Strengthening cross-regional DIH collaboration in aquaculture innovation support services (AquaHubs)

D4. WP2 activity outcome report, including knowledge exchange and capacity building workshops and IE commercial exploitation strategy development materials

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Executive Summary

The aim of this Deliverable is to report on WP2 activity outcome. The activity reported in this Deliverable is 4 capacity building workshops and a commercial exploitation strategy. The four workshops were implemented within M5-M10 of the project, two workshops were implemented by XAMK, one by AFK, one by AFL. The aim of these workshops was to enable cross-regional knowledge transfer from DIHs to IEs and develop IEs capacities and capabilities in innovation management and exploitation. The Deliverable includes general information about events, key event outcomes and reusable results. The activities were conducted in compliance with SAHs Demonstration Activity Procedure (DAP), so the Deliverable includes the documentation required by DAP as well as print screens/pictures from the events. The outcomes from capacity building workshops were incorporated to develop a commercial exploitation strategy. In the second part of this report the commercial exploitation strategy is presented. The strategy includes business models, value proposition, commercial benefit analysis and market entry plans of IE's technologies, products or services for each AhuaHubs partner IEs.

Introduction

This document constitutes the outcome of task Task 2.1. "Knowledge exchange and capacity building workshops with IEs", and Task 2.2. "Supporting IEs in innovation commercial exploitation strategy development" which is part of WP2 "Supporting Innovation Experiments with DIH services" of the AquaHubs project. The aim of this document is to present planned and implemented IEs workshop events and to report on M3. "Knowledge exchange and capacity building workshops (3 in total) with IEs held" [M5-M10] as well as present the commercial exploitation strategy that was developed after incorporating the results from workshop events.
The general aim of WP2 is to provide common DIH services to Innovation Experiments that are supported under the AquaHubs project with the aim of advancing their innovation management and exploitation capacities and capabilities.
IEs were supported in co-organizing capacity-building workshops to enable cross-regional knowledge transfer from DIHs to IEs and developing IEs capacities and capabilities in innovation management and exploitation. 4 workshop events were conducted, each per partner – AFL, AFC and two by XAMK.

To ensure uniformity and consistency amongst all of the above-mentioned events, we presented all activities using the same event outcome reporting methodology that was developed in D3 "Programme of cross border knowledge exchange and IE capacity building", which was developed under WP1" Development of common DIH services and capacities". Event outcome reporting has also been conducted in compliance with SAHs Demonstration Activity Procedure (DAP).
The commercial exploitation strategy was developed after gathering results from workshop events. The aim for this task was to support IE's with the cross-border expertise of DIHs in developing commercial exploitation strategies, business models, value propositions, commercial benefit analysis and market entry plans of their technologies, products or services. A common Commercialization plan and go-to-market guidelines using DIHs support

were developed using all three IE's as a use-case example. The guidelines consist of: Go-to-market plan; Distribution and sales channels; Marketing strategy; Customer and end-user relations. The commercial exploitation strategy development support was applied to the business models of each IE analysed during the Aquahubs project.

1. AFL Technology Demonstration - Current situation and future perspectives of the aquaculture sector

1.1 GENERAL INFORMATION ABOUT THE EVENT

Event type	Workshop
Priority area related to the event	Knowledge exchange and capacity building
Event topic	Current situation and future perspectives of the aquaculture sector
Organizing partner	Afrifood Lithuania DIH (AFL)
Other associated parties	Ministry of Agriculture of Lithuania, Klaipėda University,
Date of the event	February 10th, 2022
Location of the event	Virtual meeting
Number of participants	133
Description of participant profiles (with numbers by target group);	Ministry of Agriculture of Lithuania: 3 Companies and farmers: 14 Other public officials: 10 Researchers and students: 68 Media: 1 Other unedified: 37
Event abstract (up to 100 words).	The workshop focused on the challenges that the aquaculture industry is currently facing and the potential solutions to them. Also, current trends and the potential of using innovative technologies were discussed.

	It also encouraged participants to express their opinion and engage in discussions with experts. During the webinar, experts presented the current situation in the aquaculture sector and shared good practices. In addition, the participants of the webinar were introduced to guidelines on the most convenient and efficient ways to successfully use available resources and offered services and implement digital tools that grow their business

1.2 KEY EVENT OUTCOMES AND REUSABLE RESULTS

Event agenda	Opening of the event Keynote: "AquaHubs and strengthening cross-regional cooperation" Kristina Šermukšnytė-Alešiūnienė | Director at AgriFood Lithuania DIH Presentations by the expert: Keynote: "General overview of the aquaculture sector, its challenges and opportunities" Loreta Bražinskaitė | Advisor to the Fisheries Unit of the Ministry of Agriculture of the Republic of Lithuania Keynote: "Aquaculture Technologies in Lithuania" Gintautas Narvikas | Junior Researcher at Fisheries and Aquaculture laboratory of Marine Research Institute of Klaipeda University Keynote: "How important is the blue part of the bioeconomy to us?" dr. Nerijus Nika | Head of Fisheries and Aquaculture laboratory of Marine Research Institute of Klaipeda University Keynote: "How could the Future Technologies Digital Innovation Hub help to aquaculture businesses?" Tomas Bunga | Innovation Manager at Future Technologies DIH Discussion between experts and participants of the workshop. Interactive questions & discussion after every keynote speaker and at the end of the event. The questionnaires were sent to fill in after the event.

Event recording (of full event or of separate event sessions, especially presentations by experts)	Full recording available.
Content presented and used in the event	5 presentations by the experts, questioner.
Impact assessment outcomes (consolidated participant inputs)	The event feedback questionnaire can be seen here. Participants found the workshop useful and improved their knowledge about Aquaculture and it's technologies in Lithuania.
Brainwriting session outcomes (identified issues, consolidated participant inputs)	N/A
Feedback and suggestions (consolidated participant inputs)	• The topic was interesting, participants were interested in further collaboration • The event was considered well organized • Digital solutions are considered to be innovative and effective • The costs and return on investment were discussed • Some participants were interested in algae and other plant production in aquaculture topic.
Other outcomes directly related to the particular event.	Participants' interest in the Aquahubs project and further development, especially in the exploitation strategy and other finalised results.

Annex 1 - Online Demonstration Activities Plan template (DAP)

Topic:	Current situation and future perspectives of the aquaculture sector
FIE:	Agrifood Lithuania DIH
Event overview	Please, indicate: • Title: Current situation and future perspectives of the aquaculture sector • Time: February 10th 10:00-12:00 • Platform: Zoom Meeting • Main technologies that will be presented:

	○ Recirculating aquaculture systems ○ Marine aquaculture systems ○ Artificial sea water ○ Shrimp Tower concept ○ „Biofloc" system ○ Aquaponics ○ Use of ozone in aquaculture ○ Smart control systems
Constraints	No
Planned stakeholders' groups	Researchers Public officials working on fish farming regulations Representatives from private fish farming entities Farmers Representatives from DIH's
Planned number of attendees	50
What do you want to achieve with this particular demonstration	Present technological solution for automatic fish farming, data management and automated decision making, attract relevant stakeholders and end-users. Promote IE's technology. Present current situation and market potential.
Dissemination channels envisioned	Targeted mailing, Main Dissemination channels- Linkedin and Facebook posts and newsletter
Potential collaboration with other H2020 projects	
Roles and responsibilities	Please, indicate the organizational team (name and email) – contact points for the following topics: ● Demonstration Activity Main responsible – UC coordinator: Giedrius Leskauskas (giedrius@agrifood.lt) ● Facilitator: Giedrius Leskauskas (giedrius@agrifood.lt) ● Presenter/s: Kristina Šermukšnytė Alešiūnienė – director at Agrifood Lithuania DIH Loreta Blažinskaitė – Advisor to the Fisheries Unit of the Ministry of Agriculture of the Republic of Lithuania Dr Nerijus Nika - Head of Fisheries and Aquaculture laboratory of Marine Research Institute of Klaipeda University Gintautas Narvilas - Junior Researcher at Fisheries and Aquaculture laboratory of Marine Research Institute of Klaipeda University

	Tomas Bunga - Innovation manager at Future Technologies DIH Kęstutis Skirgaila - R&D Concept Developer
Feedback from participants	The topic was interesting, participants were interested in further collaboration

Annex 3 - Lessons Learnt report

Lessons Learnt report		
DA field	**Highlights**	**Attention points**
Presented solution features – observation (based on interaction with attendees)	• The presented solution raised interest. • Digital solutions were very innovative and effective in resource-saving and healthier fish stock outcomes.	• The cost and return on investment.
Solution presentation (how, what additional material was used, structure of demonstration, etc.)	• Slides, presentations of the experts	
Communication with stakeholders	• Interaction through Zoom Meeting room during the event, collaborative interview • Feedback questionier after the event	
Target audience and feedback		
Total number of participants (from all target groups):	133	
Below, please provide a total number of participants per each target group (feel free to add any other relevant target group)		

Scientific	Industry	Civil Society	General Public	Policy makers	Media	Investors	Customers	Others
68	14	-	-	13	1	-	-	37

How will you implement feedback you have received form the participants?	The feedback clearly encouraged further development of the concept.

Pictures/screenshots from the event.


Krevečių bokšto koncepcija
• Visiškai naujas krevečių baseino dizainas.
• Uždaro tipo baseinas su išmaniomis stebėjimo ir valdymo sistemomis.
• Novatoriška šėrimo sistema.
• Skirta dideliems krevečių ūkiams.
58:50 / 2:55:33


Kuris sektorius jums atrodo perspektyviausias? What sector would you consider to have the highest potential in aquaculture?
27%
9%
64%
Recirculating aquaculture systems (RAS)
Pond aquaculture and flow-through systems
Marine coastal or off-shore aquaculture
100%
80%
60%
40%
20%
0%
Lithuania
Germany
other
Marine coastal or off-shore aquaculture
Pond aquaculture and flow-through systems
Recirculating aquaculture systems (RAS)
Familiar
Beginner
Not familiar at all
Recirculating aquaculture systems (RAS)
Pond aquaculture and flow-through systems
Marine coastal or off-shore aquaculture
2:00:12 / 2:55:33

2. Xamk Workshop - Exploring the topic of automatic fish stock estimation

2.1 GENERAL INFORMATION ABOUT EVENT

Event type	Workshop
Priority area related to the event	
Event topic	Exploring the topic of automatic fish stock estimation
Organizing partner	South-Eastern Finland University of Applied Sciences – Xamk
Other associated parties	
Date of the event	October 18, 2021
Location of the event	Virtual meeting, implemented with MS Teams and XLeap (www.xleap.net)
Number of participants	10
Description of participant profiles (with numbers by target group);	Applied university of sciences: 3 University: 1 Research institutions: 1 Company representatives: 3 Public officials: 2
Event abstract (up to 100 words).	In this initial workshop, we shall identify the most relevant stakeholders for the topic of automatic fish stock estimation. In addition, we shall collaboratively explore potential technologies and determine objectives for the innovation experiment.

2.2 KEY EVENT OUTCOMES AND REUSABLE RESULTS

Event agenda	1. **Introduction of participants** 2. **Brainstorming: Who are affected by automatic fish stock estimation?** Write each affected stakeholder as a separate entity 3. **Voting according to 2 criteria:** 1) How important is the topic for each stakeholder? 2) How interested the stakeholder is to participate in the innovation experiment (IE)? 4. **Selection of 10 most promising stakeholders for the IE** 5. **Brainstorming: What needs the selected stakeholders have related to automatic fish stock estimation?** Sub questions for each selected stakeholder: a. What does the stakeholder want to accomplish in his/her work?

	b. What opportunities the automatic fish stock estimation would create for the stakeholder? c. What challenges the stakeholder have related to fish stock estimation? d. How could the stakeholder contribute to automatic fish stock estimation? **6. Brainstorming: What technology could we utilize for automatic fish stock estimation?** Sub questions for each inputted technology: a. What are the strengths/weaknesses of proposed technology? b. What kind of data the proposed technology would provide? c. What kinds of challenges there are in utilizing the chosen technology? d. How could we mitigate identified challenges? **7. Brainstorming: What should we accomplish with the innovation experiment?** Sub questions for each inputted objective: a. How we can measure success and what is the target level? b. How realistic you think the objective is? **8. Voting: Select 5 objectives or metrics that are most important to you** **9. Brainstorming: What development steps we need to take?** Sub questions for each inputted objective: a. Who should be involved in this development step? b. What tasks should be implemented in this step? c. What should be the outcome of this step? d. How do we measure success? **10. Anonymous feedback**
Event recording (of full event or of separate event sessions, especially presentations by experts)	Recording of full event.
Content presented and used in the event	-
Impact assessment outcomes (consolidated participant inputs)	-

Brainwriting session outcomes (identified issues, consolidated participant inputs)	results available from here: **Identification of most relevant stakeholders:** 1. Researchers 2. Fishing economy development organizations 3. Officials responsible of water body maintenance 4. Commercial fishermen 5. Fisheries administration 6. Officials planning for responsible fishery management and fishing **Increased understanding about selected stakeholders** (job to be done, headaches, opportunities, contribution to IE) **Scoping of potential technologies** **Scoping of IE objectives**
Feedback and suggestions (consolidated participant inputs)	• It was nice to be able to strengthen network of relevant stakeholders • Brainstorming was considered useful • The used methods succeeded in having participants involved • There was quite little time to answer questions, but the method served its purpose in building an overview of the problem domain • One positive thing about the implementation of the workshop is that it automatically results with a written report
Other outcomes directly related to the particular event.	

Annex 1 - Online Demonstration Activities Plan template (DAP)

Topic: **FIE:**	Technology demonstration for automatic fish stock estimation
Event overview	Please, indicate: • Title: Exploring the topic of automatic fish stock estimation • Time: October 18, 2021 • Platform: Virtual meeting, implemented with MS Teams and XLeap (www.xleap.net) • Main technologies that will be presented: No technologies presented yet. This was a needs assessment workshop

Constraints	The event was targeted to relevant stakeholders, to which invitation was sent
Planned stakeholders' groups	1. Researchers 2. Fishing economy development organizations 3. Officials responsible of water body maintenance 4. Commercial fishermen 5. Fisheries administration 6. Officials planning for responsible fishery management and fishing
Planned number of attendees	20
What do you want to achieve with this particular demonstration	In this initial workshop, we shall identify the most relevant stakeholders for the topic of automatic fish stock estimation. In addition, we shall collaboratively explore potential technologies and determine objectives for the innovation experiment.
Dissemination channels envisioned	Personal invitations
Potential collaboration with other H2020 projects	
Roles and responsibilities	Please, indicate the organizational team (name and email) – contact points for following topics: • Online Demonstration Activity Main responsible – UC coordinator: Sami Jantunen • Facilitator: Sami Jantunen • Presenter/s: Sami Jantunen
Feedback from participants	Opportunity for networking and collaborative style of the WS were considered good.

Annex 3 - Lessons Learnt report

Lessons Learnt report		
DA field	**Highlights**	**Attention points**
Presented solution features – observation (based on interaction with attendees)	• Increased understanding of who are the stakeholders	

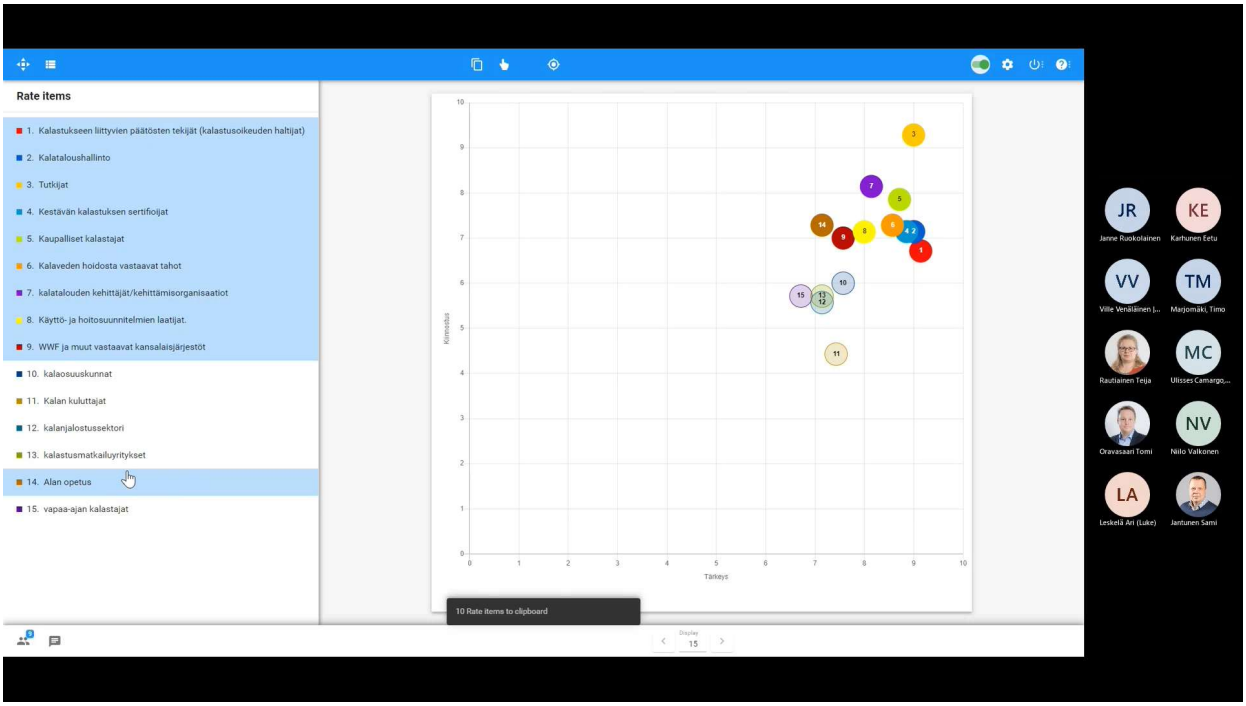
	• In-depth discussion of selected stakeholders • Discussion of potential technologies	
Solution presentation (how, what additional material was used, structure of demonstration, etc.)	• The purpose of this WS was to explore the problem domain. No solution or additional material was used.	
Communication with stakeholders	• Interactive speaking discussion through MS teams • Collaborative working (brainstorming, voting, etc.) through xleap.net	
Target audience and feedback		
Total number of participants (from all target groups):	10	

