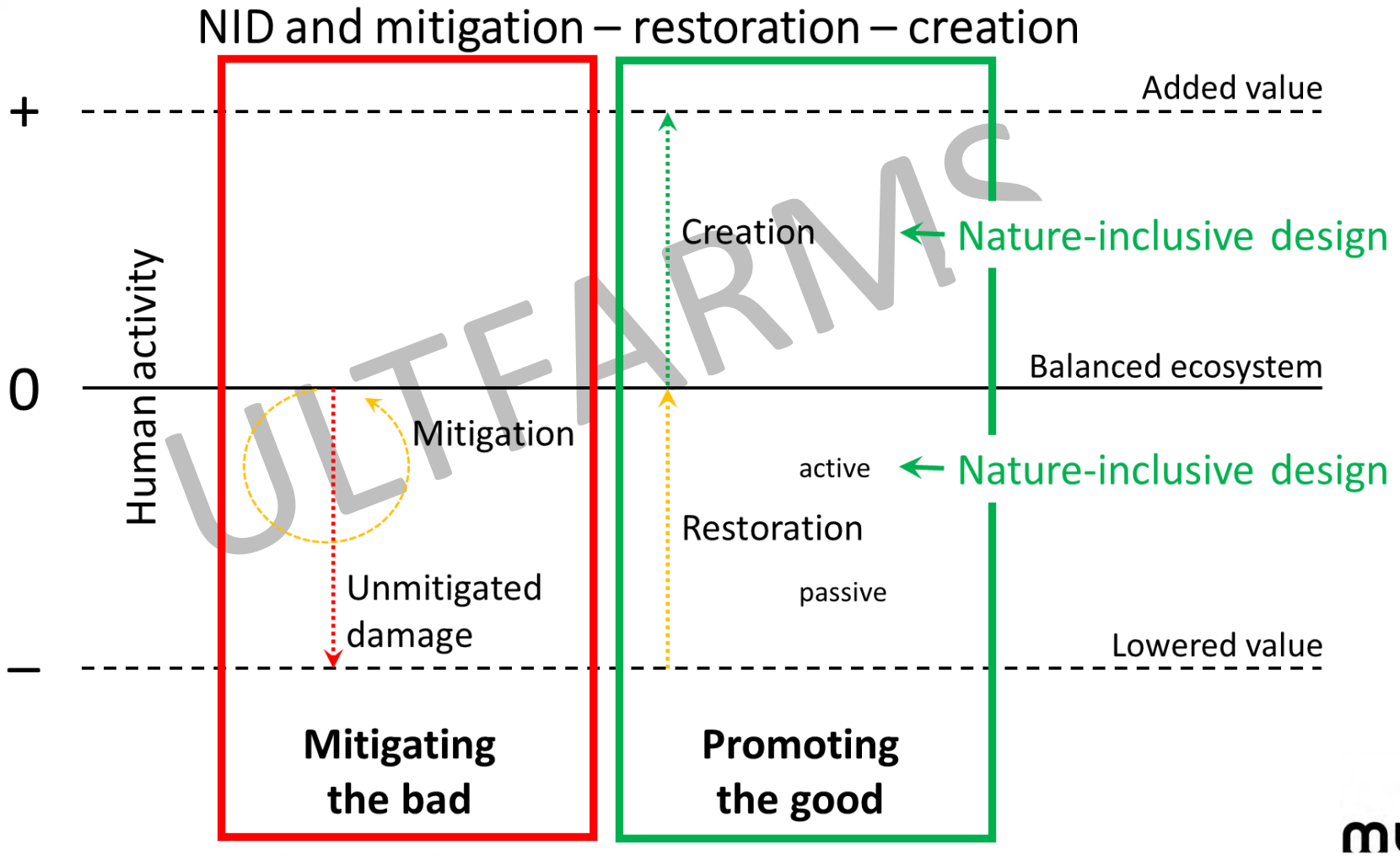

ULTFARMS

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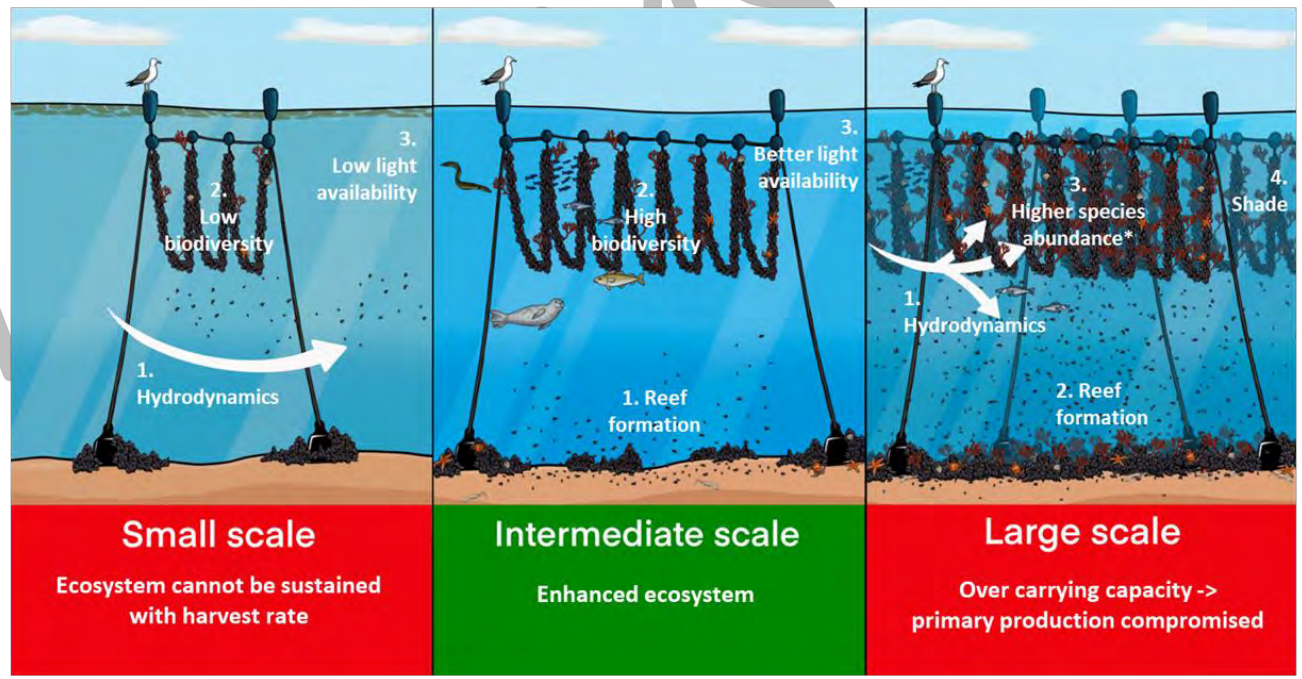
Explore the consequences of upscaling

- Spawning Grounds
- Nursery grounds
- Reef enhancement

- Habitat enrichment
- Biodiversity hotspot

(new structures, new species)



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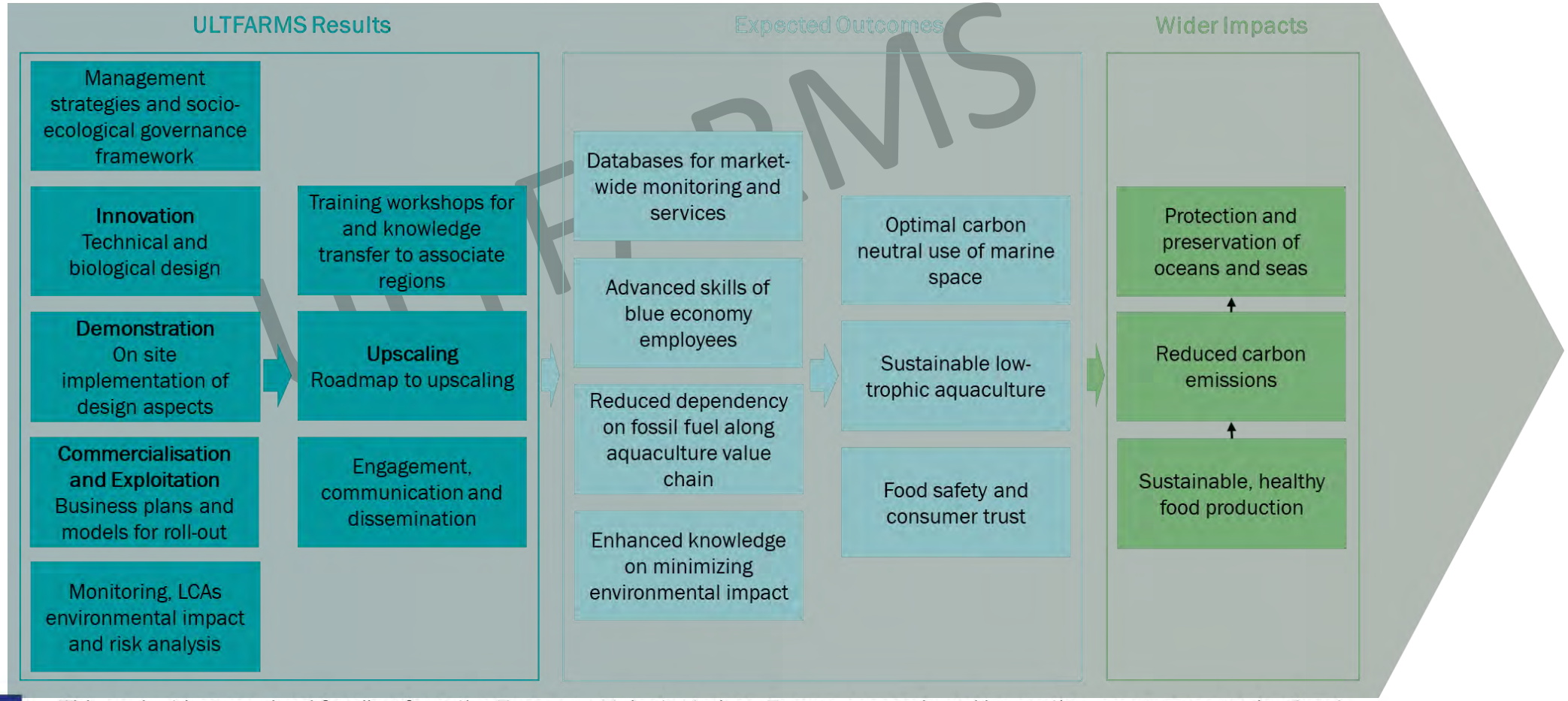
Results and Outcomes



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ULTFARMS

ULTFARMS@deltares.nl

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ICES

Jörn Schmidt, Chair Science Committee

@j_o_schmidt
@ICES_ASC

ICES
CIEM

Science for sustainable seas

VISION

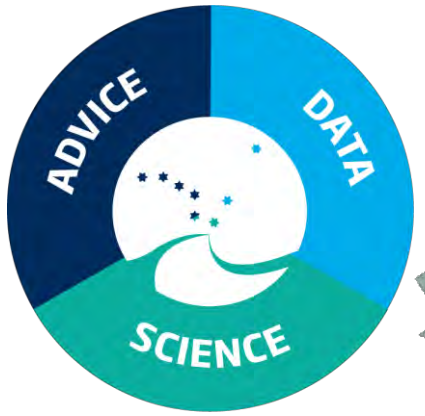
To be a world-leading marine science organization, meeting societal needs for impartial evidence on the state and sustainable use of our seas and oceans.