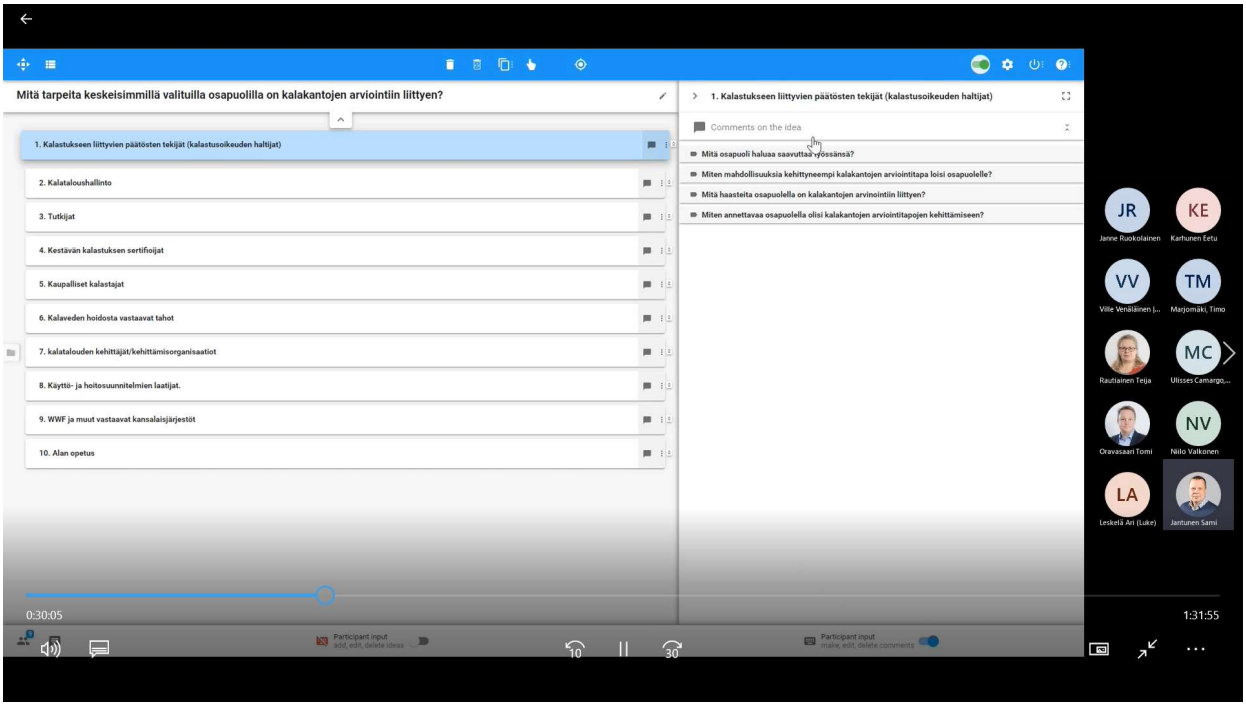
Below, please provide a total number of participants per each target group (feel free to add any other relevant target group)

Scientific	Industry	Civil Society	General Public	Policy makers	Media	Investors	Customers	Others
4	*3*	*1*		*2*				

How will you implement feedback you have received form the participants?	The input from the participants helped to focus the implementation of the IE (particularly selection of relevant stakeholders) The feedback gathered about the event itself provided support for the chosen collaborative methods of the WS.

Pictures/screenshots from the event.


Rate items
1. Kalastukseen liittyvien päätösten tekijät (kalastusoikeuden haltijat)
2. Kalataloushallinto
3. Tutkijat
4. Kestävän kalastuksen sertifioijat
5. Kaupalliset kalastajat
6. Kalaveden hoidosta vastaavat tahot
7. kalatalouden kehittäjät/kehittämisorganisaatiot
8. Käyttö- ja hoitosuunnitelmien laatijat.
9. WWF ja muut vastaavat kansalaisjärjestöt
10. kalaosuuskunnat
11. Kalan kuluttajat
12. kalanjalostussektori
13. kalastusmatkailuyritykset
14. Alan opetus
15. vapaa-ajan kalastajat
Kiinnostus
Tärkeys
10 Rate items to clipboard
JR
KE
VV
TM
MC
NV
LA


Mitä tarpeita keskeisimmillä valituilla osapuolilla on kalakantojen arviointiin liittyen?
1. Kalastukseen liittyvien päätösten tekijät (kalastusoikeuden haltijat)
2. Kalataloushallinto
3. Tutkijat
4. Kestävän kalastuksen sertifioijat
5. Kaupalliset kalastajat
6. Kalaveden hoidosta vastaavat tahot
7. kalatalouden kehittäjät/kehittämisorganisaatiot
8. Käyttö- ja hoitosuunnitelmien laatijat.
9. WWF ja muut vastaavat kansalaisjärjestöt
10. Alan opetus
Comments on the idea
Mitä osapuoli haluaa saavuttaa yössänsä?
Miten mahdollisuuksia kehittyneempi kalakantojen arviointitapa loisi osapuolelle?
Mitä haasteita osapuolella on kalakantojen arvinointiin liittyen?
Miten annettavaa osapuolella olisi kalakantojen arviointitapojen kehittämiseen?
0:30:05
1:31:55
JR
KE
VV
TM
MC
NV
LA

3. Xamk Workshop - Determination of the innovation experiment

3.1 GENERAL INFORMATION ABOUT THE EVENT

Event type	Workshop
Priority area related to the event	
Event topic	Determination of the innovation experiment
Organizing partner	South-Eastern Finland University of Applied Sciences – Xamk
Other associated parties	
Date of the event	November 8, 2021
Location of the event	Virtual meeting, implemented with MS Teams and XLeap (www.xleap.net)
Number of participants	12
Description of participant profiles (with numbers by target group);	Applied university of sciences: 6 University: 1 Company representatives: 2 Public officials & representatives of interest groups: 3
Event abstract (up to 100 words).	In this 2nd workshop, we shall continue narrowing down the objectives of the IE

3.2 KEY EVENT OUTCOMES AND REUSABLE RESULTS

Event agenda	**1. Introduction of participants** **2. Presentation: Results of Workshop1** **3. Brainstorming: How the reliability of fish stock estimation could be increased?** Sub questions for each proposed idea: a. Why do you believe your proposal would work? b. What we don't know yet? c. How can we find answers to the things we don't know yet? **4. Voting: Select 5 inputted items (proposal/answer to sub question) that you think to be most important** **5. Brainstorming: How the cost-efficiency of fish stock estimation could be increased?** Sub questions for each proposed idea: a. Why do you believe your proposal would work? b. What we don't know yet? c. How can we find answers to the things we don't know yet? **6. Voting: Select 5 inputted items (proposal/answer to sub question) that you think to be most important**

	7. **Brainstorming: What development steps we need to take** (Repeated from WS1)**?** Sub questions for each inputted objective: a. Who should be involved in this development step? b. What tasks should be implemented in this step? c. What obstacles need to be solved for this step? d. What should be the outcome of this step? e. How do we measure success? 8. **Anonymous feedback**
Event recording (of full event or of separate event sessions, especially presentations by experts)	Recording of full event.
Content presented and used in the event	• Results from the previous WS
Impact assessment outcomes (consolidated participant inputs)	-
Brainwriting session outcomes (identified issues, consolidated participant inputs)	**Objectives for the IE:** • At least as accurate and reliable as current methods • At least as cost-efficient as current methods **Key findings guiding the selection of technologies:** • Some fish are scared of drones and will swim away • Some fish are scared of light. Use IR instead
Feedback and suggestions (consolidated participant inputs)	No feedback given due to time constraints
Other outcomes directly related to the particular event.	

Annex 1 - Online Demonstration Activities Plan template (DAP)

Topic: **FIE:**	*Technology demonstration for automatic fish stock estimation*
Event overview	*Please, indicate:* • *Title: Determination of the innovation experiment* • *Time: November 8, 2021* • *Platform: Virtual meeting, implemented with MS Teams and XLeap (www.xleap.net)* • *Main technologies that will be presented: No technologies presented yet. This was a needs assessment workshop*
Constraints	*The event was targeted to relevant stakeholders, to which invitation was sent*
Planned stakeholders' groups	*1. Researchers* *2. Fishing economy development organizations* *3. Officials responsible of water body maintenance* *4. Commercial fishermen* *5. Fisheries administration* *6. Officials planning for responsible fishery management and fishing*
Planned number of attendees	*20*
What do you want to achieve with this particular demonstration	*In this 2nd workshop, we shall continue narrowing down the objectives of the IE*
Dissemination channels envisioned	*Personal invitations*
Potential collaboration with other H2020 projects	
Roles and responsibilities	*Please, indicate the organizational team (name and email) – contact points for following topics:* • *Online Demonstration Activity Main responsible – UC coordinator: Sami Jantunen* • *Facilitator: Sami Jantunen* • *Presenter/s: Sami Jantunen*

Feedback from participants	No feedback given due to time constraints.

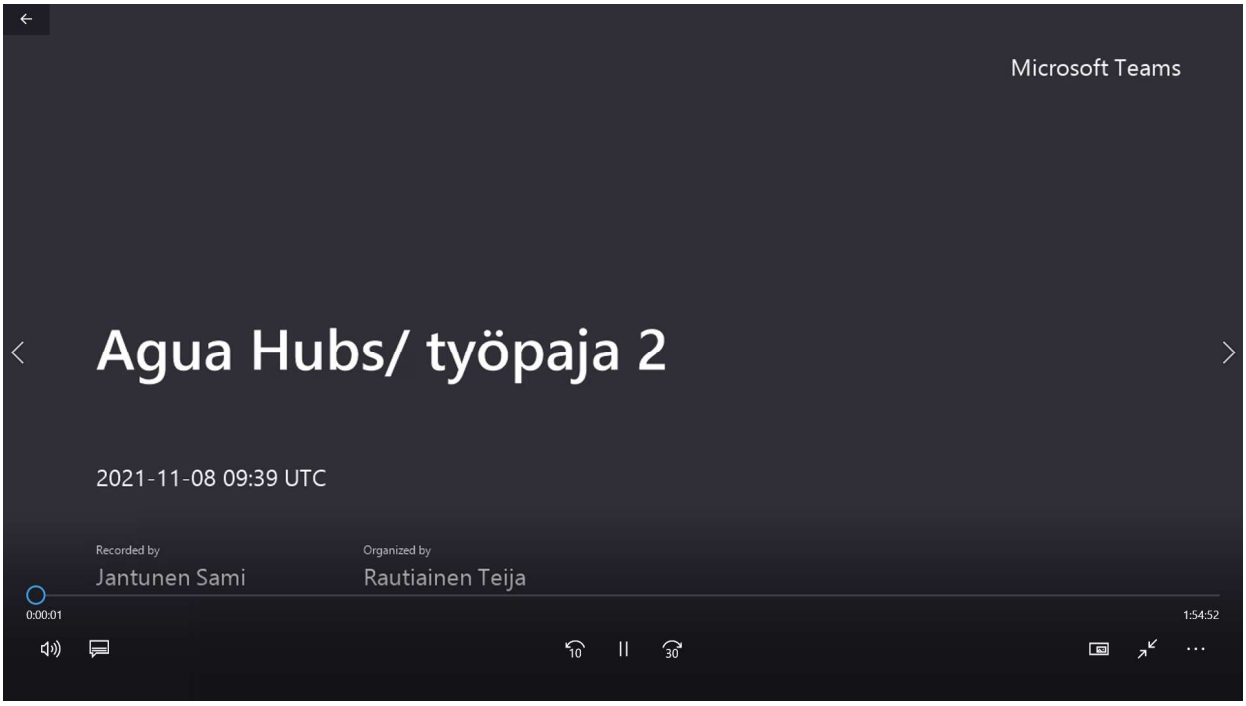
Annex 3 - Lessons Learnt report

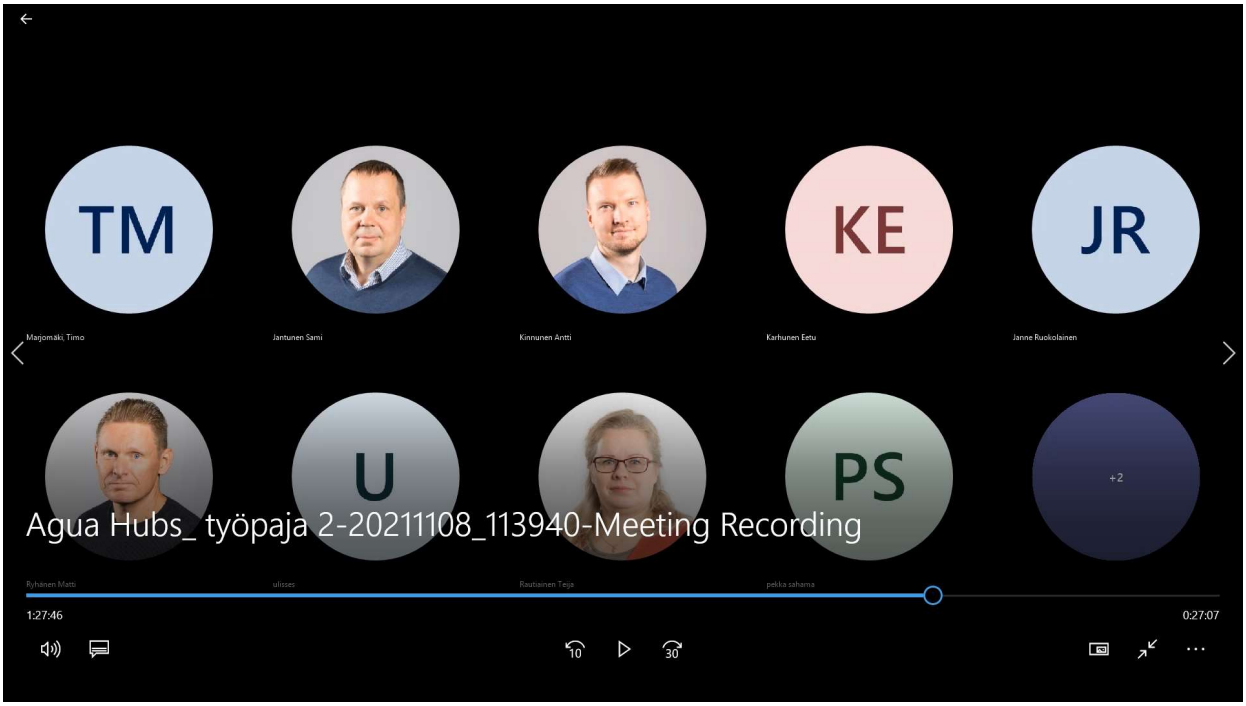
Lessons Learnt report		
DA field	**Highlights**	**Attention points**
Presented solution features – observation (based on interaction with attendees)	• Increased understanding of design constraints of IE	• Some fish are scared of drones and will swim away • Some fish are scared of light. Use IR instead Two primary design constraints: • data accuracy and reliability • cost efficiency
Solution presentation (how, what additional material was used, structure of demonstration, etc.)	• Results of previous workshop were presented	
Communication with stakeholders	• Interactive speaking discussion through MS teams • Collaborative working (brainstorming, voting, etc.) through xleap.net	•
Target audience and feedback		
Total number of participants (from all target groups):	12	
Below, please provide a total number of participants per each target group (feel free to add any other relevant target group)		

Scientific	Industry	Civil Society	General Public	Policy makers	Media	Investors	Customers	Others
7	*2*			*3*				

How will you implement feedback you have received form the participants?	The feedback guided us to implement the IE

Pictures/screenshots from the event.





4. AFC Workshop - Blue bioeconomy and biotechnology – aquaculture and fisheries

4.1 GENERAL INFORMATION ABOUT THE EVENT

Event type: • Workshop Priority area related to the event: • Knowledge exchange and capacity building workshops with IEs held (M07)
Event topic: • Blue bioeconomy and biotechnology – aquaculture and fisheries Organizing partner: • ISMAR Other associated parties: • HGK, FER, UNIDU, UNIZD (TRIESTE, UNIZG FSB), MARE FVG Date of the event: • 28.04.2022. Location of the event: • Dubrovnik

Number of participants:

- 30

Description of participant profiles (with numbers by target group);

Scientific	Industry	Civil Society	General Public	Policy makers	Media	Investors	Customers	Others
13	*3*	*2*	*-*	*9*	*1*	*1*	*-*	*1*

Event abstract (up to 100 words).

- On the first day of the event, a presentation on the role of DIHs in aquaculture innovation and development of project concepts and partnership consortiums for EU funding was presented at the workshop. The participants in the workshop were introduced to the role of DIH and how projects are financed with European money.

4.2 KEY EVENT OUTCOMES AND REUSABLE RESULTS

Event agenda:

Day 1 – 28.04.2022.	
12.00-13.30	Development of project concepts and partnership consortiums for EU funding – workshop – part 1* *In this workshops participants will be divided in 5 different areas of blue economy based on Innovamare mapping. In each of the thematic workshops we will have one EU funding expert and one from scientific research institution that will lead process of development of project concepts.
13.30-14.30	Networking break 2
14.30-15.30	Development of project concepts and partnership consortiums for EU funding – workshop – part 2
15.30-17.00	Presentation of the project proposal concepts
Day 2 – 29.04.2022.	
10.00-12.00	Demonstration activities of marine technologies for participants of Roadshow and public

11.10-11.40	The role of DIHs in aquaculture innovation
11.40-12.00	Presentation of Community in practice about sea pollution

Event recording (of full event or of separate event sessions, especially presentations by experts)

- Attached are recordings photos from the workshop

Content presented and used in the event:

- The role of DIHs in aquaculture innovation and Development of project concepts and partnership consortiums for EU funding

Impact assessment outcomes (consolidated participant inputs):

- Participants are satisfied with the presentation. They got acquainted with the possibilities of EU funds. They plan to apply in the future to develop their projects

Brainwriting session outcomes (identified issues, consolidated participant inputs):

- Based on the analysis of the questionnaire, it is concluded that the participants are satisfied with the proposed solution. They generally stated that the proposed solution could be tailored to their needs. Participants believe that the proposed solution can certainly be implemented in their business. The proposed solution would significantly facilitate their business. It is important to point out that the proposed solution, in their opinion, significantly encourages the development of digitalization in aquaculture, which consequently means overall progress.

Feedback and suggestions (consolidated participant inputs):

- Based on the analysis of the questionnaire, it is concluded that the participants are willing to pay for the proposed innovation. The proposed innovation is, in their opinion, extremely useful, so they are willing to pay to ensure progress in aquaculture. However, there are also opinions that it is important to achieve an affordable price for a wide range of users.
- Based on the analysis of the questionnaire, it is concluded that the most prominent suggestion was to achieve an adequate price for the proposed solution.

Other outcomes are directly related to the particular event.

- Development of potential cooperation on the development of the proposed solution.

Presentation and overview of the key topics of each event:

- The role of DIHs in aquaculture innovation and Development of project concepts and partnership consortiums for EU funding

Qualitative and quantitative analysis of event participant profiles and their relation to stakeholder groups:

- The event was attended by all participants who were planned. There were a total of 30 participants in the event. Since the event was attended by different groups of stakeholders who shared their knowledge from their own point of view, the goal of the project was achieved which aspires to become a compendium of know-how, resources and tools for all relevant to aquaculture and fishery stakeholders.

Analysis and overview of the main outcomes of events in the particular priority area (including impact assessment, issue identification, good practice sharing, collected feedback and suggestions):

- The aim of the project is that the project outcomes can implement practical tools and services that can be reused, available to future IEs, DIHs, CCs, etc. On the demo day, a demonstration of innovation was held based on a live presentation of the implementation. Proposals and suggestions were collected through the discussion. The demonstration served as an example of good practice.

Description of key insights per event and lessons learnt when implementing the chosen event format:

- A presentation was held on the role of DIH and the importance of EU funds in project development. after the presentation, a workshop was held where the participants could see on a direct example how they define important items at the beginning of the project

Description of other event outcomes, community building and reusability of event outcomes:

- Community building was established at the event. The event was attended by all sections of the aquaculture community. Outcomes events can be reused and are fully applicable in the future

Description of compliance with AquaHubs ethics and data privacy policies:

- The event is fully in line with the Aqua Hubs ethic. All data complies with the data privacy policy.

4.3 QUESTIONNAIRE ANALYSIS

1. Based on the analysis of the questionnaire, it can be concluded that the feedback from the participants was extremely positive. Participants generally responded that they agreed with the above statements. Dominated by the answers "I strongly agree". The statement “The product makes the production more transparent” is the only one that participants rated with “Neutral”. The usefulness and benefits of the innovation, the participants rated it as “I strongly agree” which is very important.

2. Based on the analysis of the questionnaire, the participants rated the usability of the presented technology as "very useful" in all three cases. It is important to note that participants rated “lecture” with “Very useful”. It can be concluded that the participants greatly appreciate all three aspects of the demo event.

3. Based on the analysis of the questionnaire, it is concluded that the participants are satisfied with the proposed solution. They generally stated that the proposed solution could be tailored to their needs. Participants believe that the proposed solution can certainly be implemented in their business. The proposed solution would significantly facilitate their business. It is important to point out that the proposed solution, in their opinion, significantly encourages the development of digitalization in aquaculture, which consequently means overall progress.

4. Based on the analysis of the questionnaire, it is concluded that the participants are willing to pay for the proposed innovation. The proposed innovation is, in their opinion, extremely useful, so they are willing to pay to ensure progress in aquaculture. However, there are also opinions that it is important to achieve an affordable price for a wide range of users.

5. Based on the analysis of the questionnaire, it is concluded that the most prominent suggestion was to achieve an adequate price for the proposed solution.

Annex 1 - Online Demonstration Activities Plan template (DAP)

Topic:	**Development of project concepts and partnership consortiums for EU funding**
FIE:	**AgriFood Croatia**
Event overview	Please, indicate: • **Development of project concepts and partnership consortiums for EU funding** • 28.04.2022. • City of Dubrovnik, Student centre DUBROVNIK • Development of project concepts and partnership consortiums for EU funding
Constraints	No
Planned stakeholders' groups	• Enterprise • Chambers of Commerce • Local, regional and national public authorities • NGO
Planned number of attendees	30

What do you want to achieve with this particular demonstration	Inform the general public, come in the local press, represent my organization, represent projects, represent EU funds, arouse the interest of private capital bodies
Dissemination channels envisioned	Social media: • Facebook – Agrifood Croatia • LinkedIn – DIH AgriFood Croatia • Web – AgriFood Croatia
Potential collaboration with other H2020 projects	Inovamare – Interreg Italy – Croatia
Roles and responsibilities	Please, indicate the organizational team (name and email) – contact points for following topics: • Online Demonstration Activity Main responsible – UC coordinator → Matija Bumbak • Facilitator → Matija Bumbak • Presenter/s → Ivana Bujas Rupić • Communication responsible – for local stakeholders and EU/H2020 stakeholders → Matija Bumbak
Feedback from participants	• Usefulness of presented theme • They are satisfied with the possibility of financing from EU funds • They would like to fund their potential projects with EU funds

Annex 3 - Lessons Learnt report

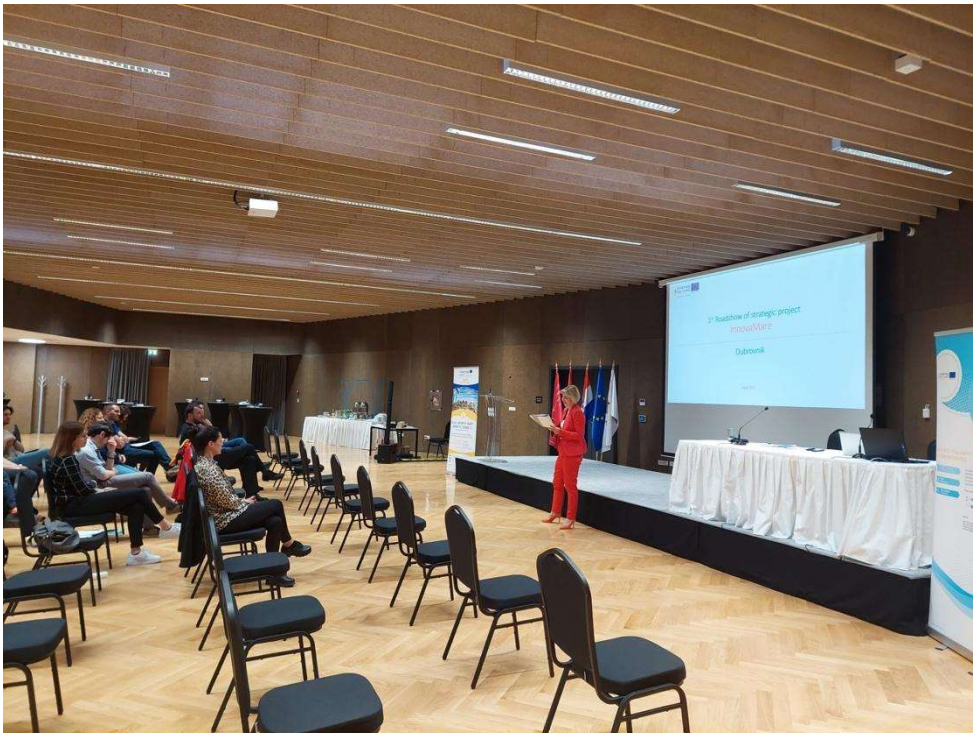
Lessons Learnt report		
DA field	**Highlights**	**Attention points**
Presented solution features – observation (based on interaction with attendees)	**Presentation of the role of DIH in aquaculture. Possibility of financing from EU funds**	**The role of DIHs in aquaculture innovation**

Solution presentation (how, what additional material was used, structure of demonstration, etc.)	**A presentation was held on the role of DIH and the importance of EU funds in project development. after the presentation, a workshop was held where the participants could see on a direct example how they define important items at the beginning of the project**	**The role of DIHs in aquaculture innovation**
Communication with stakeholders	**Communication with stakeholders showed interest in the presented innovation, which was later shown by the analysis of the questionnaire**	**Questionnaire for attendees.**
Target audience and feedback		
Total number of participants (from all target groups):	30	
Below, please provide a total number of participants per each target group (feel free to add any other relevant target group)		

Scientific	Industry	Civil Society	General Public	Policy makers	Media	Investors	Customers	Others
13	*3*	*2*	*-*	*9*	*1*	*1*	*-*	*1*

How will you implement feedback you have received form the participants?	**Realization of potential cooperation in the field of EU funds**

Pictures/screenshots from the event.



IE commercial exploitation strategy

1. Commercialization plan and go-to-market guidelines using DIHs support

One of the main goals of a DIH is to be a critical actor of the regional/national innovation ecosystem. To achieve this goal, the DIH needs to establish and maintain partnerships with actors with complementary competencies and specializations on a regional, national and European level. It should be able to act as a **doorway providing access** to **knowledge** and **expertise** not available locally but **via the network of DIHs across Europe.**

Service definitions. DIHs are one-stop shops acting as innovation intermediaries for the matching of demand and offer of advanced digital services and technologies, in order to support digital transformation processes. At the heart of the DIHs functions is the goal of creating awareness about business or production opportunities with digital technologies and to act as trusted and neutral actors in providing relevant advice.
The DIHs are both a means to reduce search costs for appropriate solutions, by serving as knowledgeable brokers that can analyze someone's need for digitalisation, and to provide appropriate services either through in-house expertise or through a partner. A DIH can

prepare a not very technologically advanced SME, realize its potential and demand suitable technologies from more advanced suppliers.

At the same time the services of a DIH should be complementary to and not replace existing commercial services. A DIH could also choose to dedicate resources to a potential niche and serve a need, by providing something additional that did not exist before. In many regional innovation ecosystems, a large variety of actors and initiatives already exist. Therefore, the introduction of a DIH should not create further fragmentation and complexity, or confusion among existing actors and potential beneficiaries as regards provision of digitalisation services already existing in the region. An important task is rather to map, structure and align different services to make it more coherent to the beneficiary-SMEs, i.e. to better coordinate the offer with a view to satisfy the latent demand previously identified.

The four main categories of services that DIHs can provide to the local SMEs/public sector beneficiaries are:

I. Test before invest;
II. Skills and training;
III. Support to find investment and;
IV. Innovation ecosystem and networking.

Test before invest - The provision of test facilities should be one of the primary and well-defined services of DIHs. DIHs should be able to provide services and facilities to raise awareness and provide access to digital transformation expertise and testing and experimentation facilities so that potential beneficiaries can make better decisions for investments that will help them develop improved new products and services.

The testing services include the provision of facilities for experimentation of hardware and software, where companies and public actors can come and try out new digital technologies that they may want to start utilizing in their processes or incorporate in their services and products. They can also serve as environments where suppliers can showcase technologies for future users, as well as facilities where pilot scale solutions can be tested for development purposes.

Skills and training - An essential part of the DIH services is training and skills development. The DIHs can coordinate with education providers the release of short-term training for workers and internships for students. Activities in relation to training and skills can cover the whole employment spectrum but should be based on an analysis of the regional needs.

The rationale for the DIH to secure these types of training is to overcome incentives issues around who will pay for the training and who will receive the benefit (company or employee, or future employers), and the eventual lack of universities and other public or private training institutions able to provide educational services tailored to the specific needs of SMEs.

Support to find investment - Digital Innovation Hubs should support companies, especially SMEs and start-ups to access regional, national and/or European funding (i.e. ERDF and ESF) to make use of new technologies. This can also include access to public and private financial institutions and investors, including InvestEU and the Enterprise Europe Network (EEN). The support can also be directed towards the public and wider public sector.

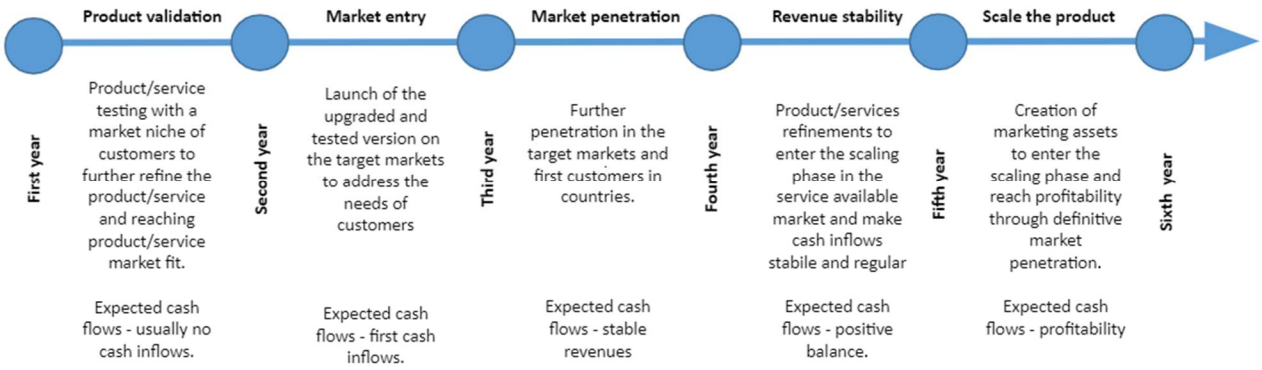
This category of activities also covers finding funding to finance the DIHs' own support activities or to develop a tech start-up company. Financing services consist of different ways to provide funding assistance for digitalisation activities, ranging from provision of subsidized services or innovation vouchers that can help companies procure digitalisation support from external actors, to assisting companies in applying for grants and other forms of R&D support, and to connecting companies with investors.

Innovation ecosystem and networking - DIHs can be seen as platforms that facilitate transactions between users and producers and reduce transaction costs, by making it easier to find what one is looking for, by gathering a wide range of services and goods in one place. Many platforms also have mechanisms to create a secure and trusted environment. The DIH can provide opportunities for actors to meet and initiate collaboration, either spontaneously or in a more directed way. The DIH can be a tool for coordination, but also for prioritization of publicly available support. DIHs can function as platforms and one-stop shops and can provide market and technology intelligence and advice to agencies when they develop new programmes.

In general, all these DIHs offered services for supporting the realization of innovative products/services are identified as - **Commercial exploitation strategy development support.**
The cross-border expertise of DIHs supports Aquahubs project IEs (services/products) and prospective investors in developing the commercial exploitation strategies, business models, value propositions, commercial benefit analysis, investment readiness services and market entry plans of their technologies, products or services.
The guidelines consist of: Go-to-market plan; Distribution and sales channels; Marketing strategy; Customer and end-user relations are described below. The commercial exploitation strategy development support applied to the business models of each IE analyzed during the Aquahubs project.

Go-to-market plan

Go-To-Market Roadmap for new SMEs innovations (products/services) with key actions, stages and milestones:



Distribution and sales channels

Commercialization and introduction product/services on the market is planning through three sales channels:

- **Direct sales** to potential buyers through direct contact at special conferences, conventions and innovation demonstrations. Sales are also planned through direct marketing - emails, letters, calls, social networks, targeted media articles and other means;

- **Sales through specialized organizations**, cooperatives, etc. It is planned to hold demonstration of the service to the main organizations of producers or sellers, offering preferential terms of service (trial versions, discounts) to their members;
- **Sales through local partners and distributors** who have previous experience, expertise and specialization in the market. The special importance of local partners in the markets.

All those channels are specified as B2B and B2C services. Main channel – B2B service sales and indirect end-customer reach:

- Local distributors;
- Integration partners.

Limited channel – direct B2C service sales in the local market:

- Existing customer base – integration with existing products;
- New customers – direct marketing (dedicated website, promotional activities, cold calling).

The cloud-based Progressive Web Application (PWA), available online directly from the users' browsers, is used for the software as a service (SaS) distribution.

Marketing strategy

The overall approach to marketing include:

- direct marketing - emails, letters, calls, social networks, targeted media articles and other ways;
- holding service demonstrations to major producer or seller organizations.

In the beginning, marketing goes into a face-to-face situation with the identified stakeholders, for a specific product/service market.

Customer and end-user relations

Usually in the early phases, the new solution is still to be developed in close collaboration with potential customers. This creates good opportunities for strong direct customer support.

Later, the objective is to offer the product/services and/or SaS on a subscription basis following a model (B2B, B2C). At this stage, customer support services are built as a web-service, enabling constant virtual support to customers.

Most end-customer facing activities (small-scale agri-food innovation demonstration events for farmers, agronomists, suppliers and other related stakeholders) are directly performed by local service distribution partners.
The potential new clients are invited to come onsite to see expected results using the showcase's learning.