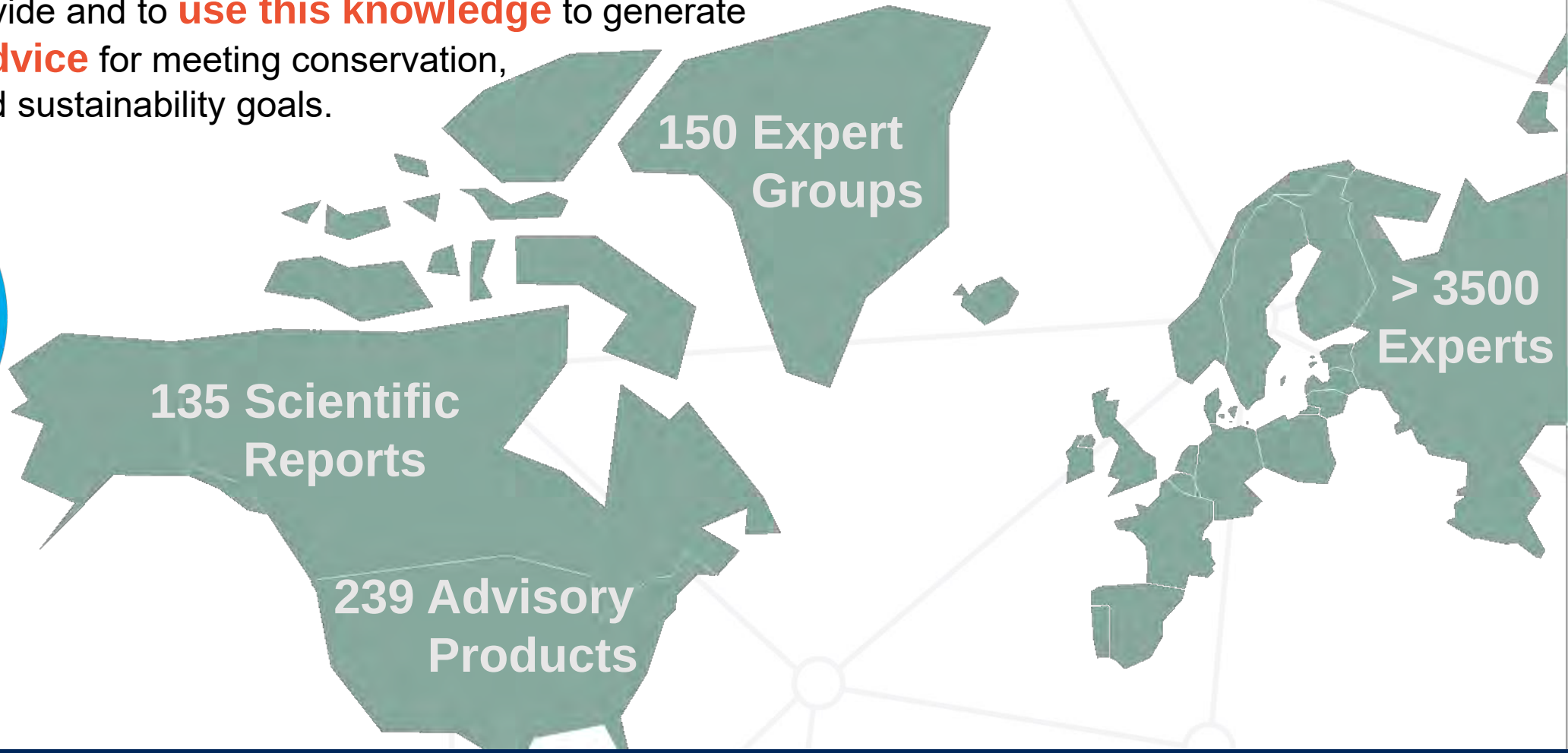
MISSION

To advance and share scientific understanding of marine ecosystems and the services they provide and to use this knowledge to generate state-of-the-art advice for meeting conservation, management, and sustainability goals.

International Council for the Exploration of the Sea

To **advance** and **share scientific understanding** of marine ecosystems and the services they provide and to **use this knowledge** to generate state-of-the-art **advice** for meeting conservation, management, and sustainability goals.





Translation and application of knowledge

Science: knowledge creation

Advice: knowledge translation

@ Mark Dickey-Collas

Our Science network in 2023

# of Expert Groups	# of Countries	# of Institutes
153	78	827

209 Meetings in 2022

Year	No. of participants	Distinct
2022	7823	3414
2021	7322	3221
2020	6039	2825
2019	4707	2348
2018	4350	2300

Aquaculture in ICES

Aquaculture is making an increasing contribution to global fish and shellfish production and a growing and visible industry in many ICES countries.

The Aquaculture Steering Group (ASG) is responsible for guiding and supporting expert groups that are working on science and advisory topics contributing to the sustainable development of aquaculture.

Aquaculture in ICES

- evaluating the social and economic consequences of aquaculture operations
- types, transmission and prevalence of diseases affecting cultured species and actions that can be taken to address them
- environmental impacts of aquaculture, approaches to monitor and mitigate them and methods of aquaculture risk assessment
- carrying capacity and relative efficiencies of alternate aquaculture systems
- genetics of cultured species
- projecting the future development of aquaculture and its implications for the food system and food security

Aquaculture in ICES

Working Group on Ecological Carrying Capacity in Aquaculture (WGECCA)

Working Group on Open Ocean Aquaculture (WGOOA)

Working Group on Pathology and Diseases of Marine Organisms (WGPDMO)

Working Group on Risk assessment of Environmental Interactions of Aquaculture (WGREIA)

Working Group on Social and Economic Dimensions of Aquaculture (WGSEDA)

Working Group on Ecological Carrying Capacity in Aquaculture (WGECCA)

Seafood production

The group will review existing methods for **estimating ecological carrying capacity** to produce guidelines for considering aquaculture scenarios under different geographic scales and conditions. Their work endeavours to increase understanding of **how nutrients flow through wild and aquaculture production scenarios** in different habitats and how the ecological relationships and trade-offs therein could be affected. In so doing, **identifying critical data gaps** and developing recommendations for addressing them in light of maximizing ecosystem service opportunities through sustainable aquaculture.

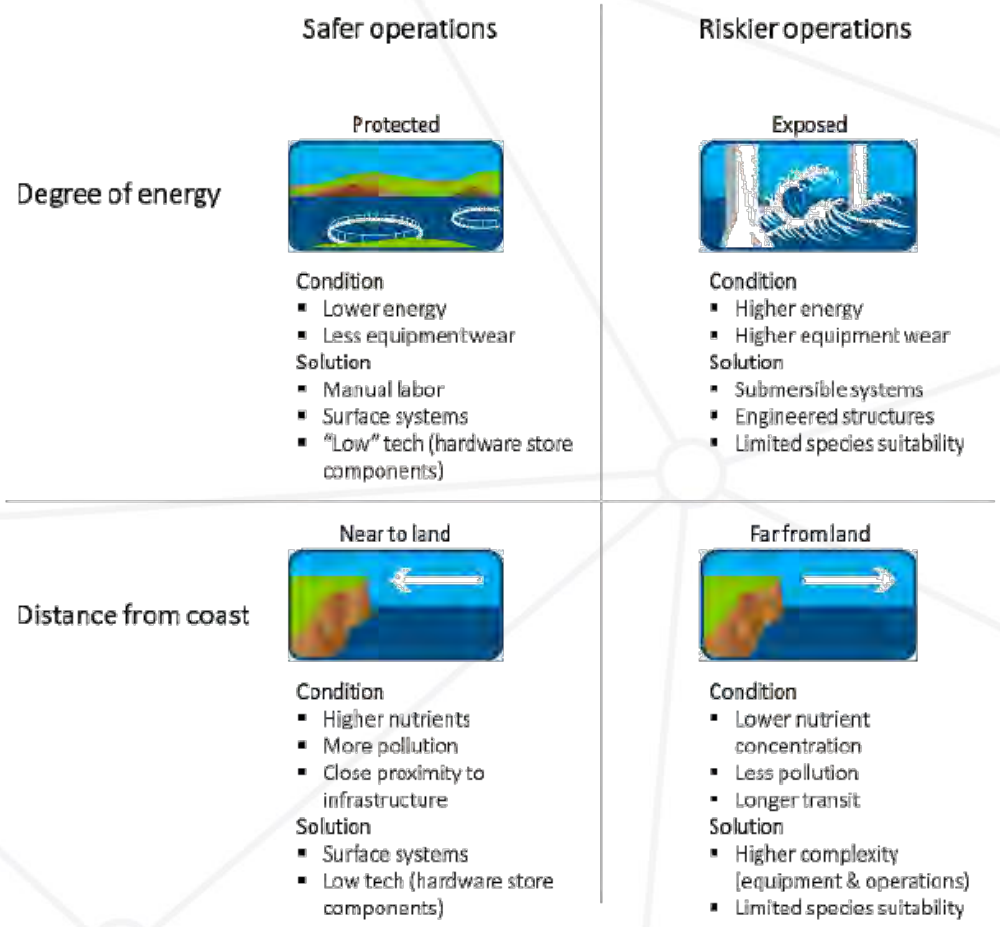
- Product 1: National Strategy and Policy Review
- Product 2: Review of ecological carrying capacity mod-elling applications in mariculture
- Product 3: Integrated Multi-Trophic Aquaculture (IMTA) data gaps

Working Group on Open Ocean Aquaculture (WGOOA)

Seafood production

The central focus of this working group is placed on questions related to open ocean aquaculture, such as:

- the role of potential environmental influences (marine flora and fauna, ecosystems and habitats)
- the technical challenges and specific system design requirements
- the concepts of marine multi-use and site selection
- the economic aspects



Proposed differentiation in the current version. The final version is presented in Paper 1.

Seafood production

Working Group on Risk assessment of Environmental Interactions of Aquaculture (WGREIA)

ICES CIEM

The Working Group on Risk assessment of Environmental Interactions of Aquaculture group (WGREIA) will seek to **prioritize areas where aquaculture management can lead to better environmental performance** of the industry.

The working group will develop **risk/benefit assessment methods and models** to support informed sustainable industry management. Since aquaculture has many interactions with the environment, **improved understanding, management and mitigation of risk**, and optimization of ecosystem benefits is essential both for the industry and society.

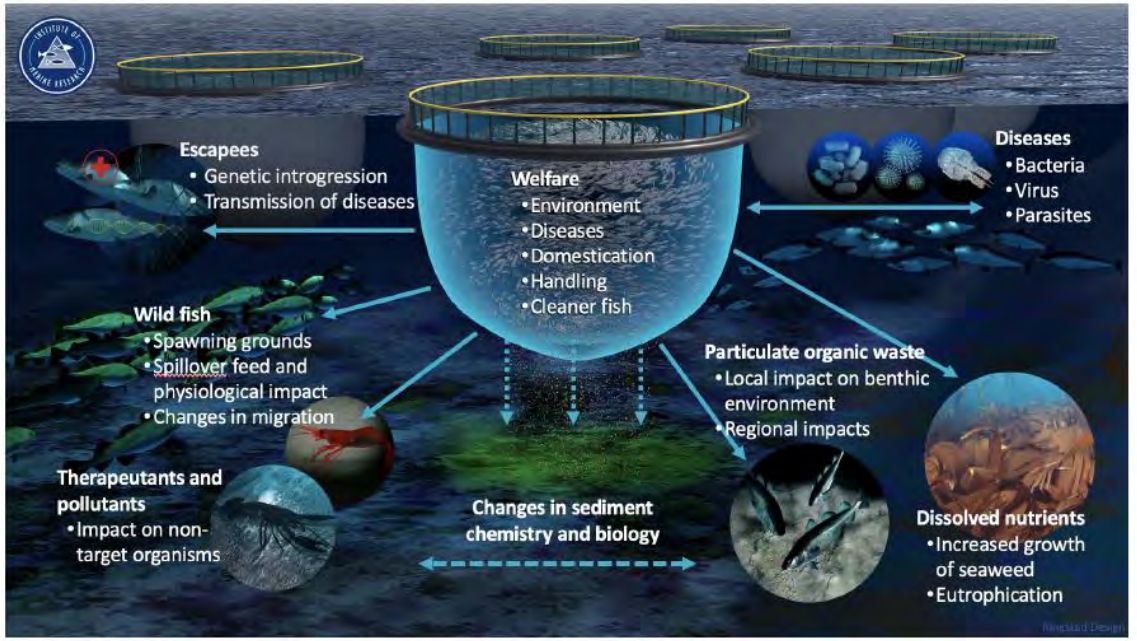


Figure 3.1 Illustration of environmental impacts of salmon farming in Norway (Grefsrud, IMR, 2019).

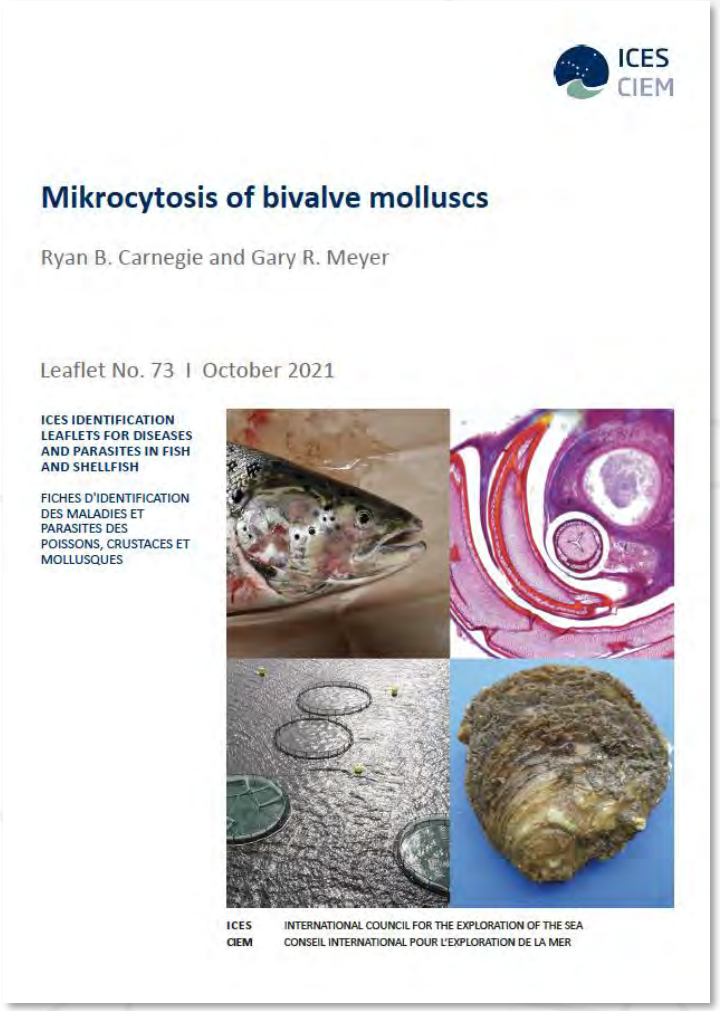
Seafood production

Working Group on Pathology and Diseases of Marine Organisms (WGPDMO)

ICES CIEM

The Working Group on Pathology and Diseases of Marine Organisms (WGPDMO) covers a wide range of topics related to diseases and pathology in wild and farmed finfish, shellfish and crustaceans within the ICES areas.

CRR 265: Trends in important diseases affecting the culture of fish and molluscs in the ICES area 1998–2002



https://www.ices.dk/community/groups/Pages/WGPDMO.aspx

Science for sustainable seas

Seafood production

Working Group on Social and Economic Dimensions of Aquaculture (WGSEDA)

ICES CIEM

The Working Group on Social and Economic Dimensions of Aquaculture (WGSEDA) addresses the question of how to balance the negative and positive socio-economic consequences of aquaculture development.

WGSEDA places special focus on identifying the social and economic trade-offs of aquaculture.

REVIEWS IN Aquaculture

Reviews in Aquaculture (2021) 13, 601–618 doi: 10.1111/raq.12488

Availability and usefulness of economic data on the effects of aquaculture: a North Atlantic comparative assessment

Eirik Mikkelsen[1], Lucia Fanning[2], Cornelia Kreiss[3], Suzannah-Lynn Billing[4], John Dennis[5], Ramon Filgueira[6], Jon Grant[7], Gesche Krause[8], Doug Lipton[9], Molly Miller[10], José Perez[11], Selina Stead[12] and Sebastian Villasante[13,14]

1 Nofima AS, Tromsø, Norway
2 Marine Affairs Programme, Dalhousie University, Halifax, NS, Canada
3 Thünen Institute of Sea Fisheries, Bremerhaven, Germany
4 Scottish Association of Marine Science, Oban, Scotland, UK
5 Bord Iascaigh Mhara - Ireland's Seafood Development Agency, Clonakilty, Ireland
6 Dalhousie University, Halifax, NS, Canada
7 Department of Oceanography, Dalhousie University, Halifax, NS, Canada
8 Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany
9 National Marine Fisheries Service, NOAA, Silver Spring, MD, USA
10 School of Marine Sciences, University of Maine, Orono, ME, USA
11 Ifremer, Univ Brest, CNRS, UMR 6308, AMURE, Unité d'Economie Maritime, IUEM, Plouzane, France
12 Institute of Aquaculture, University of Stirling, Stirling, Scotland, UK
13 Faculty of Political and Social Sciences, University Santiago de Compostela, Santiago de Compostela, Spain
14 Campus Do Mar- International Campus of Excellence, Santiago de Compostela, Spain

AQUACULTURE OVERVIEW 2022

CELTIC SEAS ECOREGION

Share of total European aquaculture production within the Celtic Seas ecoregion in 2018

34% by value

21% by volume

Average price changes for some significant cultured taxa in the last decade

Mussel prices decreased by **49%**

Pacific oyster prices increased by **34%**

Aquaculture practices and species cultured within the Celtic Seas ecoregion are varied and consist of a range of both intensive finfish and extensive shellfish production practices.

Policy and legal foundation

Aquaculture production requires licences and is regulated, but aquaculture policy differs between the five countries within the ecoregion.

Main aquaculture species

Atlantic salmon

>34% total production by volume

Largely produced in Scotland

Shellfish

Dominates in number of licensed sites and enterprises

Invertebrates and seaweeds

Relatively small production volumes

Primary environmental interactions relating to habitats and species

Main threats to wild salmon populations

Sea lice and genetic introgression from farmed salmon

Other important environmental interactions

Disease transmissions, emissions of dissolved nutrients, pollutants, particulate organic matter, and therapeutants

Recommendations for sustainable aquaculture growth

Promoting innovative production technologies to reduce environmental impacts

- Diversification of existing culture systems
- Application of diverse and innovative delousing techniques
- Expansion of seaweed aquaculture
- Diversification of fish culture species
- Development of offshore aquaculture

Considerations for future aquaculture development and management

Interactions with other human activities such as wild capture fisheries, recreation/tourism, offshore renewables, and the designation of marine protected areas.

Climate change hampers sustainable growth and existing capacity for aquaculture in the ecoregion and alters interactions with other sectors.

Offshore & Marine Renewable Energy Development

Workshop on Offshore and Marine Renewable Energy (WKOMRE)

Understand the effect of offshore & marine renewable energy development on

- structure & function of marine ecosystems,
- current & future human uses,
- scientific data collections to support sustainable management of marine resources.

Improve & develop tools to inform OMRE development in context of ecosystem-based management & using adaptive management & assessment approaches.

Conservation & management science

Develop tools, knowledge, and evidence for conservation and management — to provide more and better options to help managers set and meet objectives

Figure 3.1. Game table as used in Galway.

Working Group for Marine Planning and Coastal Zone Management

Based on current developments in marine planning practice and research, WGMPCZM focuses on knowledge gaps in MSP and risk analysis. It also looks at quality assurance of both advice for MSP and of processes in coastal and marine planning, social-cultural dimensions of ecosystem services and the use of fisheries data in planning decision-making processes.

Ecosystem science

Advance and shape understanding of the structure, function, and dynamics of marine ecosystems — to develop and vitalize marine science and underpin its applications

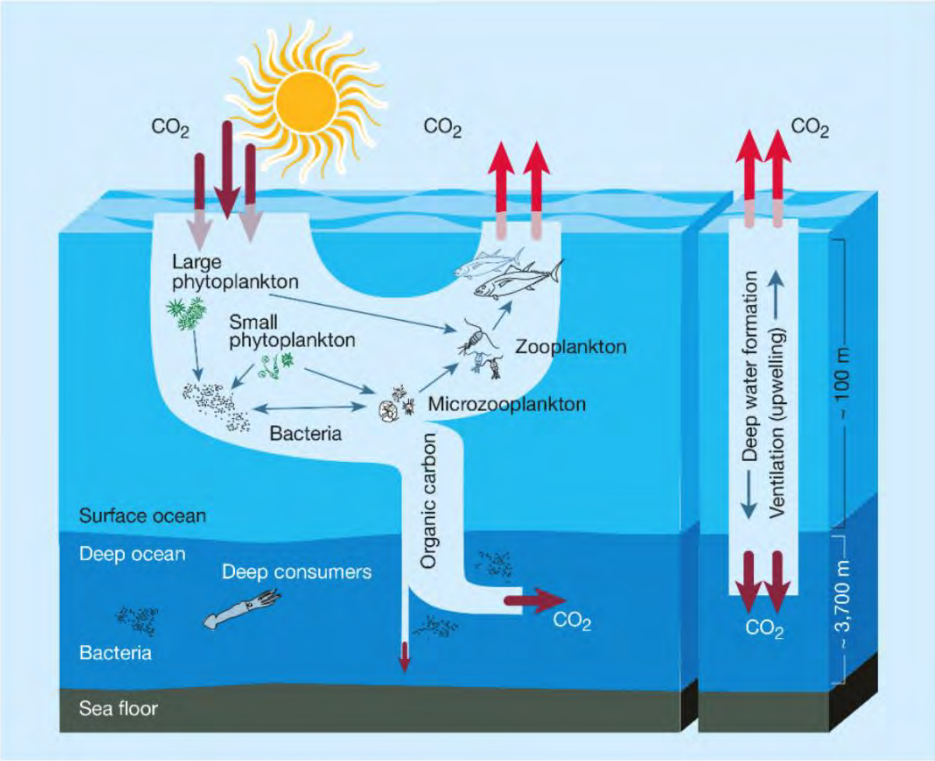


Figure. The biological pump and the solubility pump in the ocean (Chisholm, 2000).