DIHs role in Aquahub project

AquaHubs is a cross-border project to strengthen collaboration between Digital Innovation Hubs that are engaged in supporting aquaculture and fishery-focused digital innovation development, demonstration and implementation.

The aquaculture and fishery sector, despite being an essential part of the agri-food industry – which has been developed and digitized significantly during the past few years – and despite the interdependence amongst them, have remained stragglers in the process of adopting the latest developments of high-tech innovations. The low level of digitization of the

sectors prevents them from exploiting in the fullest the crucial elements – such as access to pre-existing technological know-how, targeted end-user outreach, validation, commercialization, etc. – that can lead to their further development, growth and wider impact.

AquaHub project visualization:

AgriFood Lithuania DIH (AFL) has deep and long-term experience as a leading innovation developer for the agri-food and associated industries in the Baltic states. Its focus on advanced ICT domains such as Artificial Intelligence and data analytics, spectrometry and remote sensing, utilization of EO, UAV and GIS-based technologies, IoT and Robotics, distributed ICT systems, industrial ERP solutions, etc, can become a great asset for the aquaculture industry. AFL, as the national EIT Food Hub and as part of a consortium, selected to become the national EDIH of Lithuania, can contribute to the development of the industry but AFL, itself as well, can benefit from this expansion to this new sector, that grows by the day in the Baltic area.

The involvement of the South-Eastern Finland University of Applied Sciences (XAMK) in the project has, also, a lot to contribute to it, since it represents our connective link with the academic and research sector. Our goal is not just to expand the existing technological know-how on a theoretical and research level, but to apply this expansion on real operational environments by the end-users themselves. XAMK will benefit from this process, as a DIH-in-progress institution that is already part of a consortium of competence centers and DIHs in Finland called Robocoast, by coming closer to the real aquaculture market and its stakeholders.

Finally, due to the importance and the size of the sector in Croatia, the involvement of AgriFood Croatia (AFC), can only be defined as necessary and useful. Through the AquaHubs project, AFC aspires to become the reference point of the aquaculture sector in Croatia and

the Adriatic region. Its existing involvement in the industry and its experience on relevant projects and technologies, as well as its position as the future EDIH of Croatia will certainly benefit the consortium itself but the future involves stakeholders as well.

To this end, precisely, the AquaHubs project aspires to intervene and provide the necessary tools through the implementation of three different IEs:

1 Digitization of aquaculture and fisheries, by AFL;

2 Automatic estimation of fish stock, by XAMK and;

3 Spectrometric oyster quality assessment, by AFC.

For each IE the potential innovations and SMEs business concepts were selected and supported during the Aquahub project.

Selected business models conception descriptions are presented below.

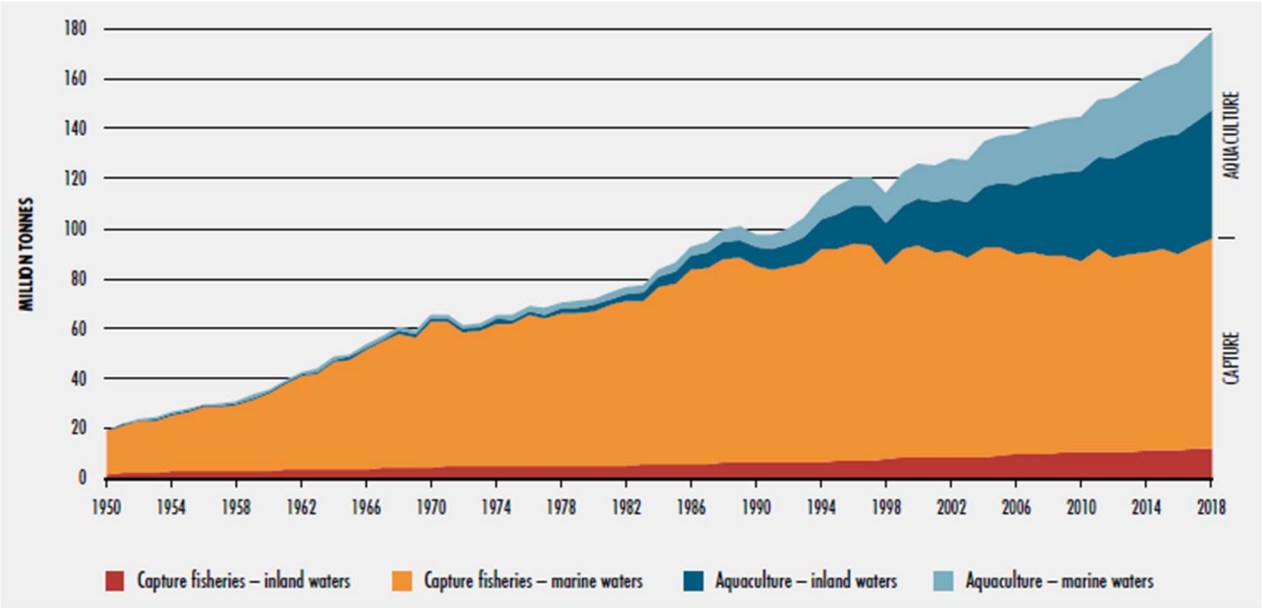
2. IE #1 – Digitization of aquaculture and fisheries (Lithuania)

The goal of the IE #1 is to support R&D&I performing SMEs working on novel digital-based solutions for aquaculture and inland fisheries. The granted support, in terms of specialized and purposeful services, will boost SME product/service innovation and business development capacities and thus will supplement the technology-related support under an ongoing national DIH service development project.

General markets and customers overview

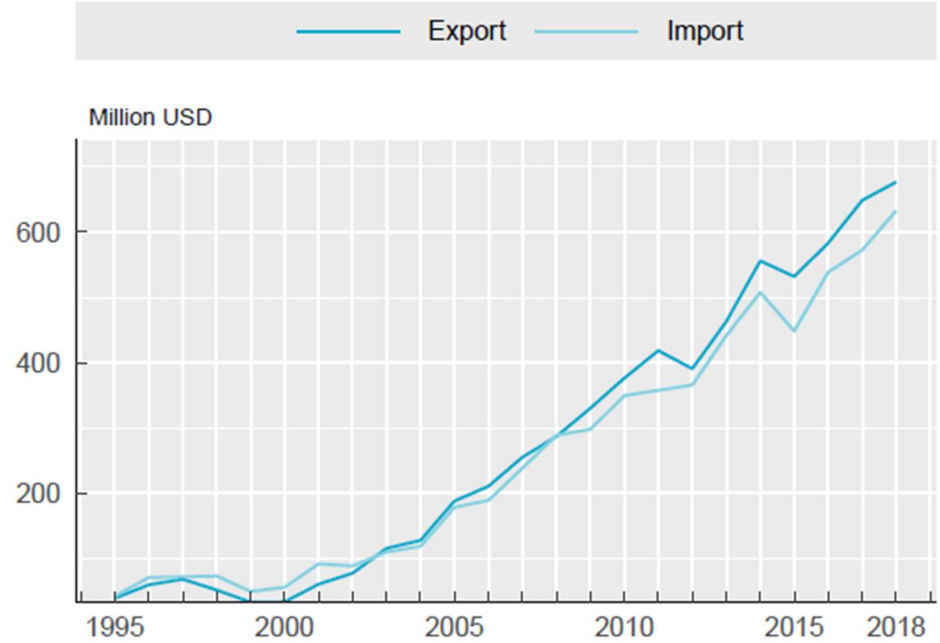
Target market(s). Overview of the main target market and Serviceable Obtainable Market (SOM).
Global fish production is estimated to have reached about 179 million tonnes in 2018, with a total first sale value estimated at USD 401 billion, of which 82 million tonnes, valued at USD 250 billion, came from aquaculture production. Of the overall total, 156 million tonnes were used for human consumption, equivalent to an estimated annual supply of 20.5 kg per capita. The remaining 22 million tonnes were destined for non-food uses, mainly to produce fishmeal and fish oil. Aquaculture accounted for 46 percent of the total production and 52 percent of fish for human consumption ().

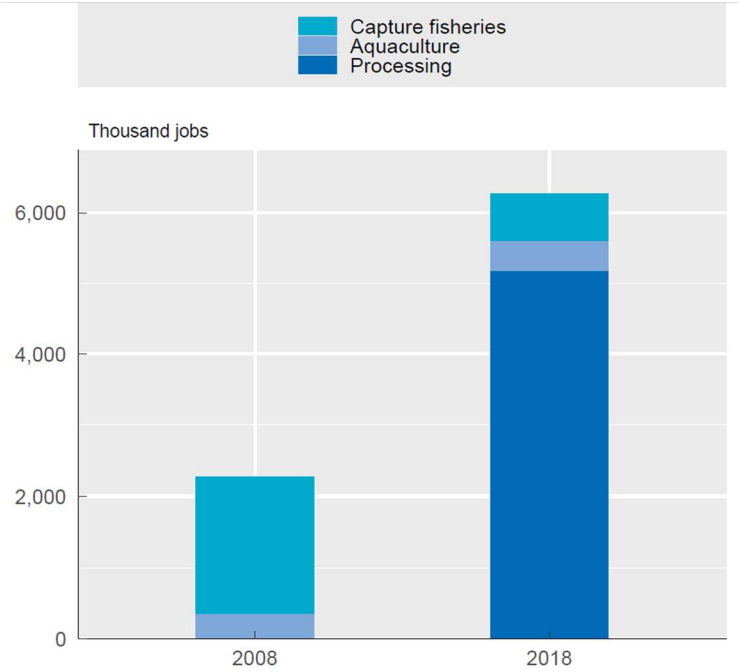
World capture fisheries and aquaculture production:

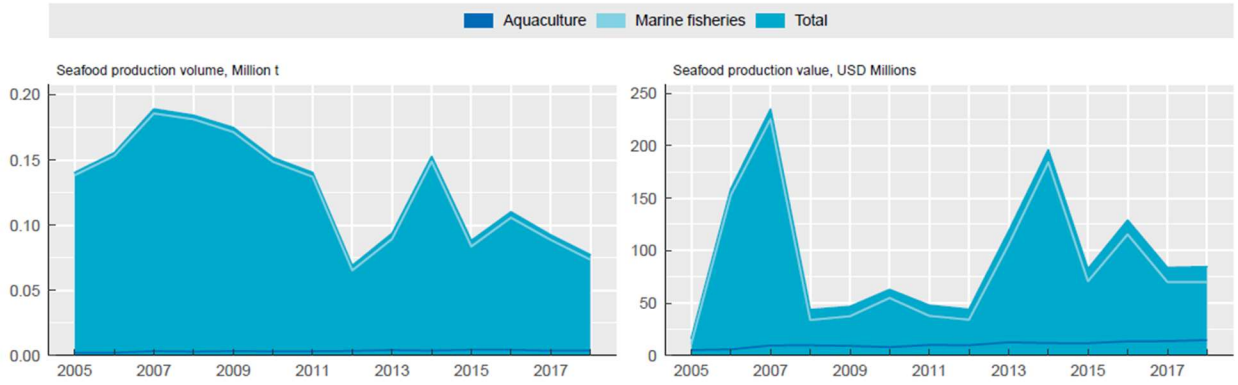


Source: UN FAO SOFIA, 2020

Lithuanian fisheries and aquaculture sector - Serviceable Obtainable Market (SOM):


Export
Import
Million USD
600
400
200
1995
2000
2005
2010
2015
2018

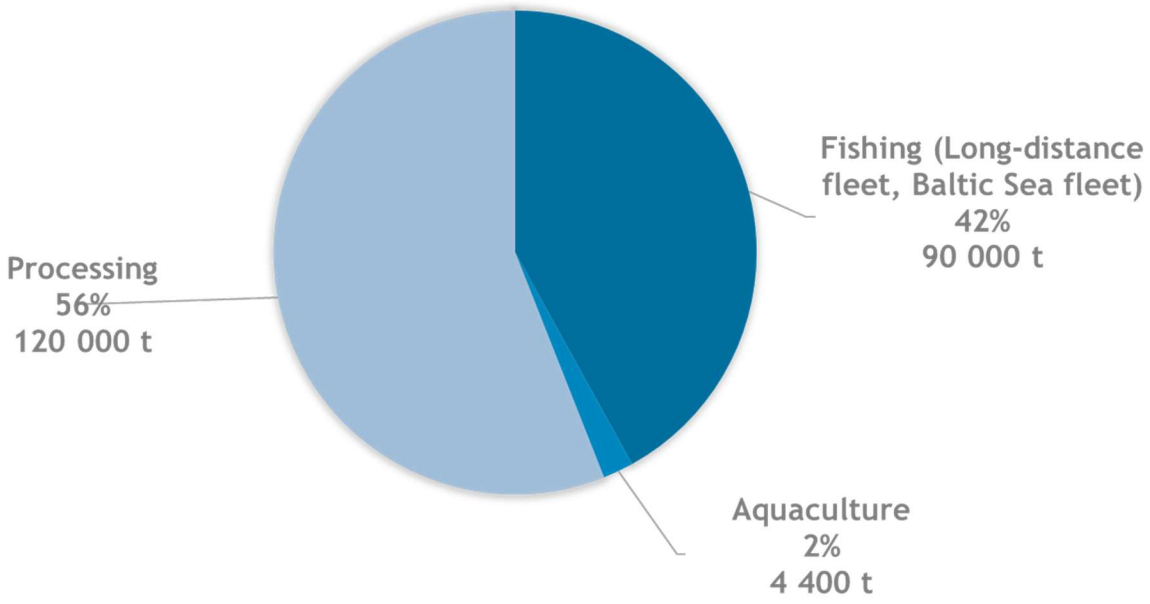

Capture fisheries
Aquaculture
Processing
Thousand jobs
6,000
4,000
2,000
0
2008
2018



Source: OECD Review of Fisheries Country Notes , 2021

- Share of global fisheries production volume (2018) - 0.086 %.
- Share of global aquaculture production volume (2018) - 0.003 %.
- Share of global fisheries and aquaculture exports - 0.437 %.
- Share of global fisheries and aquaculture imports - 0.419 %.

Fishery production (tonnes) (2020):



Source: The Lithuanian Department of Statistics database

Aquaculture production methods:

- Pond aquaculture ~ 81 (%)
- Closed (recirculation) aquaculture systems (RAS) ~ 17 (%)
- Fish farming in pools and canals ~ 2 (%)

Lithuanian aquaculture sector.

61 economic entities that have declared the sale of products (29 Aquaculture ponds and 32 CAS).

The sector employs 433 people (2020)

The area of the stocked ponds was 10045 ha (2020), and the design area of the ponds is 10362 ha, so practically everything has been used.

The volume of installed RAS reached 5618 m³ (2020), and the design volume reached 6634 m³ (2020).

4.0 - 5 thousand tonnes per year are produced of aquaculture production (about 0.3% of total EU aquaculture production).

Aquaculture production has increased by more than 30% in the last 5 years.

The main fish species farmed in Lithuania is common carp (72% of the total amount of aquaculture production and 63% of the total production value).

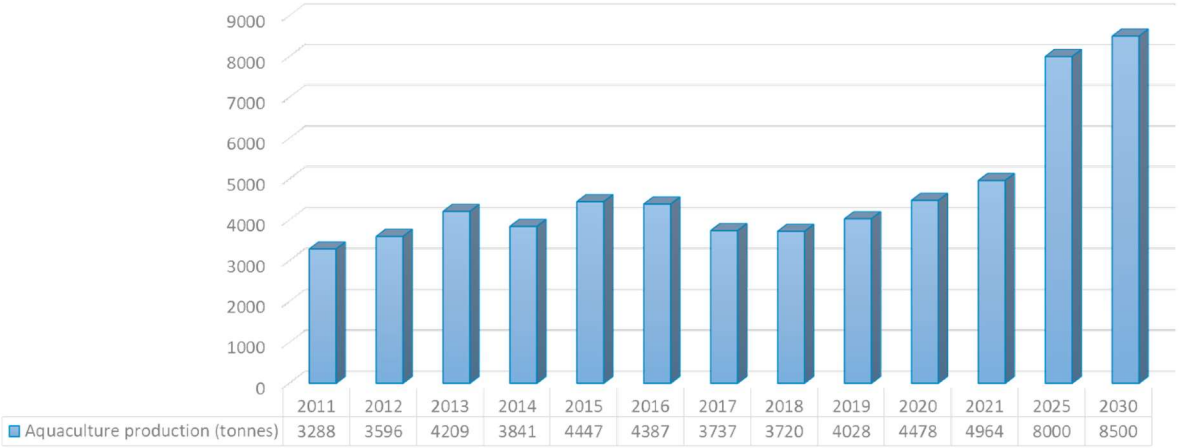
In recent years, RAS have been actively developed and the range of farmed fish species has expanded: rainbow trout, African catfish, eel, and tench.

White shrimp and tilapia are new species that have been grown commercially in Lithuania.

Although the largest share of farmed and sold aquaculture production remains carp (~ 72.5%), this share is decreasing every year (78% in 2019, 74% in 2020), other fish species are increasingly grown in Lithuania.

Amount and value of aquaculture production in Lithuania.

Amount of aquaculture production grown and sold in 2011 - 2021 and vision for 2025 - 2030:



Source: Agricultural Information and Rural Business Center database

The value of grown and sold aquaculture products per year in 2021 - is around 15.88 million. Eur (about 79% in aquaculture pounds and 21% in RAS).

Changes from 2020: Amount (+10.84%) and Values (+12.41%).

89% of aquaculture production was sold in the domestic market of fresh (56%) and processed (33%) aquaculture production in 2020.

Opportunities for aquaculture in Lithuania:

- Sufficient freshwater resources and access to them;
- Favorable natural (including groundwater) and infrastructural conditions for the deployment of RAS;
- The demand for fresh fish and its products in the internal market is growing;
- Long - term state strategy and financing opportunities

Challenges for aquaculture in Lithuania:

- Climate change impacts and seasonality;
- Dependence on energy resources (high energy consumption in production);
- Unstable, changing local and export market, increasing competition;
- Lack of skilled labor;
- Negative consumer attitudes, distrust of aquaculture products.

Objectives of the Strategic Aquaculture Plan for 2020 - 2030:

- Amount of grown and sold aquaculture production (t) +100% (from 4400 tons to 8500 tons);
- Value of grown and sold aquaculture production (Eur) +100% (from 13.6 mln. Eur to 26.5 mln. Eur);
- Amount of ecological aquaculture production (t) +66% (from 802 tons to 1200 tons).

The main goal of Lithuania Fisheries and Aquaculture sector:

The increase in aquaculture production through sustainable production and the supply of raw materials to the processing sector and the supply of high quality fishery products to consumers.

Ecological review

Due to intensive fishing, transport activities and anthropogenic pollution, the sea is highly polluted.

According to EC and THE BLASTIC PROJECT the Baltic Sea is the most polluted sea in the world. There are many rivers flowing into the Baltic Sea which carry waste from the centers of population, from industry as well as from agriculture into the sea. Because the cycle of water exchange in the Baltic Sea is slow and the sea is connected to the oceans through the narrow Danish straits, pollution also damages the seafloor and the shores of the Baltic Sea. The annual blue-green algae beds can also turn the coastal waters mushy on Finnish coast of the Baltic Sea.

In addition to the traditional pollutants, marine litter is widely discussed throughout the world, plastic waste in particular. We see shocking pictures of plastic waste swirls in the Pacific and in the Atlantic Ocean.

In the plastic waste swirls around the world's oceans there are packages, clothes, plastic bags, bottles and cans swirling and grinding into micro-plastic particles. Micro-plastic causes multiple problems, among others in the marine food webs. Aquatic organisms from zoo plankton to fish and mammals mistake inedible plastic waste for their food. Due to the lack of food in animals eating plastic they cease to grow and suffer from health problems. The chemicals dissolving from plastic pass through the muscles into carnivores.

The problems of the Baltic Sea include various drug and hormone residues that can lead to reproductive problems in biota. Sterile fish suffering from hormone disruptions have been found near Helsinki coastline where the hormone residue levels are peaking. It is almost impossible to clean the hormone residues from the waste waters but they also easily translocate in human nutrition through seafood.

In addition to trash and drug residues, also anoxic seafloor areas and eutrophication damage the Baltic Sea. The load should be reduced in all the Baltic Sea cities by building effective purification plants. The diffuse pollution from agriculture can be prevented by building buffer

strips, for example. In fish production they try to prevent unnecessary nutrients from ending up in the sea.

The Baltic Sea with its multiple problems needs a variety of detailed measures, but also a strong commitment to the protection of the sea from all the Baltic Sea coastal states. The EU Sulphur Directive has reduced sulphur emissions from shipping, and the systematic collection of bilge water in the ports has reduced draining bilge waters into the sea. The waste management in ships requires further development.

Fortunately, today that is an old-fashioned view. Now everyone understands that the economy is not healthy when the clean environment is destroyed. The Baltic Sea is one of the most polluted seas in the world, but it is surrounded by countries that are among the most prosperous in the world. Now is the time to fix the damage we have caused to the Baltic Sea – and to prevent new damage

Therefore, innovation and digitisation are needed to aim for aquaculture and fisheries sectors and ecological sustainability goals.

R&D&I beneficiaries

Overview of the main research (innovative experiments) of novel digital-based solutions for aquaculture and inland fisheries (Lithuania inland lakes and Baltic sea coastal region).

Digital and innovation technologies in Lithuania aquaculture sector:

Technological solution	Description and requirements
Recirculating aquaculture systems	Mostly installed indoors. Ability to control most environmental conditions. Possibilities to grow in high densities. Disease prevention and control. Replaces the water circulating in the system for 5-20 % in 24 hours. High equipment costs.
Marine aquaculture systems	Temperature 28-30 ° C Salinity 15-20 ppt Oxygen level 70-100% pH 7.6-7.9. Growing time 3.5 months.
Shrimp tower concept	Indoor pool with intelligent monitoring and control systems. Innovative feeding system. For large shrimp farms.
Aquaponics system and digital components	Symbiotic system of fish, plants and microorganisms.
Use of ozone in aquaculture	Ozone is used not only in marine but also in freshwater aquaculture systems.

	Functions disinfect, bind fine suspended particles, increase the amount of O2 in the water, oxidize NO2 to NO3. Automatic dosing.
Digital and automated technologies of fish transport, sorting and counting	Fish transport pumps; Fish sorters by size; Fish counting.
Digital and automated feeding systems	Feeding robots; Rotary; Pneumatic; Belts; Pendulums.
Digital and automated water quality, equipment, fish monitoring systems	Sensors for water parameters (temperature, dissolved O2 content, pH, ORP, REDOX, CO2, TGP, salinity). Equipment performance monitoring. Water level sensors. Water pump sensors. Camcorders. Alarm systems (GSM modules, apps).

Experience and potential of science:

Vytautas Magnus University (VMU) is one of ***Agrifood Lithuania DIH*** research and science partners. Aquaculture center is part of the VMU R&D infrastructure component.

A complex of closed recirculation systems was established (Laboratories for Fish Breeding and Fish Farming) in **Aquaculture Center 2015**. Analytical research equipment was acquired, the infrastructure of the center was developed with **business partners** (laboratory for cold water fish breeding, experimental fish farming system, various technological equipment, aquaponics system).

Aquaculture Center research themes of digital innovation and potential technological prototypes for aquaculture and fisheries industries:

- Research on the physical-mechanical, taste and nutritional properties of fish farmed at the Aquaculture Center through the application of various biotechnologies and the introduction of methods to improve fish meat.
- Feasibility studies of microwave freezing of fish products
- Development of aquaponics systems, increasing their efficiency
- Influence of different spectrum LED lights on the rearing of various fish in closed circulatory systems.
- Development and modernization of closed circulatory system (RAS) equipment (tanks, erlifts, drum filters, membrane filters, fish counters, fish sorters, incubators, filters, etc.)
- Energy saving measures and their application in aquaculture, alternative energy use options

- Fish and shrimp feeding equipment (pneumatic cannons, automatic, mechanical feeders), its development and modernization
- Oxygen, air, ozone injection equipment (aerators, low-pressure oxygen injection equipment, high-pressure oxygen injection columns, nano-, micro diffusers).
- Water quality sensors, flow meters, their development or application from other fields
- IT and Internet of Things, GIS and software solutions in aquaculture systems
- Underwater video cameras, underwater fish calculators
- Investigation of the influence of lighting on fish growth, photoperiod formation, use of different spectral light for fish farming

The main functions and activities of the center:

- Develops, adapts and promotes new technologies for the production of aquaculture;
- Prepare projects;
- Carry out water testing;
- Prepare the hardware;
- Close collaboration with business partners.

Overview of the main developers (SMEs) and stakeholders of novel digital-based solutions for aquaculture and inland fisheries (Lithuania inland lakes and Baltic sea coastal region).

Growers and producers:			
Name	**Description**	**Web site**	**Region**
Local Ocean	*Local Ocean* is a 100% European Aquaculture Technology company based in Lithuania dedicated to developing the most sustainable and eco-friendly farming method/technology to grow high quality shrimps for the European local market. *Local Ocean* are R&D and Digital Farmers.	http://www.localocean.eu/	Lithuania (Baltic region)
Arvydai, JSC	Pond Aquaculture: Total - 519.1 ha: certified - 288.12 ha, of which 284.52 ha are stocked. Grows organic commercial live fish - carp, starlings, white grass carp, brown bream, pike, tench, crucian carp. Carp, crucian carp, ropes, starlings, grass carp and brown squirrels are sold for stocking commercial ponds. Wholesale fish.	https://arvydai.lt/	

NORAS LT, JSC	Noras have developed a recirculation aquaculture system (RAS) system to grow Arctic Charr in a sustainable and environment friendly way to deliver the finest quality, never frozen, fresh fish to our table. Currently, *Noras Watertech* and *Noras LT* have formed a partnership to establish a RAS farm in Lithuania with an annual fish production capacity of 1500 Ton for Arctic charr in Klaipeda. The project is ongoing with phase 2 just completed with a capacity of 300 Ton. Phase 3 for grow-out is expected to begin soon.	https://noraszuvys.lt/en/about-us/story/	

Technology developers:			
Name	**Description**	**Web site**	**Region**
Spektrolabas, JSC	Spektrolabas Ltd. (website https://www.stopfakefood.com/) is an AgriFood technology research, development and innovation company. Spektrolabas is a technology and competence partner at the Digital Innovation Hub 'AgriFood Lithuania', as well as is actively engaged in collaboration, co-creation and innovation activities with governmental, scientific and business partners. Developer of Raman & Neural Network Methodology to determine traces of formaldehyde in fish.	https://www.spektrolabas.eu/index.html	Lithuania (Baltic region, Europe and the Middle East)
PureOceans	Focusing on Deep Water Rehabilitation. On a mission to remove pollutants such	https://www.puroceans.com/	

	as oil sediments and microplastics from the water bodies' seabed without harming the environment and avoiding any chemical treatment or process of excavation. Winner of the HACK Digital SEA'21 (organized by Agrifood Lithuania DIH). In the category of the most advanced solution, with their technology solution that cleans rivers and seabeds from 98% of oil and microplastic pollution.		Latvia (Baltic region)
NORAS WATERTECH	*Noras Watertech* specializes in the design and installation of a recirculating aquaculture system (RAS) and water treatment management systems. RAS designs and pilot study trials are carried out at the headquarters in Norway. Noras cooperates with local partners to establish RAS farms locally	https://www.noras-wt.com/about	Norwegian (Baltic region)

Government institutions:			
Name	**Description**	**Web site**	**Region**
The Fisheries Service under the Ministry of Agriculture of the Republic of Lithuania (hereinafter referred to as the "Fisheries Service")	Tasks of the Fisheries Service: To implement a rational fisheries policy of Lithuania and the Common Fisheries Policy of the European Union (hereinafter – EU). To investigate, protect, restore, and increase fish stocks in the fisheries waters.	https://zuv.lt/about/?lang=en	Baltic region (Lithuania)

	To protect a gene pool of valuable fish species and cultivated fish species, to develop and coordinate selective breeding fisheries. To maintain liaison with EU institutions, national and international organisations and scientific institutions in developing fisheries. To implement education and training policies in the fisheries sector. To participate in formation and implementation of the Lithuanian fisheries development strategy. To control fisheries in the marine waters.		

In general, the support to stakeholders is based on DIH services:

- Collaboration - Stakeholder ecosystem building and synergy creation
- Knowledge Transfer - Facilitating international technology, competence and know-how transfer
- Innovation Co-Creation - Supporting R&D project development and funding accessibility
- Use Case Validation - Solution prototyping, end-user testing and market need assessment
- Commercialisation - Innovation business development and investment readiness services
- Mentoring and Training - Supporting upcoming talent and fostering innovation growth

The Potential EU SMEs commercialisation business concepts descriptions are presented below in Annexes.

Annex 1 - IE #1 - Business concept description (LocalOcean)

Annex 2 - IE #1 - Business concept description (PurOceans)

Annex 1 - IE #1 - Business concept description (LocalOcean)

Product or service description

Local Ocean is developing a unique shrimp farming solution (hardware + software package), merging and adapting low-cost shrimp production methods from outdoor pond farming and indoor RAS (Recirculating Aquaculture System) fish aquaculture technology best practices, to create a fully sustainable, low cost, high yield shrimp production solution on a small footprint.

Our hardware has a unique architecture specially developed for shrimp growth cycle and is managed by our bespoke software that controls and constantly optimizes the growth process using AI; business process and the water chemicals parameters to mimic oceanic sea water parameters.

Our system is an indoor aquaculture architectural innovation that will positively impact the creation and scale up of the European shrimp aquaculture industry by allowing a strong growth in production capacity at low infrastructure investment costs.

Local Ocean system is a level 3 innovation and existing shrimp farms will have to retool their existing farm with Local Ocean system and adopt our Standard Operating Procedures to achieve the expected results. For New farms, Local Ocean systems will be low-cost, quick set up alternative solutions to contracted or self-developed solutions but with guaranteed results and quick ramp up.

Our system requires x5-10 inferior construction and running budget compared to RAS farms since it does not require standard RAS equipment like bioreactors, protein skimmers, water pumps, water exchange, Oxygenation tanks and Ozonation systems, to function. Our hardware system coupled with our software and Operating manual is easy to install, setup, maintain and operate with already better than average production results.

Our system is designed to maximize floor occupancy (rectangular shape compared to round) and for allowing continuous production of shrimps all year round: up to 11 cycles (harvests) /year

Our standardized system gives the possibility to local Europeans to grow shrimps at scale anywhere and cost efficiently to kick start the industry for better food security as well as the possibility to consume shrimps at fresh state compared to frozen.

Our system also produces high quality shrimps with none of the environmental drawbacks from classic shrimp farming: no mangrove destruction, no water pollution, low carbon footprint, traceability of food, no chemicals, no hormones. All our waste is recycled or transformed into added value by-products like chitosan, biogas or soil fertilizer.

Our project is aligned with several UN SDG themes: 3,9,11-14. All these goals will benefit from the adoption of our technological solution.

Key exploitable components

Identification of main components of the overall solution that could be exploited fully or partially independent:

Component	Component description	Exploitation potential description
Stand Alone shrimp tank system	• Plastic sea water grade tanks • Water pumps • Water parameter sensors • Heating system • Aeration system • Feeding system • 15x3.4m footprint	To be used to continuously produce shrimps in indoor facilities on small footprint
Shrimp production software	Aggregate data points from: • water sensors, • feeding protocols • biomass estimator • Standard Operating Procedures • Chemical balancing equations	In conjunction with the hardware, the software manages the production growth cycle constantly optimizing biomass production potential through a step by step operational guide for the operator

Markets and value proposition

Target market(s) (Serviceable Obtainable Market description and Value propositions). Growing shrimp indoors is the only solution available to Europe and we are bringing to market a very different product than the classic fish aquaculture solution: RAS farms. We focus on developing a low cost product that can be installed on any warehouse type building, with little adaptation.
If Europe is only 1% of global aquaculture output, investments in local sustainable aquaculture are accelerating, supported at different levels by EU, States, localities, retailers and consumer demand.

The growing interest in growing shrimps indoor at scale in Europe represents a great opportunity for our technology to attract pioneer customers. However, should Local Ocean system reach the market too late to benefit from these early adopters' projects, it will be a commercial threat to our development strategy to become a tech leader and standard in the short term.

Since our main customer segment are companies within the aquaculture industry, having financial resources to invest in shrimp production capacity and a clear Blue Ocean Strategy to break the value-cost trade off: Our innovation is Niche Market targeted.

We identified some 50 companies in Europe in line with our primary segment and have approached some with positive feedback on their interest in growing shrimps.

Customer or end-user profile

Customer group(s) their profile and needs description:

Customer (end-user) group	Customer profile description	Customer needs and requirements
Fish Farms	Already producing fish at scale, they want to diversify the species grown in their facilities	Need an easily transposable knowledge transfer from current method to shrimp farming methods
Shrimp farms	Already producing shrimps at a loss or newcomers to the shrimp farming industry.	Need a cost effective, scalable, yield efficient solution to grow shrimps at scale
Fish farm engineering companies	Already in the business of engineering fish farm constructions, their previous shrimp farm are not providing sufficient results in term of production yields	In need of a shrimp farming expert partner to incorporate a valid shrimp farming design option to their range of services

Customer willingness to pay

Description of customer willingness to pay for the product or service (value <-> needs matching):

Customer (end-user) needs	Value proposition	Customer willingness to pay explanation
Fish farms	Easy to install hardware component in existing facilities without the need of heavy refit investments, easy current fish farm personnel transfer to shrimp activity	Shrimps wholesales prices attract a high premium on the market compared to commonly grown fishes. The market is also void of competition for shrimp specie aquaculture in Europe
Shrimp farms	Cost effective shrimp growing option, X10 cheaper to fit and run than existing RAS solutions	Predictive, stable, continuous shrimp production allows them to shift their balance from red to black.
Engineering firms	Easy to sell, reliable and proven technology package to grow shrimps	Off the shelf product range composed of standalone, plug and play hardware and software packages ideal to increment their product & services range.

Business strategy

Description of the overall business model, strategy and its main components and distinctive features.

Local Ocean is the only shrimp farming facility in Europe (and in the world), with a clear strategy of offering its technology to third party clients.

All systems sold will be of standard size operated by the same software. It is then cheap and easy to manufacture, fast to deploy and convenient to update for all users to benefit from process improvements: we are a "plug and play" solution.

Our commercial business model is also innovative as we adopt a license fee based on the number of systems in operation by the customer: we are a "plus and play" solution, compared to heavy engineering solutions and contracts with multiple stakeholders for ongoing operations.

We are what Apple is to computers: we provide an indissociable Hardware + Operating System to farmers for the best in the market performance. Our system also produces high quality shrimps with none of the environmental drawbacks from classic shrimp farming: no mangrove destruction, no water pollution, low carbon footprint, traceability of food, no chemicals, no hormones.

Pricing strategy

Description of the approach to product/service pricing.

Hardware: sold per system or leased as ready to use (just add water and shrimps). The hardware can be purchased by the units. We however plan to offer farm engineering services to centralize some of the machinery (aeration system, feeding systems, heating system, water treatment) for reduced investment and running costs. We will then help our client design their shrimp farming facility

Software: to be licensed per system in use: fixed price / system/month to access the system data and operation protocol (the software is cloud based so clients will benefit from regular updates to enhance their productivity further).