Joint ICES/PICES Working Group on Ocean Negative Carbon Emission (WGONCE)

There are growing societal and policy needs for information on Negative Carbon Emission and the work of this group will help to address this evidence need. Current activities of this Group will lead ICES into issues related to the global climate change, especially with regard to the role of ocean in the global carbon sequestration.

Sea & society

Evaluate contributions of the sea to livelihoods, cultural identities, and recreation — to inform ecosystem status assessments, policy development, and management

ICES CIEM

Working Group on Social Indicators

People and their livelihoods are part of the ecosystem and as such must be understood and assessed.
Social indicators can be a powerful tool to expand ecosystem modelling and assessment to include the social dimension.
WGSOCIAL will assist in coordinating development of social-ecological models for ecosystems, as well as social indicators for monitoring and assessment.

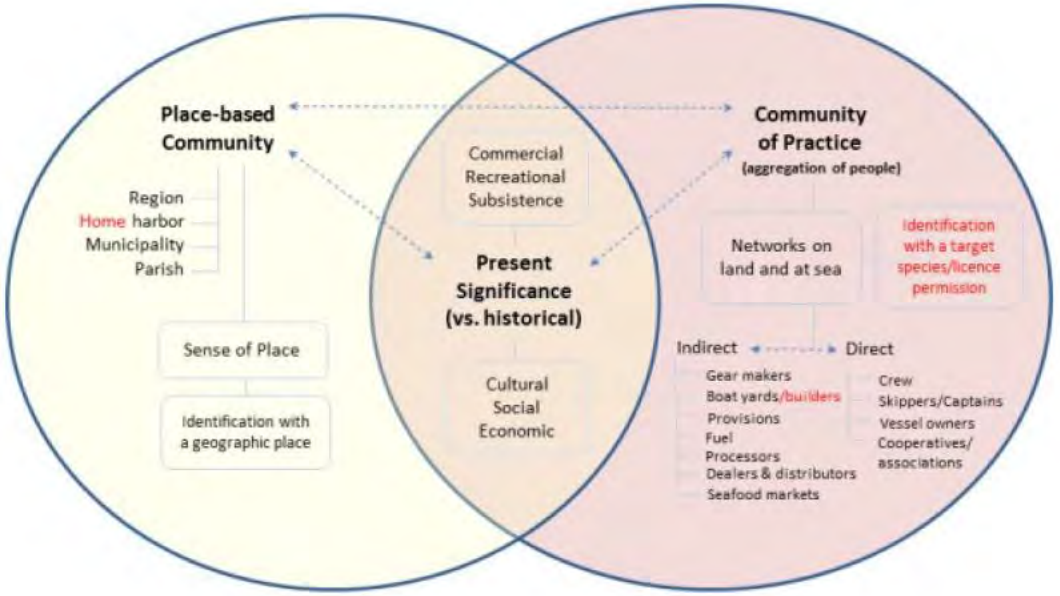
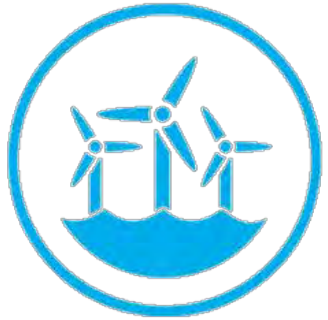


Figure 3.1 Conceptual model of the social landscape of fishing communities.

ICES. 2021. Working Group on Social Indicators (WGSOCIAL; outputs from 2020 meeting). ICES Scientific Reports. 3:8. 29 pp. https://doi.org/10.17895/ices.pub.7690



Measure and project the effects of human activities on ecosystems and ecosystem services — to elucidate present and future states of natural and social systems

ICES CIEM

Working Group on Cumulative Effects Assessment Approaches in Management

Cumulative effects assessments (CEA) are considered a key requirement for sound policymaking and ecosystem-based management. Their actual implementation to guide ecosystem-based management or marine spatial planning is yet to be seen. Cumulative effects are the result of multiple activities that exert pressures on ecosystem components and their functions.

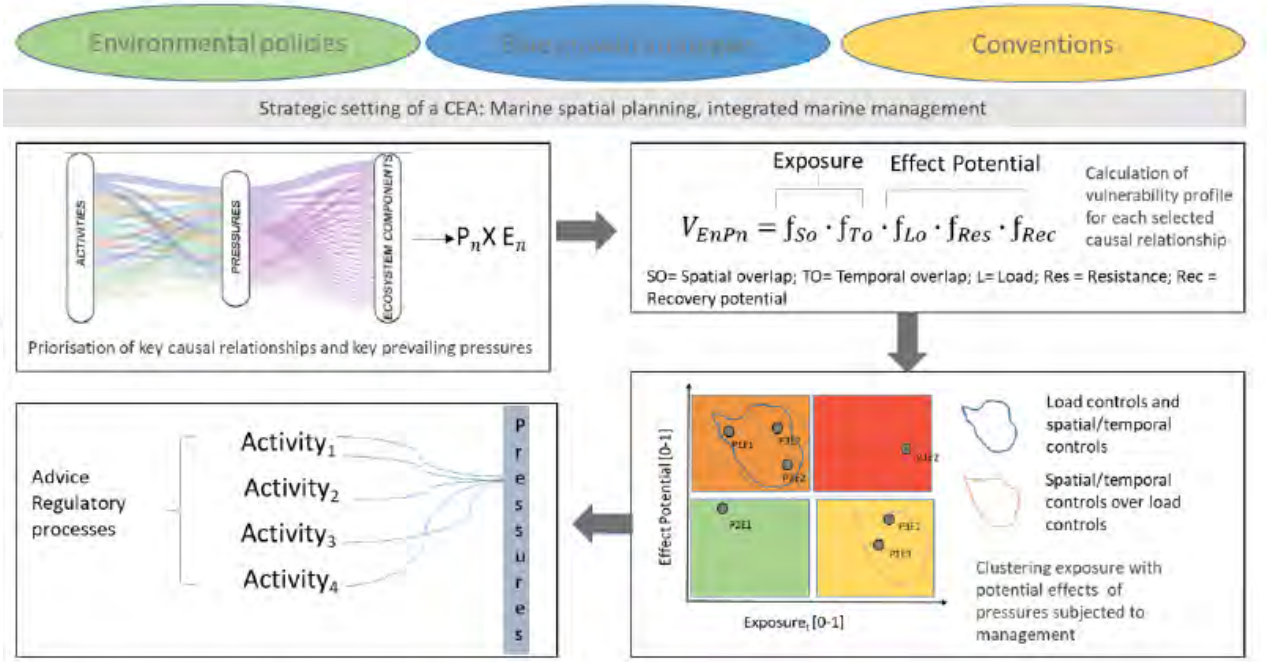


Figure 1. Conceptual CEA framework for management.

ICES. 2020. Working Group on Cumulative Effects Assessment Approaches in Management (WGCEAM). ICES Scientific Reports. 2:101. 20 pp. http://doi.org/10.17895/ices.pub.7561

Science Cooperation

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

ICES CIEM

Ministry for Primary Industries, **New Zealand**
IFOP Instituto de Fomento Pesquero, **Chile**
IMARPE Instituto de Mar del **Peru**
CMAR CSIRO Marine and Atmospheric Research, **Australia**
Department of Agriculture, Forestry and Fisheries, **South Africa**

IMO

PICES

OSPAR COMMISSION
Protecting and conserving the North-East Atlantic and its resources

HELCOM

NORDIC MARINE THINK-TANK

PAME
Protection of the Arctic Marine Environment

EUROMARINE
EUROPEAN MARINE RESEARCH NETWORK

AMAP
Arctic Monitoring and Assessment Programme

FAO
FIAT PANIS

IUCN

CEM

EIFAAC
CECPAI

IASC

GFCM
CGPM

UNESCO
United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

CIESM
The Mediterranean Science Commission

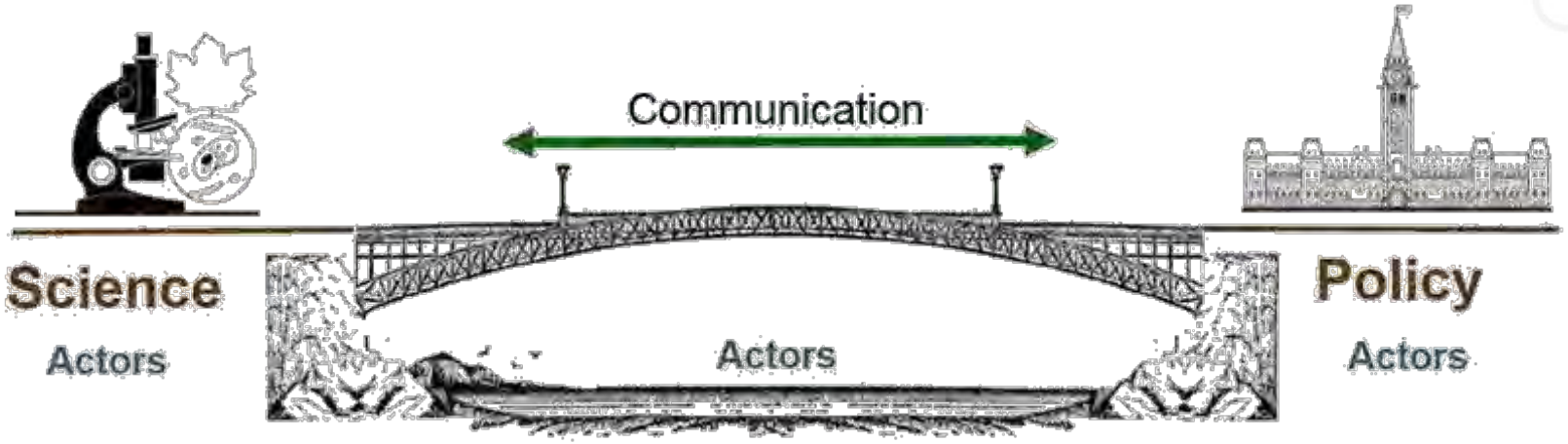
ICES is currently a partner in 15 projects

ICES advice

…by employing the knowledge of ICES to effectively meet the societal needs for impartial evidence, and to generate state-of-the-art advice on meeting conservation, management and sustainability goals.

https://issuu.com/icesdk/docs/ices_stategic_plan_2019_web

Science Policy Interface



Diverse subjects / types of knowledge

Enablers

Barriers

Decision-Makers (Politicians & Senior Public Servants)

Managers

Information & Knowledge Brokers

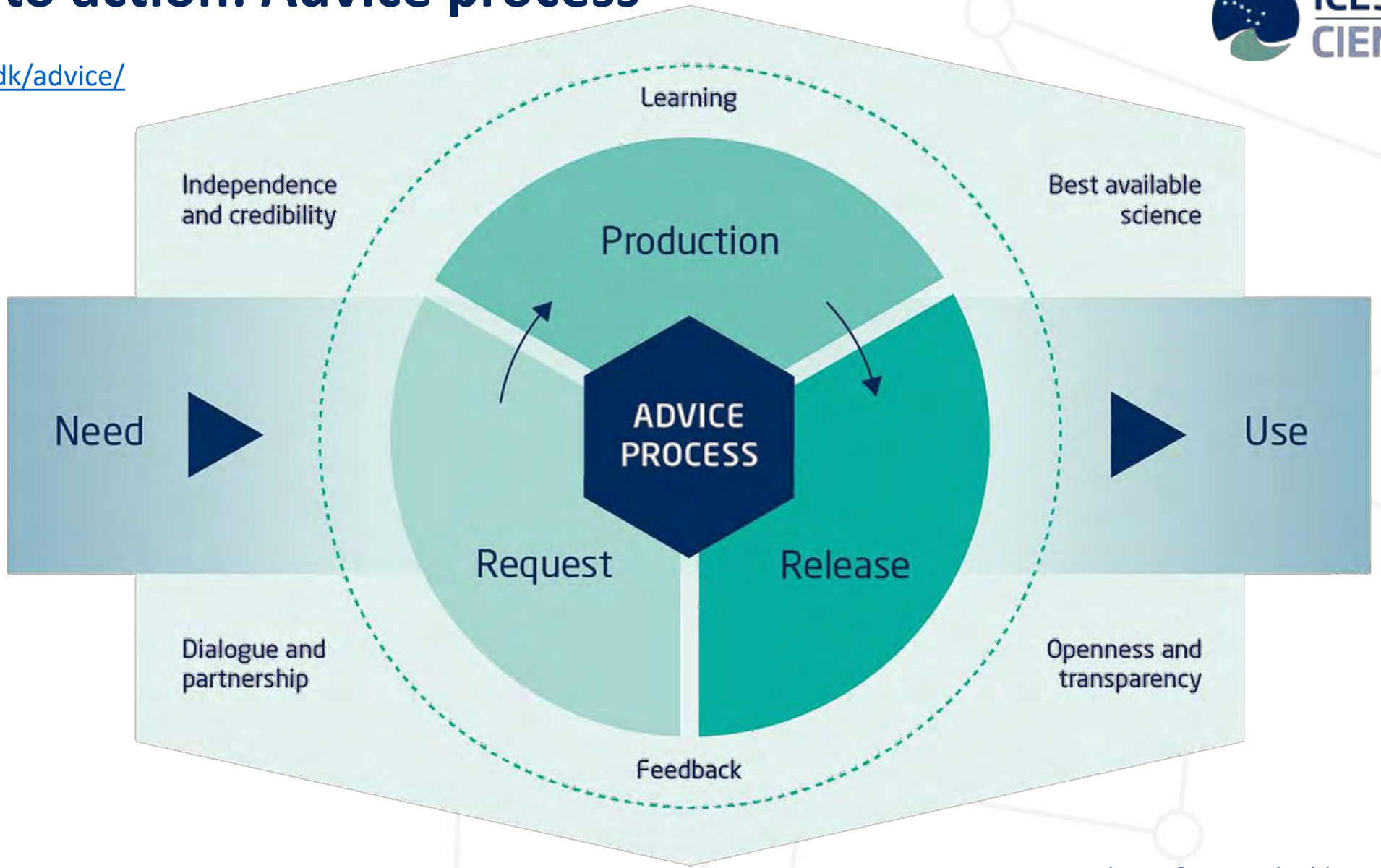
Boundary Organizations

Various Communication Tools
(e.g., Policy Brief)
Grey Literature

MacDonald, B. H., Ross, J. D., Soomai, S. S., and Wells, P. G.: How information in grey literature informs policy and decisionmaking: A perspective on the need to understand the processes, Sixteenth International Conference on Grey Literature, Washington, DC, December, 2015.

Putting into action: Advice process

https://www.ices.dk/advice/



Science for sustainable seas

Thank you

ICES
CIEM

Science for sustainable seas

Image Dirk Vonten, Fotolia

CENTRE FOR GREEN TRANSITION AND MARINE ECOLOGY – GTM

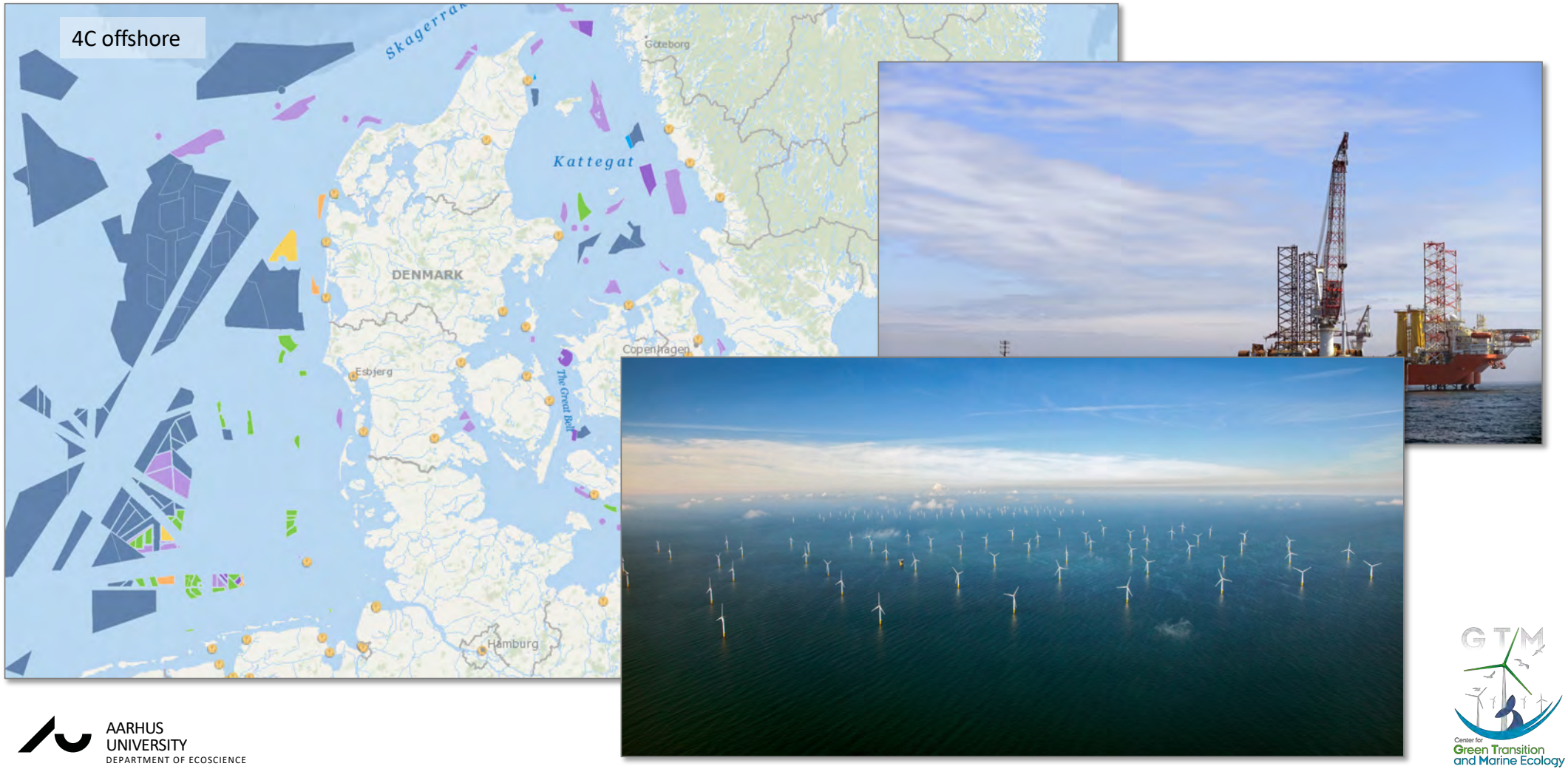
AARHUS UNIVERSITY
DEPARTMENT OF ECOSCIENCE

OLAMUR PRESENTATION
10 JANUARY 2024

PROF. JACOB NABE-NIELSEN
LEADER OF CENTRE FOR GREEN TRANSITION AND MARINE ECOLOGY (GTM)

GTM
Center for Green Transition and Marine Ecology

ACCELERATING EXPANSION OF OFFSHORE WIND



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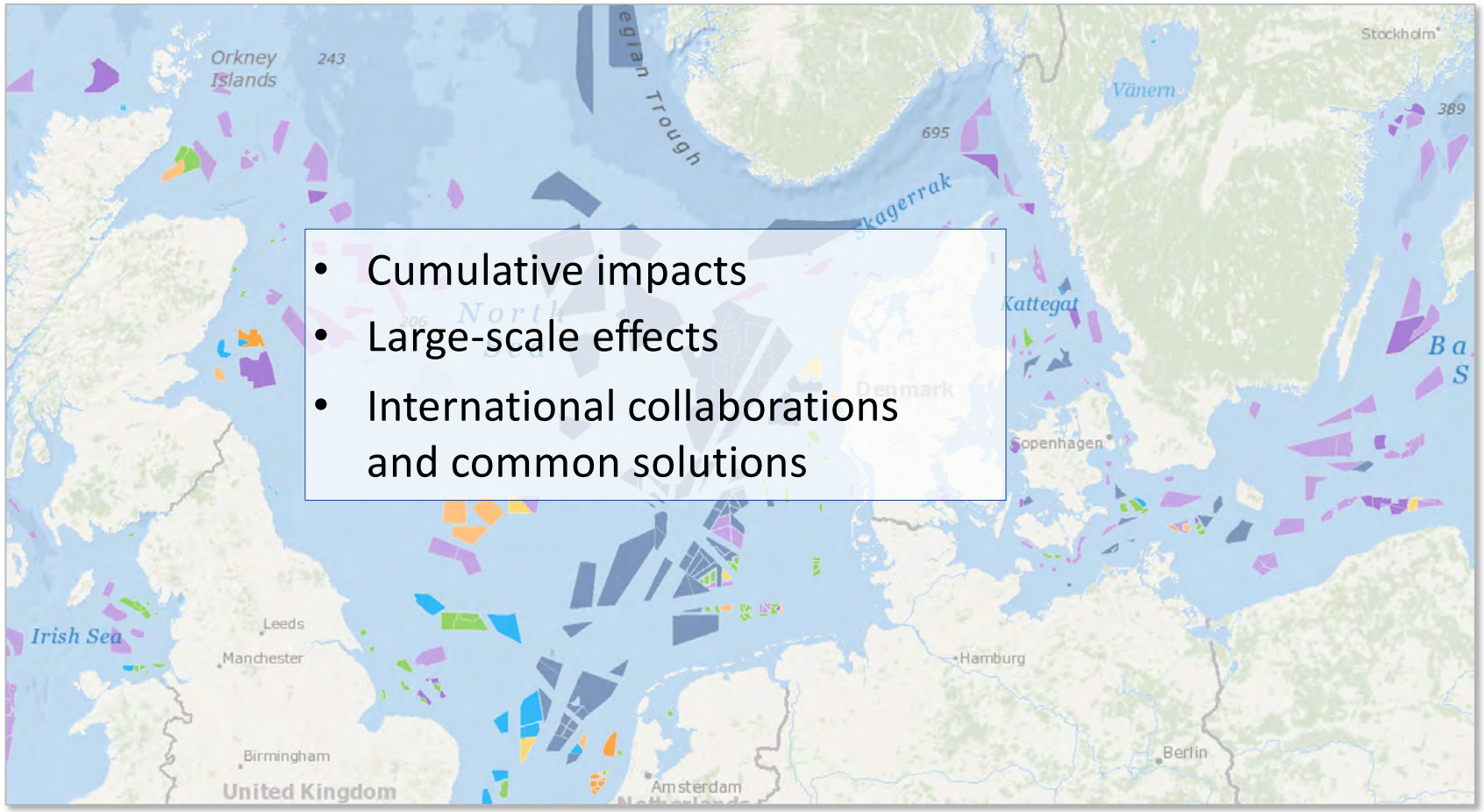
Center for
Green Transition
and Marine Ecology