Revenue model

Main revenue streams.

Hardware: 20k euro per system shell

Software 120 euros/month/system in operation

Commercialization plan

Go-to-market plan (Key actions, stages, milestones):

2022: finalization of software and system architecture

2023: commercialisation to pilot farms (1-2 new clients)

2024: European market penetration: (4-6 new clients)

2025: break even point reached (+10 new clients projects)

2026: internationalization with project outside Europe

Distribution and sales channels

Identification of main channels for product/service sales and commercial exploitation - direct sales through business development, trade shows and word of mouth.

Marketing strategy

Description of the overall approach to marketing. Using the learning of our showcase farm in Lithuania, potential new clients will be invited to visit our high intensity farm to prove that our architecture delivers the results expected.

Customer and end-user relations

Description in relation to customers and customer support. For new clients, they can just purchase our stand alone units or benefit from our engineering team to design their farm layout.

Local Ocean will then for each client provide adequate system training of management and staff, as well as on site breaking in onsite support. Once the facility is up and running, online/visio customer support will be enabled and paid for though the licensing contract in place.

Parties, partners and stakeholders

Exploiting parties (Key exploitation partners, Stakeholders and relevant parties):

- Tank system assembly will be through partners as well as ancillary items sourced from various suppliers (water pumps, sensors, etc).
- Cloud servers (AWS/Azur/other) partners will be selected to host our client data.

Costs and resources

Cost structure (Description of foreseen costs incurred on product/service sales, delivery, maintenance, etc):

Cost category	Cost description	Estimate annual costs
Software development	Development, project management and aquaculture team salaries, freelancers fees (front end design and UI/UX, 3 D modeling)	180,000.00
Hardware prototyping	Hardware manufacturing, water sensor equipments, pumps, filtration, heating	120,000.00
Solution testing	Purchase of Post larvae (baby shrimps), feed, probiotics, laboratory analysis, utility expenses (electricity and wood pellets), experimental space allocation	45,000.00

Internal resources. Our team dedicated to the development of technology is already almost complete: data analytics, aquaculture team and back-end software team is already operational with the exception of an additional software developer. We are looking to strengthen the team shortly on the front-end and design side as well as for 3D designing. Since the sprint is required for a short amount of time, we will use freelancers in that part of the project.

On the hardware prototyping side, we are already renting an equipped and operational shrimp farm, have several prototypes in operation but need to have pre-production models manufactured and tested to validate our R&D. This testing of the pre-production model will involve usage of space, energy to operate and test growing in real condition of shrimps over enough cycles to validate the software and hardware efficiency. Shrimps will be grown and sold to be leveraged against the testing costs.

Business prospects

Business development scenarios. Over a 3-5 years period, we expect to reach TRL9 for our system. In the optimistic scenario, TRL 9 will be reached within 12 months from funding and the target shrimp growth KPIs will be reached with first pre-production model prototypes. The realistic achievement of TRL9 shrimp growing solution will be attained within 3 years and several iterations of prototypes until finding the right final design. The pessimistic scenario would be that after 5 years, we would have been able to reach our target KPIs or that a competing solution delivers better than our system results.

In terms of commercial development, we already have shrimp farm projects identified as interested in using our technology. The optimistic outcome would be that these 2 projects sign with us within the next 12 months to guarantee our commercial launch. Realistically, and with the attainment of TRL 9 stage in the next 24 months, we expect to equip 6-10 farms in the next 5 years and achieve breakeven point.

Business risks and risk mitigation

Identification of main business associated risks and mitigation strategies:

Risk	Risk description	Risk mitigation strategy
Solution development risks	Not achieving our set productivity KPIs with our hardware and software solution	Development of a more classic shrimp growing methods using large indoor ponds
Better commercially viable solution	We are developing a full indoor solution working in extreme weather conditions. We know of several shrimp farming development working in countries like Spain and Italy	Refocus commercial development in eastern and northern Europe and North America, where we could have a better commercial advantage with a more adapted product in cold countries
More cost-effective solution made available	New competition entering the market with a cheaper to own and operate solution	Try to merge their product offer with our state of work to create a definitive USP on the market and share resources to develop the industry more quickly and secure market position.

Change management

Our hardware and software will constantly be optimized by our team: new functionalities of software will be made available to all our clients via cloud updates so they all benefit from protocol updates. We are to offer hardware owners regular product updates and upfitting to ensure they can keep upgrading their production KPIs like dead shrimp catcher, more efficient water pumps and filtration systems, and additional equipment to further automate their production.

Our solution will evolve regularly and customers will benefit from these updates. Some of these updates will not be software and hardware related: We expect to provide additional services to our customers in time like providing them with Post larvae (baby shrimp) genetically selected to operate well in our hardware environment, we would also make our customers benefit from grouped purchase for raw material (salt, chemicals, probiotics) and feed to reduce their COGS to improve their bottom line,

Finally, Locally Ocean brand name is a deposited trade mark across Europe and our customers will have the possibility to sell their product under our brand name and benefit from our negotiated contract with major European retailers, ensuring a secure distribution of their production at negotiated prices, saving them all of the commercial and marketing development costs.

Business Model Canvas

Key Partners	Key Activities	Value proposition	Customer relationship	Customer segments
1/Plastic tank manufacturers: LZT and Plastic Formo 2/ water sensors: Oxyguard 3/ shrimp experts: N. Scalise, White panther	1/System production management with subcontractors and key partners (final assembly) 2/ client farm construction supervision 3/ system commissioning at client farms (set up, ramp up and staff training) 4/ client support (technically and commercially) 5/ R&D to further develop the solution	Offering to client a simple, automated and stand alone indoor shrimp farming solution to produce shrimp cost effectively in Europe	We will assist our client every step of the way: 1/ blue print design of their shrimp farm taking into consideration their geographic and production volume specifics 2/ assist in the setting up and ramp up of their operations 3/ provide staff training in operating a shrimp farm 4/ enable client to license Local Ocean brand to	We are clearly a B2B company dedicated to aquaculture companies. Our solution is only adapted to fish and shrimp farms as well as newcomers to the aquaculture industry. Our solution can be used as a single unit for small private production and

			sell their production	also at large scale with banks of systems in a dedicated area for volume production.
	Key resources		**Channels**	
	1/Hardware and software development and IP protection 2/Hiring and keeping key staff 3/development of shrimp production farm network 4/ Local Ocean brand protection		We are planning on communicating directly with existing fish and shrimp farms to convince them to use our tech. Presence in trade shows, social media and European press is also vital to generate inbound enquiries from new comers. Finally, we are going to partner with fish farm engineering firms to be their shrimp farming solution. This will constitute our indirect sales channel	

Cost structure	**Revenue streams**
For the system: Our system is composed of a stand-alone hardware (tank system) manufactured by partners upon specification. The hardware is then equipped with heating, aeration, filtration systems bought on the market (many suppliers of each item). Finally, the tank is equipped with standard water sensors from our partner. The software is a Saas software working from any commercial computer, tablet or phone The commercial development of our system is to be done by traveling senior sales executives, presence to trade show and	1/ Customers will pay a one time set up costs for the design supervision of their farm (our team will help with the blueprint design according to their project scale), including a farm ramp up and staff training. 2/customer will then purchase or lease the hardware equipment to produce their shrimps 3/customer will pay a software license monthly fee according to the number of systems operated (MRR) 4/ customer will be able to request on site consulting assistance, further (new staff) training

specialized conferences, targeted advertising and press opportunities.	5/ With the development of our business, customers will be able to purchase centrally their PL, feed, and other raw materials from our central purchasing department.

Annex 2 - IE #1 - Business concept description (PurOceans)

Product description

PurOceans Technology is a deep-tech startup that develops an innovative technology to clean up bottom sediments from oil, oil products, microplastic, and other hazardous sediments.

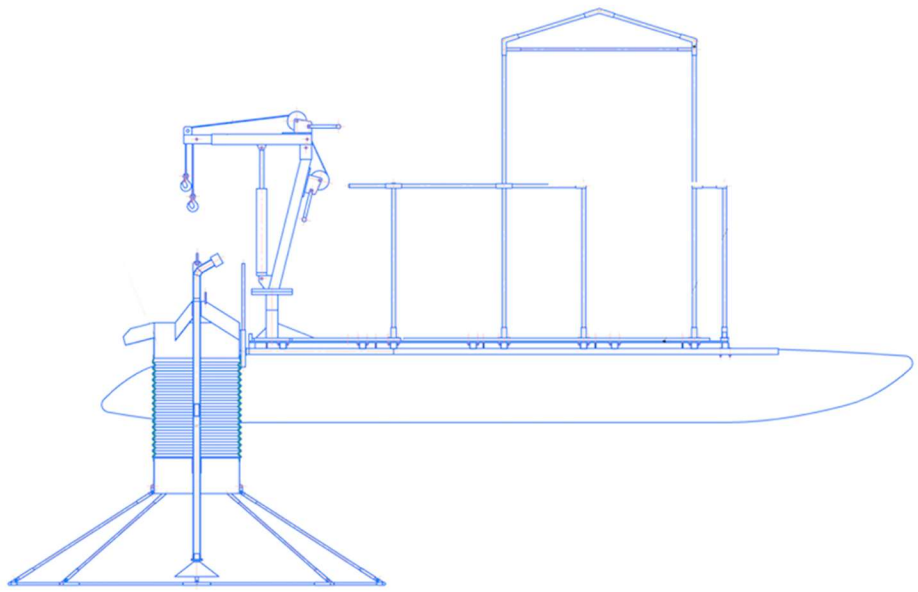
Most of the time, after the pollutants are leaked and reach the water surface, 60% of it sinks down to the bottom. It happens due to natural physical events, such as evaporation of light elements, and sinking of the heavy elements, whose density is greater than water's. The speed of evaporation of light elements and sedimentation of heavy ones is very much dependent on the weather and environment conditions (e.g., sun, wind, salinity of water, etc.).

By the time when the relevant machinery is dispatched at the spot and the leakage is localized, those 60% of heavy elements are already residing at the bottom.

Unlike the competitors, our technology doesn't use the mechanical excavation of soil, electrochemical treatments, and other unsafe solutions. All it uses is ambient air, that is pumped down to the bottom and breaks-down the bonds between the hydrocarbons into smaller particles. Due to the laws of physics, and buoyancy force in particular, the air is less dense than surrounding water, hence, it floats up, and on the way up – it drags the particles of the pollutants with it. In other words – we make the pollutants float up to the surface without even touching it. When it reaches the surface – we safely collect it and prepare for the further utilization/recycling.

It's well known that the utilization of the underwater pollution usually costs a fortune due to the fact that the pollutants are usually excavated with all sorts of substances (sand, rocks, algae, etc.).

Whatever we lift – is a pure product (oil, microplastic), free of other elements that are not supposed to be lifted and belong down there. Hence, it won't require the utilization. It's the other way around – it can be sold as a raw material which will be used for the production of the secondary products. Therefore, the cost of service is much less than it's offered by the competitors.



Key exploitable components

Identification of main components of the overall solution that could be exploited fully or partially independent:

Component	Component description	Exploitation potential description
Boat	Floating base that is able to support the equipment + 3-4 operators.	
Pump	The pump that can create a correct water-air mixture, and strong enough to pump it down.	
Submersible construction	The submersible construction is one of the main elements. It must be stable, extendable, and easily operable.	

Markets and value proposition

Target market(s) (Serviceable Obtainable Market description and Value propositions). The global oil spill management market size is expected to reach $177.63 billion by 2025. Our road to market is divided into two parts:

As of now, we plan to begin as a service provider for any client that is willing or obliged to pay for the clean-up of the bottom sediments. Amongst the clients we have:

- Ports
- Oil & Gas companies with off-shore or on-shore (near water bodies) operations
- Manufacturing companies that happen to dispose substances into the nearby waters
- Urban Water Treatment Facilities
- Local authorities
- Ministries of the Environment

- Logistic companies (responsible for the spill-offs)
- Water Cleaning Companies
- Others…

Currently, almost each of the clients can fully use our services, except for O&G companies that operate off-shore, as the maximum depth of our operation currently is limited at 25 meters. However, with the attracted investment the depth will be increased for up to 300 meters, and more (with alternative methods), which will allow to include them into the list of serviceable clients.

Later on we are planning to launch the Sales/Lease BM, that will allow us to expand by selling our equipment and subscribing our clients to the monthly fees for the use of our automated software.

Complete solution will consist of:

- Independent assembly of the technology, that will be attachable to any floating transportation, or a complete assembly with the boat.
- Submersible part of the technology.
- Pumps.
- Computer.
- Software that will be processing the input data (made by operators) and control the machinery.
- Solar panels.
- Wave-energy harvesters.
- Module for express-testing of the sediments.
- Skimming module (for collection of the lifted sediments).
- Automated transportation module of the collected pollutants (delivery to the shore).

Target markets – Europe (Germany, Baltic states, Netherlands), Asia (Japan, China, India), USA.

Customer or end-user profile

Customer group(s), their profile and needs description:

Customer (end-user) group	Customer profile description	Customer needs and requirements
Port authorities	Environmental Department within the structure. Existing constant needs to support the quality of water and soil. Quality of water is needed to comply with the local/EU regulations. Quality of soil is required to constantly dig deeper and avoid the utilization costs (if the soil contains oil products – it can't be just dumped).	Reasonably priced technology that can be used at request / according to the schedule. Shall have necessary certification of quality and proven efficiency.
Oil & Gas companies with off-shore or on-shore (near water bodies) operations	Environmental Department. Responsible for the elimination of the pollution caused by the malfunction	Efficient and reasonably priced technology. Needs to have a needed reach (depth).

	or accidental spill-off during the off-shore production.	
Local authorities	Water department, responsible for the overall quality of water, coordinating the governmental projects for cleaning.	Efficient and reasonably priced technology.
Ministries of the Environment	Water department, responsible for the overall quality of water, coordinating the governmental projects for cleaning.	Efficient and reasonably priced technology.
Water Cleaning Companies	Project management. The company that has main contracts in the region, where our technology will be an extension of their scope of services that are being provided to the clients.	Efficient and reasonably priced.
Logistic companies (responsible for the spill-offs)	Environmental department, that is responsible for the mitigation of the spill-offs.	Efficient and reasonably priced.
Manufacturing companies that happen to dispose substances into the nearby waters	Environmental department, that is responsible for the leak/dump of pollutants.	Efficient and reasonably priced.

Customer willingness to pay

Description of customer willingness to pay for the product or service (value <-> needs matching):

Customer (end-user) needs	Value proposition	Customer willingness to pay explanation
Port authorities	Highly-efficient and cost/time-saving technology, for an easy cleanup of the polluted areas.	Port Authorities usually pursue two goals – the overall quality of their area (public image), and the cost-efficiency during the digging (keeping the depth for the ship traffic). By keeping the bottom sediments clean, the port authorities save money on fines, but most importantly – it will save millions in utilization of the polluted soil.
Water Cleaning Companies	Highly-efficient and cost/time-saving technology, for an easy cleanup of the polluted areas.	By providing the WCC with our technology, we help them widen their scope of operations, and offer the already established clients a new type of service that becomes highly required. By partnering up with us the client acquires a new revenue stream by offering a new type of service.
Oil & Gas companies with off-shore or on-shore (near water	Highly-efficient and cost/time-saving technology, for an easy cleanup of the	The type of client is known for regular pollution caused by the operations. Since the off-shore terminals are operating remotely – the depth of the bottom sediments is deeper than a few hundred meters. Therefore,

bodies) operations	polluted and deep-water areas.	excavation is no longer an option. Our solution shall efficiently deal with the recurring problem. That will improve the company image, save money in not paid fines.

Business strategy

Description of the overall business model, strategy and its main components and distinctive features.

PurOceans' goal is to complete the development of the complete whole setup, that can be used by untrained personnel, to make the clean-up cheap and easy, with the possibility to eventually lease our pieces of equipment to the end clients and use it like a robotic vacuum-cleaner at home.

Business models to be used:

Stage 1:

B2B sector: As long as we are located at the current point of the development, PurOceans company is planning to serve the end clients either directly, or indirectly as the subcontractor hired by the main contractor in the region. The clients to be charged per hectare cleaned.

Stage 2:

B2B sector: Once the development of the technology is completed, and it is confirmed that it can be used by the untrained personnel, PurOceans company will begin to lease the equipment to the end clients / main contractors in the region to perform the clean-up operations. The clients to be charged per month, with the possibility to agree the pricing according to the seasonally planned activities.

B2G sector: PurOceans company is working on becoming an obligatory service provider to be used by the state-owned ports and water objects and to make our technology to be used on a regular basis to comply with the local regulations on the water quality as the only alternative to efficiently deal with the constantly appearing pollution due to ongoing business activities.

Pricing strategy

Description of the approach to product/service pricing.

During the first stage – service provision – we will charge our clients 50.000-70.000 EUR per hectare cleaned. Such pricing is the most comfortable for both parties (clients & us).

The closest (in terms of pricing) competitors usually charge 5 times more (according to the information revealed by the clients for the past unsuccessful attempts to clean the bottom sediments).

With such setup – all the costs that are incorporated with the preparation for the project, assembly of the device, hiring of personnel/delivery of our own – will be covered within the first hectare. Every next hectare will bring a profit of 90%. And that is considering the fact, that we do not need to assemble the device for each client.

Later on, when we move to the Sales/Lease model – we are planning to charge our clients 70.000-80.000 EUR for the device + 15.000 EUR per hectare cleaned (by them). That will allow us scale up and collaborate with an unlimited amount of clients at the same time.

Revenue model

Below is the snapshot from our budget projection, that indicates the potential revenues from the first 3 clients. The areas to be treated (30 HA and 27 HA) are a fraction of what will have to be treated in reality. Those numbers are the most realistic from our current capabilities.