NEED FOR A NEW APPROACH



- Cumulative impacts
- Large-scale effects
- International collaborations and common solutions

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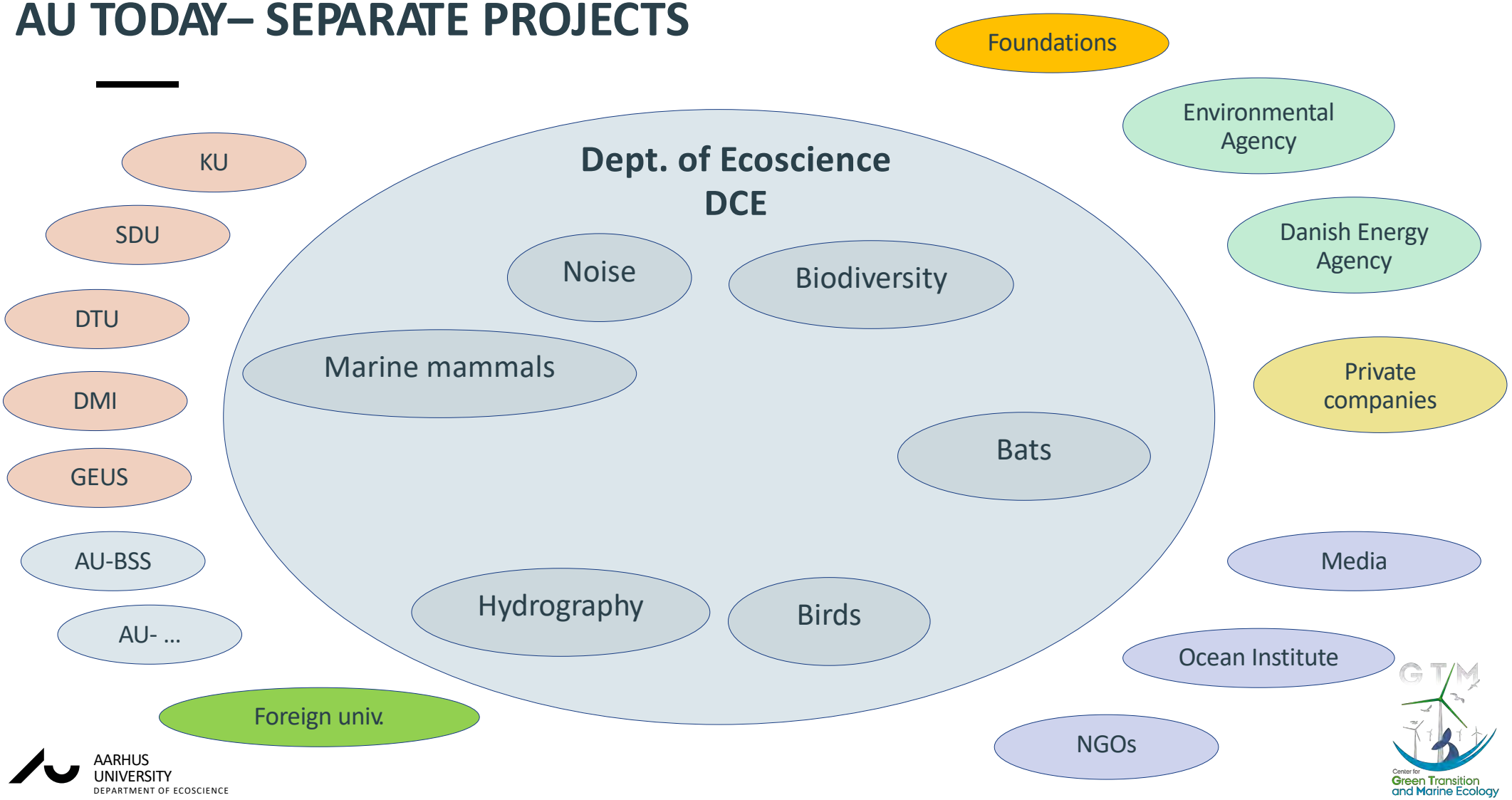
AU TODAY– SEPARATE PROJECTS



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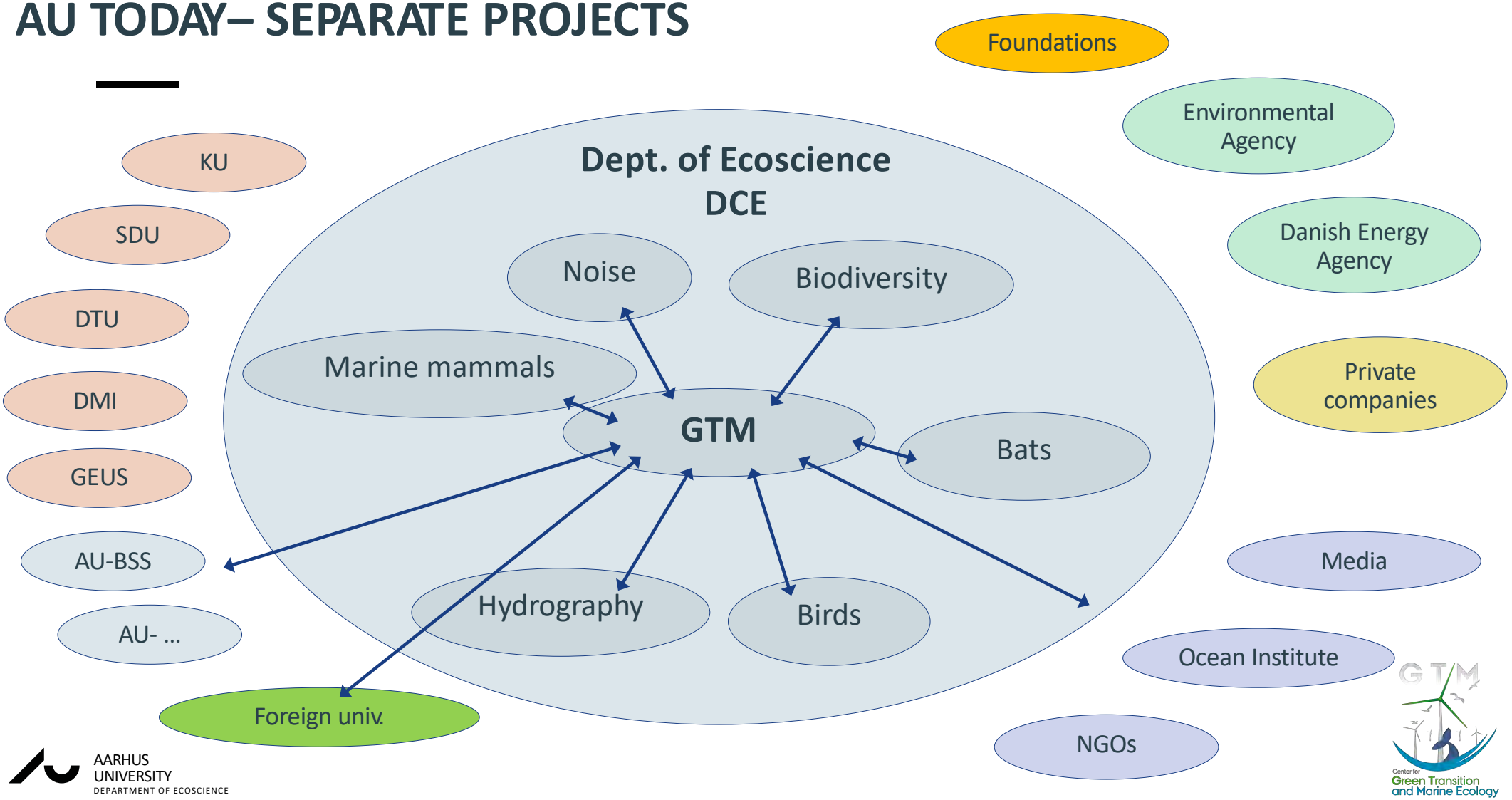
AU TODAY– SEPARATE PROJECTS



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DIVERSITY OF PROJECTS

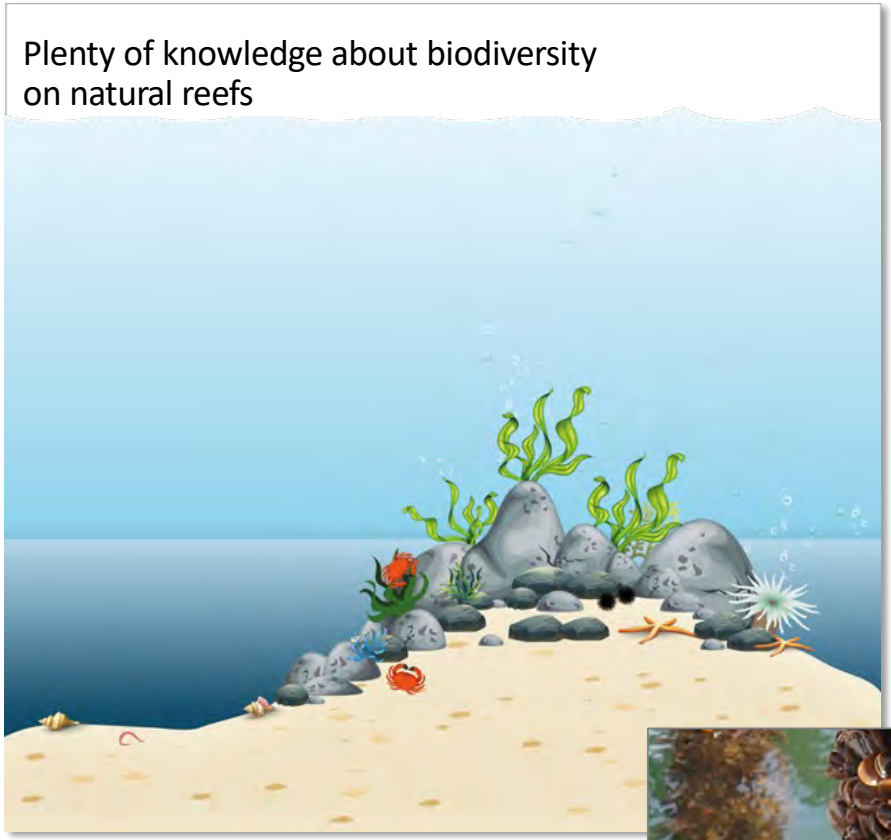
OLAMUR | WIN@sea | SMART TANG | SATURN

Screening of offshore wind potential in DK | CO_2-neutral fuels for the shipping industry

Nordsø I | Energiø Nordsøen | BioRigs | PrePARED | .... | ....

- > 50 ECOS employees from six sections in GTM related projects
- > 150 mio. DKK on-going projects
- > 50 mio. DKK applications

EFFECTS ON MARINE BIODIVERSITY



- Establishment of new species?
- Changed fisheries?
- Long-term effects on large spatial scales?

- Karsten Dahl, Peter A. Stæhr Jørgen Hansen – benthic biodiversity

- Jacob Nabe-Nielsen & Jonas Teilmann – fish and marine mammals

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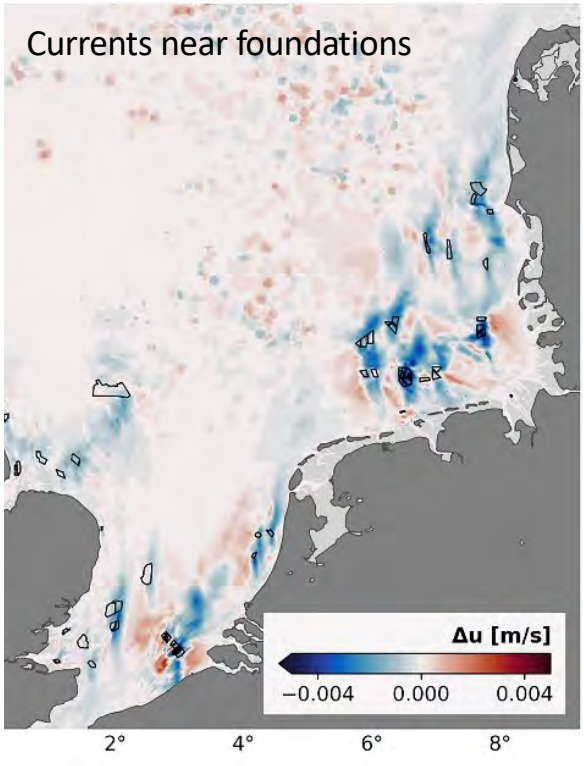
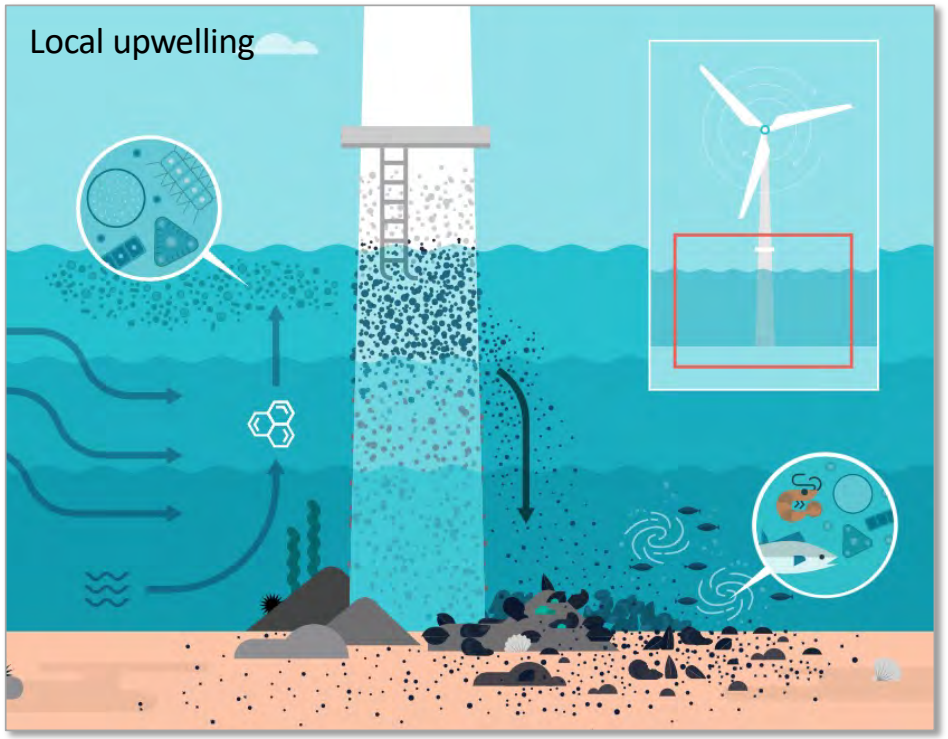
CHANGED HYDROGRAPHY

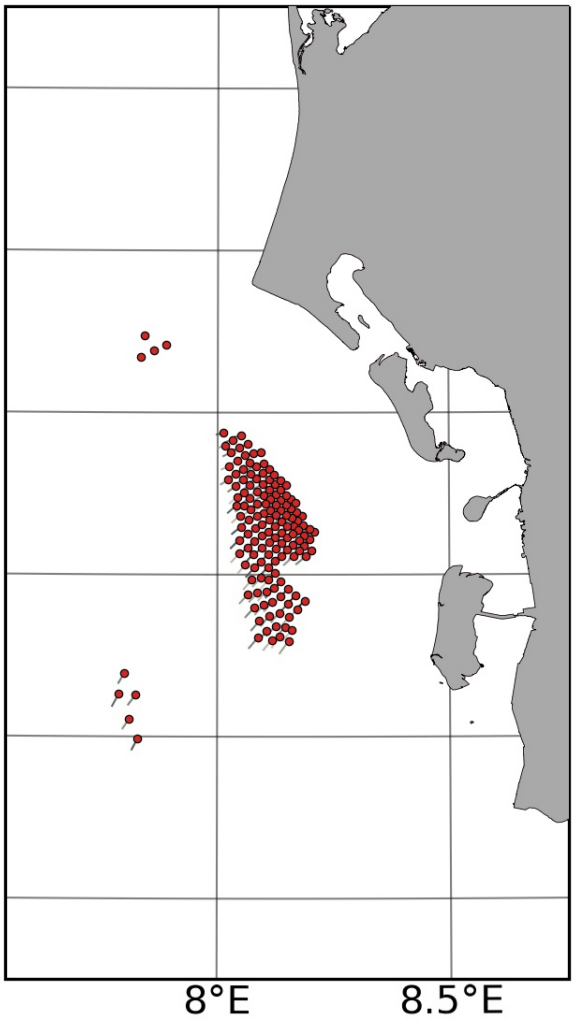




- Changed currents?
- Changes in productivity?
- Large-scale effects?

- Marie Maar & Janus Larsen et al. – modelling of currents

DISPERSAL OF SPECIES



- Larvae spreading between areas with hard substrate
- Increased risk of invasive species?

- Marie Maar & Janus Larsen et al. – modelling
- Peter Stæhr – biodiversity & nature reestablishment

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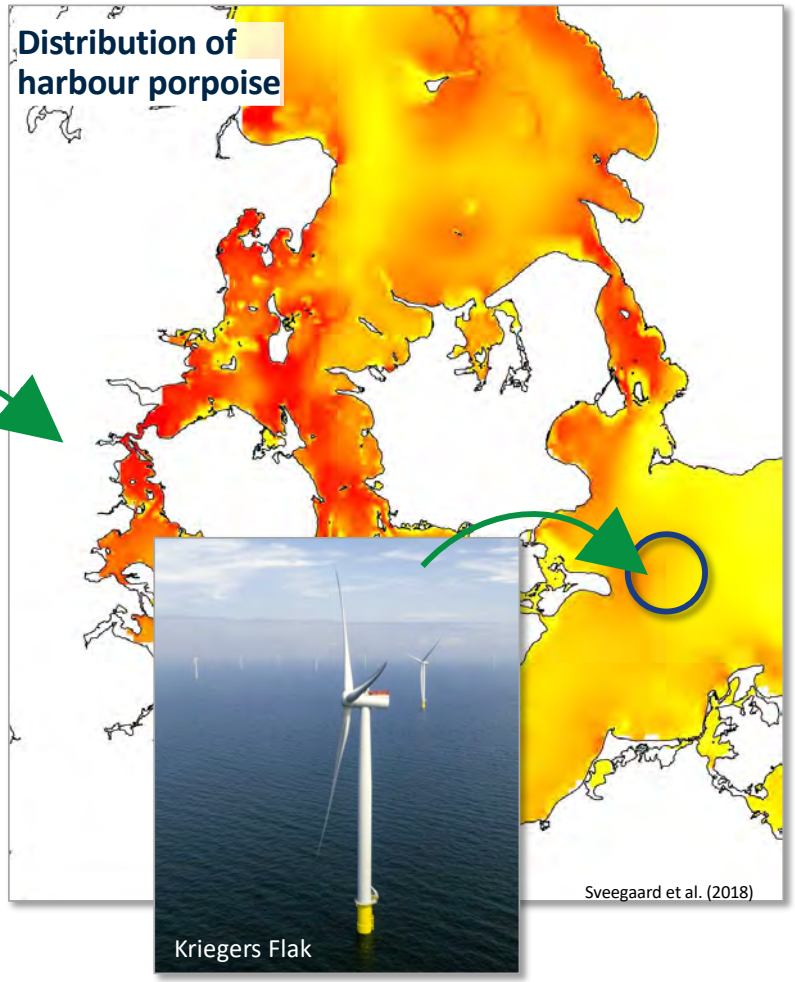
EFFECTS ON MARINE MAMMALS



- Changed distribution of porpoises and fish due to noise?
- Artificial reef effects?
- Behavioural changes?

- Signe Sveegaard & Anders Galatius et al. – monitoring

- Rune Dietz et al. – satellite tagging

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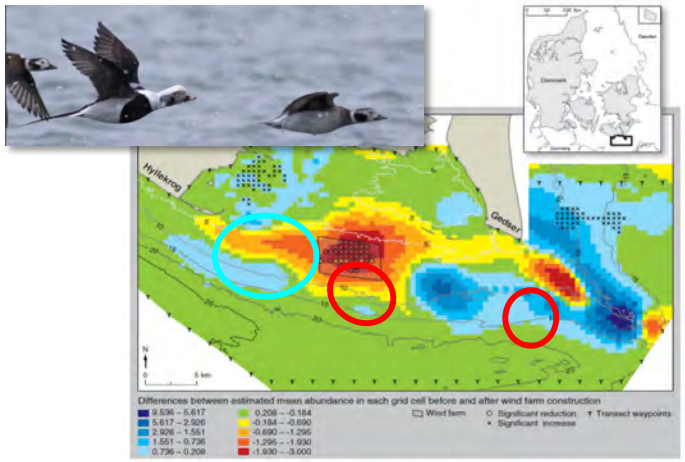
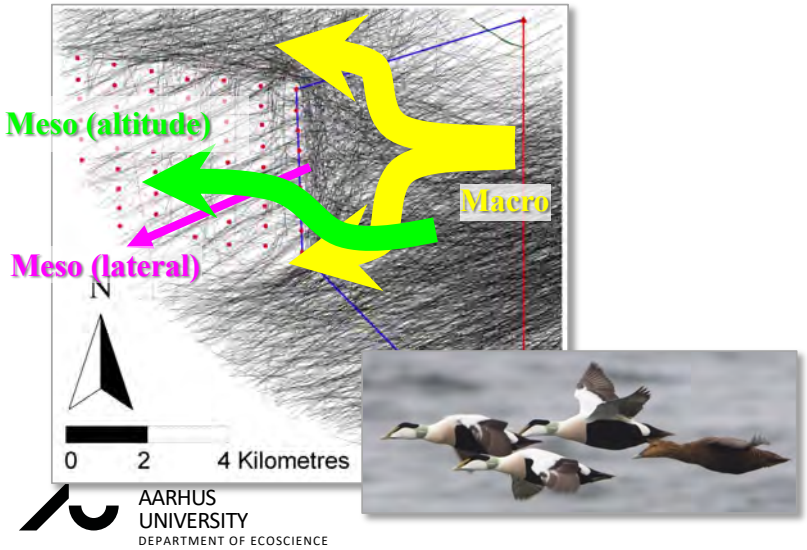
IMPACTS ON BIRDS