Serving 2 clients & Sales/Lease with third:

- Client #1 – 30 HA to be cleaned (1.800.000 EUR)
- Client #2 – 27 HA to be cleaned (1.620.000 EUR)
- Client #3 – Sales & Lease (230.000 EUR)

The next year the capabilities are expected to grow, hence higher incomes.

Serving 2 clients:

- Client #1 – 80 HA to be cleaned (4.800.000 EUR)
- Client #2 – 50 HA to be cleaned (3.000.000 EUR)
- Client #3 – Sales & Lease (1.260.000 EUR)

Commercialization plan

Go-to-market plan (Key actions, stages, milestones):

2022/2023 – Development of the automation modules of the technology + adoption of clean energy generators

2024/2026 – Development of the next generation of the cleanup – genetically modified bacteria, that will be completely environmentally neutral, with only one goal – consuming hydrocarbons at the hard-to-reach areas. The bacteria are currently used as the pilots at different parts of the world, proving its safety. The know-how will consist of the specific genes that will be crossed, and efficiency of the bacteria.

Distribution and sales channels

Identification of main channels for product/service sales and commercial exploitation - Main distribution activities will be mainly handled by the local agents, who will be assisting with the legal, financial, and operational activities.

Marketing strategy

Description of the overall approach to marketing - The technology sells itself. However, we are planning to be present at the exhibitions, media, partnering up with large brands (Adidas, Nike – microplastic that we lift can be used for the production of the sneakers, to spread the message).

Customer and end-user relations

Description in relation to customers and customer support - In case we have a direct connection with the client – it’s handled by the Business Developers, who are collecting

information from the client, process and propose solutions after consulting with the relevant members of the team.

However, most of the time the communication with the end user will be handled by the local agents, who will have all the information at hand, and with the possibility to communicate with us (through the business developers).

Parties, partners and stakeholders

Investment fund "Commercialization Reactor" - invested pre-seed amount at the initial stage.

Governmental authorities – by having a better eco-system in the area, it attracts more businesses and investment into the development of the infrastructure.

Private businesses – businesses located nearby the water bodies and/or associated with the water activities, have less risks in closing down the business due to the overall situation with the quality of water.

Water treatment facilities – by having the clean water in the area makes it easier and cheaper to filter it out and supply to the inhabitants of the urban areas.

Resources

Currently, the main resource is the time, effort and knowledge in how to build the end-solution. Moreover, we have a possibility to attract more specialists in genetics, civil engineering, and biologists – free of charge, to push forward the development (for a while).

Business prospects

Business development scenarios. Description of the main scenarios how the product/service exploitation would look like within a 3-5 year period after project end

Brief description of optimistic, realistic and pessimistic scenarios

Optimistic: all the plans on development of the technology and servicing pace came true and the company generates EUR 3,6M within the next year. We grow business further, scale up, and every year the numbers grow with the geometric progression. We spread the message and become an environmental trend, and by 2027 become a unicorn.

Realistic: The development goes according to the plan, but with some adjustments, clients are not willing to treat large territories, however, in such scenario the company will be able to generate round numbers, which will fully cover the investment, and will increase its valuation tremendously, and give us a possibility to either adjust to the market and adjust the financial approach, or make an exit.

Pessimistic: Clients are not ready to pay for the services. In such cases we go to the main players in water cleaning services and become sub-contractors. The amount of revenues drops down, but still quite large. Valuation of the company rises anyways; clients hear of us anyways. The hiring company becomes a potential exit partner.

Business risks and risk mitigation

Identification of main business associated risks and risk mitigation strategies:

Risk	Risk description	Risk mitigation strategy
COVID restrictions	Slows down the processes, troubles the possibility to service the clients.	Local agents with the instructions of how to properly service/sell equipment. Automated solutions will make the risk irrelevant, as it won't require our presence.
Financial breakdown	When the company runs out of cash, it slows down the processes, making further development impossible.	Raising the next round of investment, securing it with the already approved grants (amounts to be reimbursed with the result of a completed development of the technology), and it will allow us to generate MRR.

Change management

Both parts of the team, technical and entrepreneurial – are highly flexible, and are always ready to listen to the trends, and adapt accordingly, but without missing out on the big picture.

3. IE #2 – Automatic estimation of fish stock (Finland) - Business model description concept

To increase understanding of how the estimation of existing fish stock (type and quantity of fish) can be automated and made more accurate. As a result, the predictability of fish to catch can be improved and opportunities to maintain healthy and viable fish stocks increases. A diverse water environment and sustainable fish stocks are prerequisites for the sustainable use of water resources.

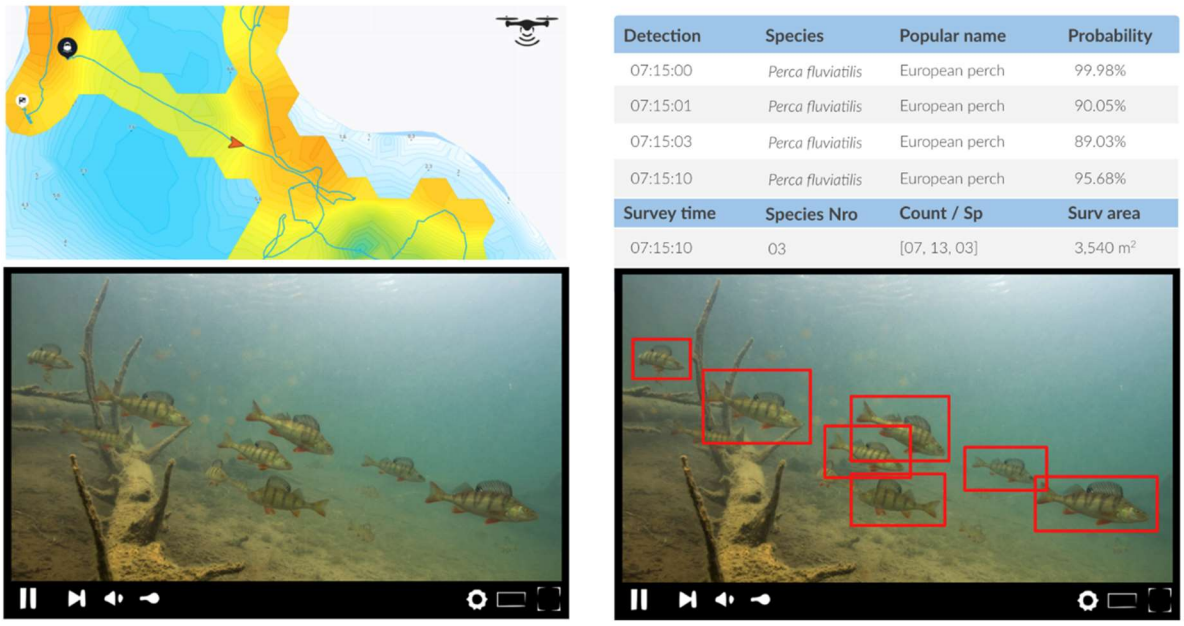
Service description

A Software-as-a-service (SaaS) concept product that is capable of documenting and estimating fish stock based on sonar data and video images obtained from aquatic-drone surveys, and uploaded to the cloud service. The software provides an interface where users can upload survey- and video data, which will then be automatically processed and analyzed for the detection of fish species.

The software can serve as a database for survey data (sonar and video data) and their associated metadata (geo and time referenced tracks of the surveys, accessory data, etc.), as well as the automatically obtained summaries of fish species and relative abundance. All the information is hosted under the user accounts, and can provide valuable insight on the assessment of fish stock. Data collected by multiple teams can be used to improve the models and estimation of similar systems and regions.

The software is powered by cutting edge Machine Learning and statistical methods used in ecology, aimed to provide reliable counts of detected fish species.

Proof-of-concept UI elements of the proposed product. Users can store and visualize their boat and drone surveys on the map, as well as the lists of detected fish species on the videos uploaded to the system. Altogether the system is a situation awareness tool used to gather relevant biological and ecological data about water bodies:



Key exploitable components

Identification of main components of the overall solution that could be exploited fully or partially independent:

Component	Component description	Exploitation potential description
CHASING F1 Fish Finder Drone	A hi-tech digital full HD wireless device, that provides you with intelligent information about the underwater terrain, surroundings, other objects underneath, the location of fish masses, and the position of fish in water. CHASING F1 Fish Finder Drone consists of: • GPS enabled floating device with all-directional horizontal movement • Full HD camera plus IR shooting at night that can be dropped up to 28m below water. • Wifi-connection to enable real-time display • Possibility to attach sonar	The device is used for gathering images and video for determining the type of fish. The fact that only the camera goes under water is believed to be less invasive for fish. This reduces the risk of fish swimming away. The ability to use IR is believed to reduce the risk of fish fearing light. The possibility to use GPS increases opportunities to attach location to the findings.

Deeper Smart Sonar CHIRP+ 2	Sonar using Compressed High Intensity Radar Pulse (CHIRP) technology, making it ideal for identifying fish, locating structure, understanding bottom consistency and most importantly, differentiating between targets and objects. CHIRP+ 2 casts out with solid connectivity to your smart device via its own generated Wi-Fi, so you won't need cellular data or an internet connection.	The device provides sonar data with crisp clarity and extreme accuracy. Can be paired with FishDeeper App.
FishDeeper App	Combined with one of the Deeper sonars, it turns your smartphone or tablet into a high-grade sonar display. Outstanding user experience, crisp clarity, and ability to modify your sonar display according to your fishing needs provides many possibilities, including: • See and explore full scan history • Mark your favorite places • Log your catches	FishDeeper App allows the recording of: • Full sonar scan of a particular trip with attached information (location, temperature, depth) • Additional data (video/images) of a particular location
CHASING GO2 App	CHASING GO2 App supports CHASING F1 series products. It provides real-time image transmission and view, live stream, as well as editing and sharing of photos and videos.	The app is used for controlling and using the drone by, for example, a smartphone.
Progressive Web Application (PWA)-cloud service to track boat and drone surveys	The application/services are used as a library to keep boat and drone geo- and time-referenced survey data.	Users can sign-in and upload their boat and drone data to the cloud. The tool will make visualizations about the tracks over a map, and users can manage their collections of surveys from the UI.
PWA-cloud service to detect, identify, and count fish from the video recordings.	The application/services are used to process and classify fish data. Users get time of detection, species identification, and individual counts over a given area surveyed.	Users can sign-in to the service and upload and analyze video data obtained from the drone surveys. The app will automatically process the video, detect and identify the fish species present and generate lists of counts of individuals.
PWA-cloud service to share and integrate data from multiple users.	In this component, users can search and access the public library of surveys and data analysis made by other users.	Users can sign-in to the service and visualize not only their own data, but all data that was made public by other users as well. With access to more data, users get improved estimates, and can also

		see data from regions it did not survey directly.

Markets and value proposition

Target market(s) (serviceable obtainable market). At the beginning, the primary target market for the automatic fish stock estimation system is Finnish aquaculture officials and professional fishermen of inland waters. There are currently approximately 300 full-time and 1900 part-time inland fishermen in Finland. It is estimated that the number of Finnish officials working in inland water bodies is counted in the hundreds. In the long term, the market could be expanded to stakeholders of inland fisheries of other countries as well.

Value proposition. The service will provide an easy-to-use interface to upload sonar and video data of a particular water body, based on which it automatically creates estimates of fish stock in the water body. Gathered data and estimated fish stock is visualized for aquaculture-related stakeholders. There is no need for experts throughout the entire process.

Automated estimation of fish stock in body of water can be used to improve the predictability of fish to catch, and to increase opportunities to maintain healthy and viable fish stocks in body of water. In addition, being able to produce real-time data related to fish to catch is likely to affect consumer behavior.

Customer or end-user profile

Customer group(s), their profile and needs description:

Customer (end-user) group	Customer profile description	Customer needs and requirements
Aquaculture policy/decision makers	Responsible for regulating fishing activities to ensure the sustainability of fish stock	Needs accurate data about fish stocks for setting lake specific objectives to ensure sustainability
State/regional fisheries administration	takes care of maintaining and promoting the operating conditions for all aspects of fisheries. The closest to the fisheries administration is the regional fisheries administration, which is now part of the regional economic, transport and environmental centers.	Needs accurate data about fish stocks for monitoring the impact of regulations on a practical level.
Commercial fishers	Parties conducting fishing activities on a professional basis	Needs to have opportunities for long-term profitable fishing. This can only be achieved by ensuring sustainability of fish stock.

Example of users that can benefit from the services and tools provided by our concept product:

	Academic and Researchers	Certifiers of sustainable fishing	Water body management	Fishery management and fishing
What do they need?	Ecological data collected at low costs, and with quality and quantity	Information on sustainability of populations / effects of fishing activities on fish stock	To ensure viable populations, to identify and protect the locally endangered species	Assess fish stock statuses and the new methods that can add value to fishery activities
Interested in?	The datasets and the trained AI models; also in collaboration and R&D	Getting access to snapshot and long-term data across specific locations	Knowledge about common / rare species, and the drivers of ecosystem dynamics	Knowledge about the quantities and dynamics of commercial species
Main risks	Abundance data is difficult to obtain, and the estimates might not be reliable	Long-term spatio-temporal data they need to rely might not be easily available	Fish abundance is just one of the multiple ecological factors needing consideration	The data acquired does not have the necessary quantity and resolution to be useful
Main Opportunities	Scientific community can help to develop faster and more accurate methods	Information utilized for the certification is based on collected field data	Citizen science portal and services to engage with the local communities.	Explore new models of certification and added value

Customer willingness to pay

Description of customer willingness to pay for the product or service (value <-> needs matching):

Customer (end-user) needs	Value proposition	Customer willingness to pay explanation
Need to make regulations more justifiable and data behind the decisions more transparent.	Accurate and up-to-date data of fish stock in the body of water	Improved opportunities for fact-based decision making. Transparent and accurate data of fish availability would reduce arguments and build better arguments for the decisions.
Need to increase impact of decision-making.	Accurate and up-to-date data of fish stock in the body of water	Better understanding of fish stock leads to better impact of decision-making.
Need to increase predictability of the fishing-related supply chain.	Accurate and up-to-date data of fish stock in the body of water	Improved ability to: • inform clients about the status of fish stock • conduct fishing activities in a sustainable and profitable way

Business strategy

Description of the overall business model, strategy and its main components and distinctive features.

Strong fish stocks, good water conditions, and quality of fish products are all prerequisites for a viable fish economy and for increased use of local fish. Sustainable fishing is also good for the body of water, because it helps to remove nutrients, and hence reduces eutrophication.

Being able to maintain strong fish stocks and to predict the amount and type of fish to catch requires new technological solutions. Automated estimation of fish stock in body of water can be used to increase opportunities to maintain healthy and viable fish stocks in body of water, and to improve the predictability of fish to catch. In addition, being able to produce real-time data related to fish to catch is likely to affect consumer behavior.

The distinctive features of the proposed system include:

- Ability to upload gathered data (boat track, sonar data, video, metadata)
- Ability to visualize and browse uploaded data
- Automatic identification and counting of fish species from video
- Automatic estimation of fish stock of a particular body of water
- Dashboard functionality for communicating created knowledge related to a particular body of water
- Interface for accessing gathered data for further R&D purposes

The offered features are believed to increase the use of local fish, which in turn is hoped to improve the business opportunities for fish primary production. Competitive and predictable operative environment would enable sustainable growth of fish primary production and would attract new firms and capital to the field.

Pricing strategy

Description of the approach to product/service pricing.

Up to date, estimation for fish stocks have been created with two primary ways:

1. Exploratory fishery is currently considered the most reliable method for estimation. However, the reliability of this method has been questioned, with the main argument that different fish species may behave in different ways and the results are not then generalizable in a reliable way.
2. Professional fishery. In this method, estimations of existing fish stocks are created on professional fishermens' reports of caught fish. The main challenges of this method are that the estimations are created on past data and that many of the lakes do not have professional fishermen.

There is a clear need for increased cost-efficiency and accuracy when estimating fish stocks. In particular, state/regional fisheries administrations have not been sufficiently successful in monitoring the impact of regulations on a practical level, due to labor intensity of current methods. Utilization of automation and mechanisms for crowdsourcing would provide more data with increased accuracy and cost-effectiveness. There are clear incentives for aquaculture officials to subscribe for offered services. There are also opportunities in future for expanding customer groups and revenue streams.

Revenue model

Main revenue streams. Example of possible revenue streams could include monetization for:

- the right to use the services (i.e., a Subscription system).
- buying extra storage to host their own videos.
- gaining access to the general knowledge database and abundance maps.
- buying annotated training data for AI, as well as trained AI models to identify fish species.

As the proposed devices to gather data are relatively inexpensive and already targeted to leisure fishermen, the offered software solutions could also be offered to a larger audience. This would notably increase possibilities for gathering data, which in turn would improve the estimation of fish stock.

Commercialization plan

Go-to-market plan (Key actions, stages, milestones):

As the concept is in its early stages, there are still many steps to be taken before commercialization. The biggest challenge by far is how the fish abundance can be accurately extrapolated from the gathered data. In order to work with this challenge, we first need to gather data. Therefore, the next steps on the commercialization path are:

1. Development of interfaces to upload gathered data and to browse uploaded data in a user-friendly way. Ability to browse historical data is considered vital for being able to motivate users to gather and upload data.
2. Building capabilities to automatically identify fish species and count them.
3. Building ways to estimate the size of fist stock based on gathered data
4. Developing dashboard of created knowledge for satisfying the stakeholders' needs
5. Expanding the product features to larger audiences, such as leisure fishermen

These first steps need to be taken in close collaboration with research partners as well as aquaculture officials.