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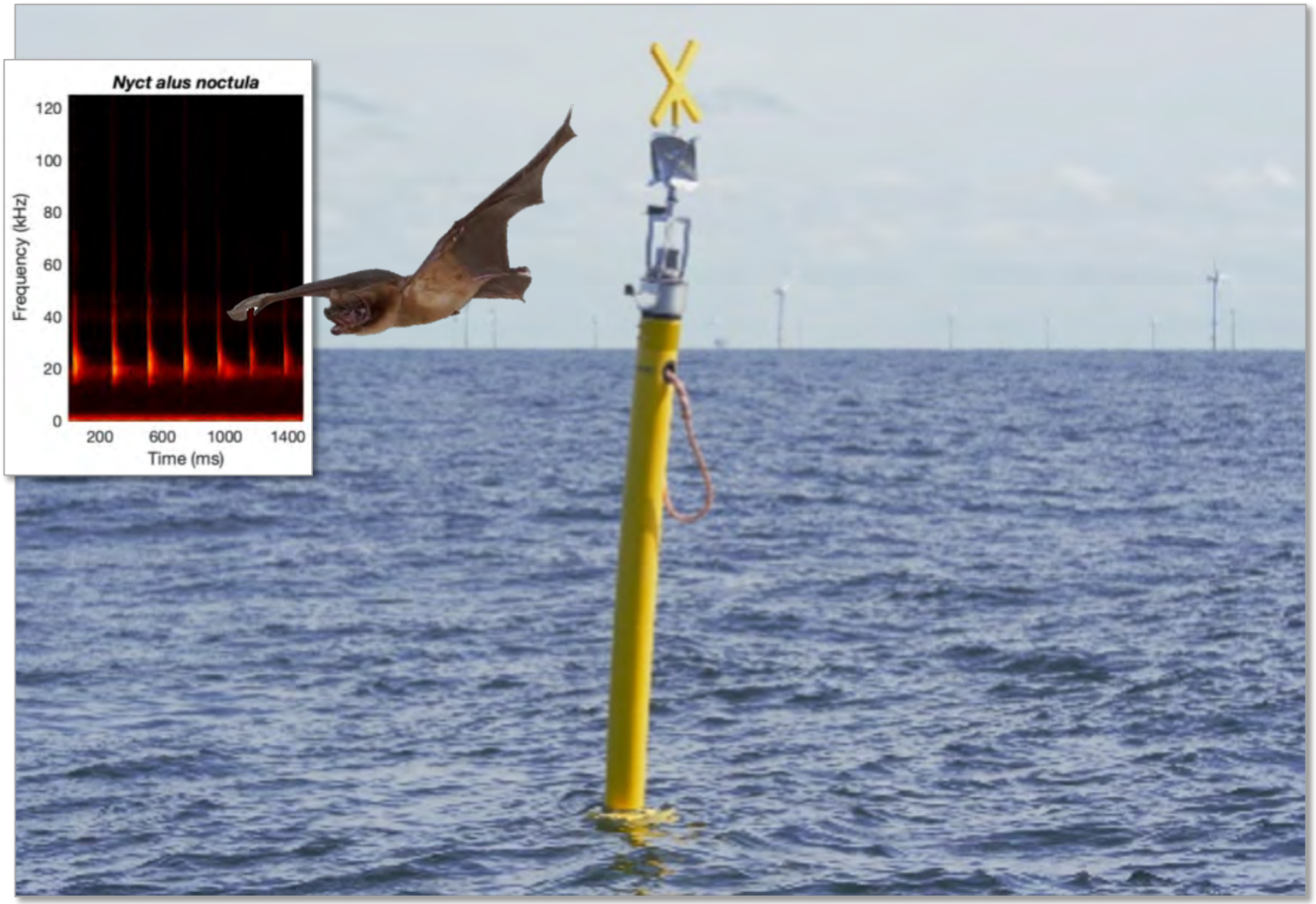
- Changed distribution?
- Changed flyways?
- Risk of collision

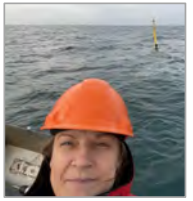
- Tony Fox,
  Ib Kragh
  Petersen et al.
  – monitoring of
  birds

IMPACTS ON BATS

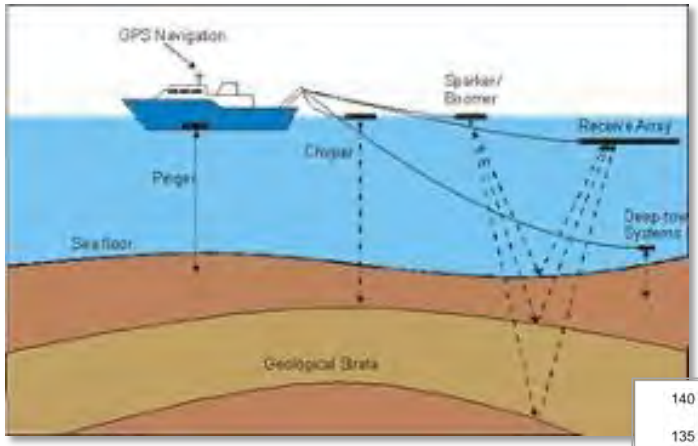


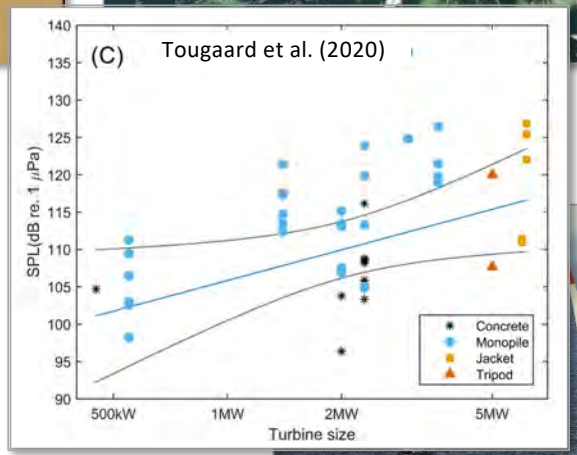
- Migration routes?
- Collision risk?
- Behavioural changes, attraction/displacement?

- Morten Elmeros & Signe Brinkløv – monitoring & adaptive management



UNDERWATER NOISE





- Seabed investigation
- Munition clearance
- Construction noise
- Post-construction noise

- Jakob Tougaard – underwater noise

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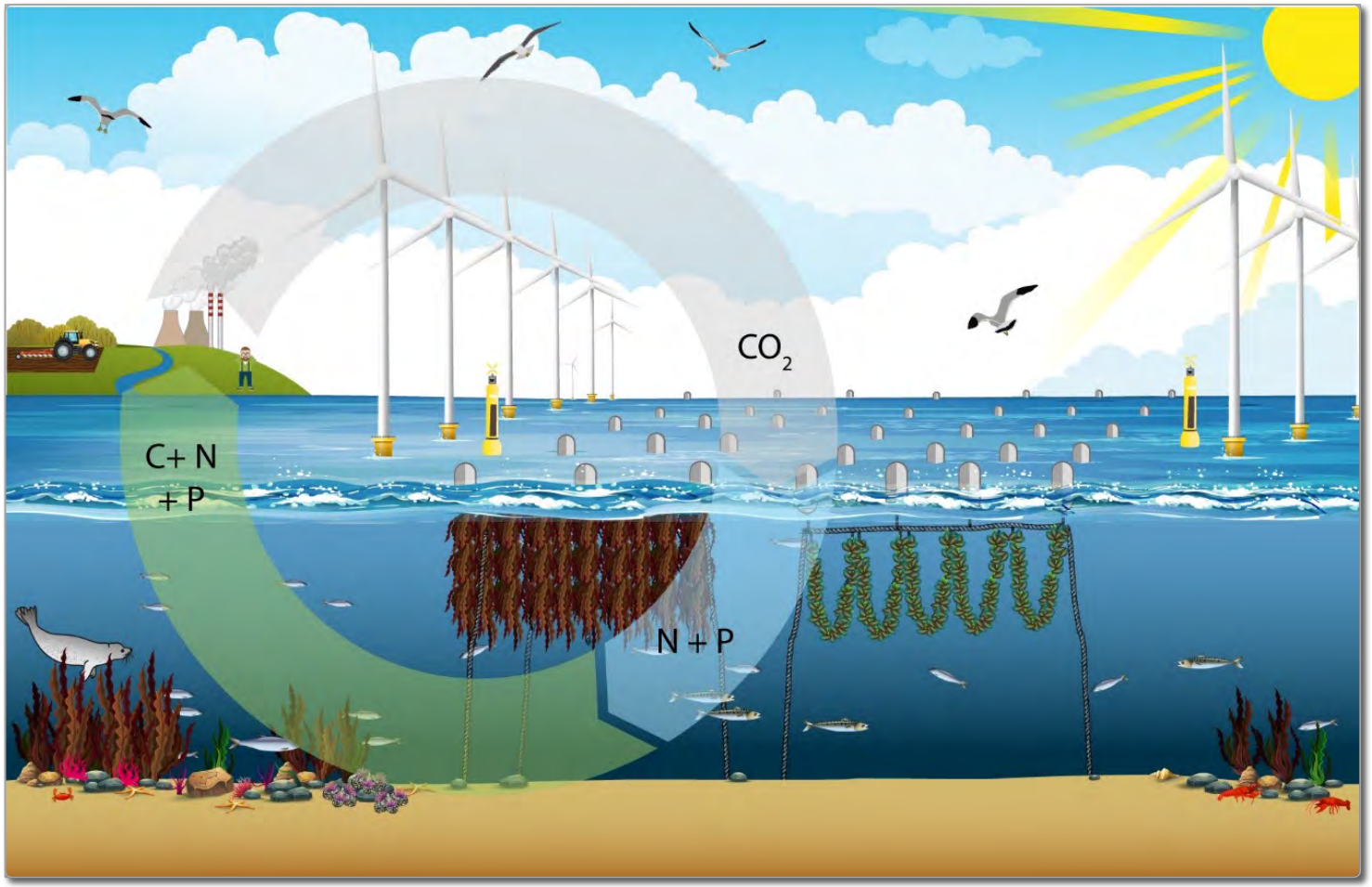
NATURE INCLUSIVE SOLUTIONS



- Marine Multi-Use Platform
- Production of sea weeds and mussels
- Removal of nutrients and CO_2

- Annette Bruhn – aquaculture
- Marie Maar – modelling

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GTM – A HOLISTIC LARGE-SCALE APPROACH

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GTM – COORDINATION AND NEW KNOWLEDGE

- Communication between research institutions, authorities and the energy sector
- Coordinated measurement of environmental parameters, combined with monitoring of species to better assess impacts
- Modelling hydrodynamics for predition of productivity and biodiversity
- Proces-based population modellering for prediction of cumulative impacts of offshore wind on marine species

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OLAMUR

Governing Council

Annual partner meeting 8-11 January 2024

OLAMUR : Offshore Low-Trophic Aquaculture in
Multi-use Scenario Realisation in North and Baltic Seas

Governing Council

- Overall decision making body
- Shall consist of 1 repr from all partners
- Take decisions on:

  Content
  Finances
  IPR
  Evolution of the consortium

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Agenda

- No items or issues have been reported to us within the deadline (10 Dec 23)

- Brief Project status

- Amendents needed:

  WP5 change due date of deliverable D5.1
  - add two more deliverables? D5.1a (a first version/draft) and D5.4a (a first version/draft)

  -others?

- Next meeting

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OLAMUR

Thanks for your attention

Contact: olamur@hi.no

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