Parties, partners and stakeholders

Exploiting parties. Primary parties exploiting the services are those aquaculture officials, who are:

- regulating fishing activities
- maintaining viability of water bodies and sustainability of fish stock
- enforcing regulations and monitoring their impact

Key exploitation partners:

- Research institutions and expert researchers from the fields of biology, ecology, computer science, and Artificial Intelligence.
- Governmental agencies responsible to incubate applied research into profitable business.
- Private individuals and companies interested to invest and commercialize the innovation.

Stakeholders and relevant parties. Parties having indirect interest in the offered services include:

- Research institutes involved in fish stock assessment and fisheries management in inland fishery (inc. authorities)
- Locally and nationally operating associations and agents that have an important role in promoting fisheries and communication.
- Companies for fish processing and wholesale.

Costs and resources

Cost structure:

Cost category	Cost description	Estimate annual costs
R&D of AI and Statistical Ecology methods	Necessary further research, data collection and analysis work necessary for the robust estimation of fish abundance.	50,000 €* *1 time work for the basic implementation
Software implementation	MLops, UI/UX, and all the implementation work for the software wrapping the AI-engine.	100,000 €* *1 time work for the basic implementation
Service hosting and maintenance (AI and cloud services)	Costs related to maintaining the system online, training and updating AI models, and processing and storing user data.	10,000 €*, **, *** *Can vary depending on the number of active users. **Can vary depending on the volume of data uploaded to the system. *** cost per year
Other	Market analysis research, Service design, UI/UX design, and release plan activities.	20,000 €* *1 time work for the basic implementation

Internal resources:

XAMK Memory Lab offers computational infrastructure for training and running the ML structure necessary for the services, as well as video-hosting databases. Furthermore, an active and diverse expert network is needed for collaboratively develop the services

Business prospects

Business development scenarios:

Aspect	Optimistic	Realistic	Pessimistic
The quality of the abundance inference that the method is capable of providing.	The abundance estimates are not only reliable, but can also be acquired at lower costs and less effort than the existing techniques.	The reliability and resolution of the data will not be ideal, but will provide better information than current baseline methods.	The abundance of data will never be reliable enough to prove useful for any type of users.

Business risks and risk mitigation

Identification of main business associated risks and mitigation strategies:

Risk	Risk description	Risk mitigation strategy
Not acquiring the minimum necessary user base, especially the	Releasing a software or service is not only about the need for the product, but also its quality, user	Release the first versions of the software as a free alpha-version, and a paying beta-release only later.

necessary number of paying customers.	friendliness, timing and marketing strategy.	Make sure that paying users get value out of the tool; that is the only measure that will make the product idea viable over time.
Who came to the first problem, the users or the data?	In order to have users, the tool needs data; In order to have data, the tool needs users.	Releasing free versions, especially in partnership with institutions that can generate quality data in quantity and with quality should give the initial input to guarantee robust services that would attract new users.
Reliable abundance estimates are critical for the service to work, and therefore attract paying users.	Estimate animal abundance is no easy task. Acquiring, automatically processing, classifying species on video, are all simpler compared to estimating abundance.	There's no way out of this: R&D work related to statistical ecology methods. Partnering up with academia and research institutions is key.
Spatio-temporal coverage of the data might not be sufficient to estimate some parameters of interest	The value the product and services provide, at least for some users, might not be felt before there's enough data available in the system	Stimulate collaboration between teams, and reinforcing the need for teams to share their data; This can enhance data coverage both in space and time.
Software can be expensive to develop and host when ready.	Expert software is never cheap to develop: The idea presented here brings together cutting-edge Machine Learning methods, as well as modern software development (SaaS models). The costs to implement and maintain such services might be higher than expected.	The research and public-service aspects of the product might be helpful to mitigate costs, and raise money to cover R&D and hosting costs. Key collaborators are also vital, both to develop and implement the solution, as well as host and maintain the services online.

Change management

Description of how exploiting partners will manage and adapt to change due to unforeseen circumstances, both positive or negative (such as how new market opportunities would be exploited). Iterative and incremental development style will create opportunities for adaptation and change course of development, if necessary.

Business Model Canvas

Key Partners	Key Activities	Value proposition	Customer relationship	Customer segments
Research institutions and expert researchers from the fields of biology, ecology, computer science, and Artificial Intelligence. Governmental agencies responsible to incubate applied research into profitable business. Private individuals and companies interested to invest and commercialize the innovation.	The key activities relate to identifying potential users and their needs, together with developing the MVP version of the system. Market research and Service design, to construct the product UI/UX and services from the perspective or acquiring and converting paying users. R&D and implementation of ML methods and Statistical Ecology models necessary to obtain reliable estimates of fish abundance.	Expert methods made easily available to non-expert users. Inference based on collectively acquired field data. Portal to collect information and bring together relevant actors.		1. Academic users and research teams. 2. Governmental actors (e.g., Certifiers of sustainable fishing). 3. Agents responsible for water body management. 4. Actors responsible for the management of fisheries. Potentially, also private users such as hobbyists, sports fishery, tourism and other actors.
	Key resources		**Channels**	
	XAMK Memory Lab for training and running the ML structure necessary for the services, as well as video-hosting databases. AI experts as partner collaborators for consultancy and hands-on work on		The software is distributed as a cloud-based Progressive Web Application (PWA), available online directly from the users' browsers. The users gain access to team spaces, where they can store	

	development of the services.		data about different surveys and run multiple analyses.	

Cost structure	Revenue streams
Costs relate to the following activities: - R&D related to building reliable methods to estimate fish abundance. - Implementation of machine learning models to identify and count fish. - Work to develop and implement the software around the ML methods. - Hosting costs: computing power to train and run ML models in production. - Hosting costs: cloud services to serve the software for its users. - Hosting costs: cloud data storage costs for uploaded videos.	Example of possible revenue streams. Monetization for: 1) the right to use the services (i.e., a Subscription system). 2) buying extra storage to host your own videos. 3) gaining access to the general knowledge database and abundance maps. 4) buying annotated training data for AI, as well as trained AI models to identify fish species.

4. IE #3 – Spectrometric oyster quality assessment (Croatia) - Business model description concept (BENCO Baltic)

The goal of the solution is to develop the technology which will enable users to analyze the protein, glycogen, fat and moisture levels in oysters with the accuracy/prediction rate higher than 0.95 rate (r2) and with the prediction errors which do not exceed 0.4% values. The time of one analysis (including data gathering, processing and analysis) done by the prototype will not exceed 30 minutes.

Service description

The service consists of rapid on-site assessment of oysters for preventative oyster quality assessment on-site, by combining near-infrared spectrometry (NIR) with machine learning and advanced data analysis techniques service for rapid on-site assessment of oysters, where a customer opens a single oyster from a batch, 'scans' its flesh and receives results on its (and by extension the remaining batch) quality parameters. Customers will be able to utilize third-party NIR spectroscopy hardware for oyster flesh 'scanning' and submit the data for analysis via a user-friendly web service. Once the data is processed within the machine's learning-based analytical system, the customer will receive results on the main oyster quality, freshness and potential food risk parameters (moisture level, nutritional value, fats,

proteins, glycogens, etc.). This kind of service can also be used as an efficient preventative screening tool to help identify questionable oysters that need further testing using standard laboratory methods.

Key exploitable components

Identification of main components of the overall solution that could be exploited fully or partially independent:

Component	Component description	Exploitation potential description
ATR-FTIR spectrometer	A state-of-the-art scientific device dedicated to a non-destructible chemical analysis of various samples. The spectrometer is a commercially available device and can be chosen from various manufacturers if the technical parameters of the device are sufficient.	The component can be exploited independently for collecting spectroscopic data of oysters, and other samples or to carry out completely different analysis projects. The spectrometer is used only for gathering spectral information from the sample (data collection).
Water content evaluation model	A neural network-based mathematical algorithm which was created specifically for the evaluation of water content in the meat of oysters. The analysis is based on specific spectral markers of the molecule. The analysis model was tested and validated. Therefore, it has a specific set of optimized parameters to accurately evaluate the water content.	The water content evaluation model can be used partially independently if the user already has spectroscopic oyster meat data. However, using such a model requires at least the standard knowledge of the mathematical algorithms.
Protein content evaluation model	A neural network-based mathematical algorithm which was created specifically for the evaluation of protein content in the meat of oysters. The analysis is based on specific spectral markers of the molecule. The analysis model was tested and validated. Therefore, it has a specific set of optimized parameters to accurately evaluate the protein content.	The protein content evaluation model can be used partially independently if the user already has spectroscopic oyster meat data. However, using such a model requires at least the standard knowledge of the mathematical algorithms.
Lipid content evaluation model	A neural network-based mathematical algorithm which was created specifically for the evaluation of lipid content in the meat of oysters. The analysis is based on specific spectral markers of the molecule. The analysis model was tested and validated.	The lipid content evaluation model can be used partially independently if the user already has spectroscopic oyster meat data. However, using such a model requires at least the standard knowledge of the mathematical algorithms.

	Therefore, it has a specific set of optimized parameters to accurately evaluate the lipid content.	
Glycogen content evaluation model	A neural network-based mathematical algorithm which was created specifically for the evaluation of glycogen content in the meat of oysters. The analysis is based on specific spectral markers of the molecule. The analysis model was tested and validated. Therefore, it has a specific set of optimized parameters to accurately evaluate the glycogen content.	The glycogen content evaluation model can be used partially independently if the user already has spectroscopic oyster meat data. However, using such a model requires at least the standard knowledge of the mathematical algorithms.
Soqa.tech online platform	A dedicated online platform for the analysis of oyster meat quality parameters. The platform creates a link between the analysis models and the user. The interface allows users who have no background in mathematical analysis to work and evaluate the oyster meat quality.	The platform works as a stand-alone webpage. It has an API which allows the incorporation of different analysis models. The platform can be used partially independently since it is effective only when using it with the mathematical models created for quality parameter evaluation. However, other models can be implemented and successfully used. Spectral data must be uploaded for analysis.

Markets and value proposition

Target market(s) (serviceable obtainable market description). The primary target market for oyster quality assessment services are the main oyster producing European Union markets - France (81.76% of total production), Ireland, United Kingdom, Spain, Portugal, the Netherlands, Croatia. These markets are targeted due to uniform business development procedures, food safety and quality regulations, as well as relatively high added value of the production. In comparison to global context, the aforementioned markets produce 12.39% Pacific cupped (Crassostrea gigas) and European flat (Ostrea edulis) oysters while valued at 35.11 % of the total global market value. According to UN FAQ data, every year around 80.000 tons of oysters are produced in key EU markets for an estimated 398 mil. EUR in value.

In the long term new functionalities (additional or more parameters) and more testable shellfish are to be included in the service portfolio, as well as business operations expanded to non-EU markets. The long-term strategic goal is to establish a lasting foothold in the East Asian (South Korea, Japan, Taiwan) markets, who not only produce around 80% of the global oyster supply, but are also the main global producers of other shellfish.
The total global market size for oyster quality assessment services throughout the supply chain, based on global production trends and willingness-to-buy factors, is estimated around 150 mil. EUR. The serviceable obtainable market size (the targeted EU oyster aquaculture market) is estimated at up to 16 mil. EUR annually (up to 4% of the total EU oyster market value).

Value proposition. The service will provide a fast (up to several minutes) and cheap (an average prices of 2 EUR per analysis) method for producers or other supply chain participants to assess the main parameters of their oyster quality. The solution is to be made compatible with third-party NIR spectrometers and will be easy to use by non-professional users.

Customer or end-user profile

Customer group(s), their profile and needs description:

Customer (end-user) group	Customer profile description	Customer needs and requirements
oyster producers	Companies and individuals that grow oysters and care into keeping their crop as well as their businesses alive	oyster health, maturity and growth potential information, including external factors affecting growth of the oysters
oyster supply chain	wholesalers, restaurants, retailers	oyster quality, freshness and nutritional value informations

Customer willingness to pay

Description of customer willingness to pay for the product or service (value <-> needs matching):

Customer (end-user) needs	Value proposition	Customer willingness to pay explanation
oyster health, maturity and growth potential information, including external factors affecting growth of the oysters	fast (up to 2 min.) oyster analysis procedures in operational environments, potential for high throughput when needed, low service price (around 2 EUR), results with high reliability	Gets information on their oyster health, their maturity and growth potential, influence of external factors which help plan harvesting, estimate potential biorisks based on quality parameters, choose the best storage and logistics conditions
oyster quality, freshness and nutritional value informations	fast (up to 2 min.) oyster analysis procedures in operational environments, potential for high throughput when needed, low service price (around 2 EUR), results with high reliability	Gets information of the quality of received oysters, their freshness, nutritional value, assess the need for additional laboratory research, identify spoiled produce

Business strategy

Description of the overall business model, strategy and its main components and distinctive features. For many oyster farmers or further in the supply chain, the supply of fresh and The highest quality oysters, which meet the required levels of food safety, are the key to customers' lasting business success. However, the current oyster aquaculture industry is lacking flexible, high-permeability and easily applicable solutions for assessing the quality of oysters. Solutions that can be applied on site - in a work environment - are especially

needed because they can help breeders to assess the quality of oysters, breeding conditions, assessment of potential risks and operational planning both in the breeding phase and in the oyster harvesting phase, as well as to enable the implementation of supervision quality and freshness of oysters and preventive inspection at different stages of the supply chain.

It is planned to sell services to potential clients by offering several different initial ones investment options:

- Use the service immediately with NIR spectrometric equipment already available to the client

(if its characteristics meet the technical prerequisites of the service);

- Use of the service with spectrometric equipment purchased from the recommended list

manufacturers and models;

- Use the service by renting the necessary spectrometric equipment from the service provider or

its local partners

- Use of the service by purchasing equipment that has been resold by the service provider, which is specially configured and fully compatible with the service.

Given that there is currently no market for the services created by this project, projections are potential sales are calculated based on total annual oyster production in the EU. It is assumed an average of 80 (first year) to 125 (from the fourth year onwards) oyster quality assessment services per tons of live oysters - about 1-2 estimates per box of 15kg oysters in different stages of the supply chain. This figure includes an assessment of the quality of both oyster growers and oyster sellers. During time, market growth is expected both in terms of market penetration and in the volume provided service.

By modeling the financial flows and perspectives of the developing oyster quality assessment service, the service activities are expected to become profitable in its second year of commercialization.

In the fifth year, a return to the initial project investment in research and development of these expected services. Most of the profits are expected to be invested in further technological (new functionalities and applications) and business (entering the markets of East Asia) spread.

Revenue model

In the first three years after the launch of service, a total of 608 thousand of oyster quality assessment service is expected to be provided, i.e. that calculations with meat spectrometric data will be performed on oysters delivered in such quantities and that the results of the analysis will be presented. Five years after commercialization, a total of 1.9 million services are expected.

	2022	**2023**	**2024**	**2025**	**2026**
Average price of service (in EUR)	2	2	2	2	2
Average supply services oyster chain, per ton	80	100	120	125	125
Total tons of oysters	80.000	80.000	80.000	80.000	80.000

sold in the EU					
Predicted penetration into useful market (in percent)	1,00	2,00	4,00	6,00	7,00
Predicted penetration into useful market (tonnes)	800	1.600	3.200	4.800	5.600
Total services provided by years	64.000	160.000	384.000	600.000	700.000
Revenues in EUR	**128.000**	**320.000**	**768.000**	**900.000**	**1.050.000**

Pricing strategy

Description of the approach to product/service pricing. Preliminary prices of currently available NIR spectrometers on the market, which are intended for the project and suitable for on - site use, range from 1,000 to 2,000 EUR (depending on technical characteristics), while more advanced equipment is available at higher prices. At the same time, the cost installation of a laboratory instrument for oyster contamination (Neogen LFA Analyzer for PSP /DSP / ASP), which is often used frequently by professional breeders, is around 2.700 EUR, and the cost of later oyster tests is 12 EUR. Also, it is important to note that over the last decade, the price of portable NIR spectrometers is in a significant decline and that the next generation of spectrometers is widely used in various fields. Estimated average retail price developed services is 2 EUR. For these reasons, the investment required to use the service developing is considered competitive and affordable for oyster growers and sellers.

Additional exploitation cases and models

ATR-FTIR spectrometers can be exploited independently for collecting spectroscopic data of oysters, and other samples or to carry out completely different analysis projects.
Other components can be used partially independently if the user already has spectroscopic oyster meat data.
The platform works as a stand-alone webpage and can be used partially independently since it is effective only when using it with the mathematical models created for quality parameter evaluation. However, other models can be implemented and successfully used. Spectral data must be uploaded for analysis.

Commercialization plan

Go-to-market plan (Key actions, stages, milestones):

In the long run, the development of the oyster quality assessment service in 3 strategic directions is planned, taking into account the potential for commercialization:

- Expanding the business and expanding the existing range of services to new non-EU markets. Priority is given to East Asian markets (South Korea, Japan, Taiwan), which together produce and harvest 79.93% the world's Pacific oysters, or about 6.5 times the EU market. Entry into the subject markets is planned in collaboration with local partners who will direct sales to their local markets. These markets are also important for the production and export of the largest quantities of other molluscs and seafood in the world and therefore provides the greatest potential for sales and business growth.
- Extending the existing functionality of the service to include more composition parameters,
  quality and nutritional safety of oysters for analysis. Potential of spectrometric data and advanced analytical techniques for direct estimation or indirect quantification

potentially elevated levels of mycotoxins and heavy metals or other bio-risk factors would significantly contribute to market penetration and sales growth.

- Extending the application of analysis to more species of oysters, mussels, shellfish and other molluscs. This will also significantly contribute to the sale of services in other markets different from the shellfish aquaculture tradition. The development of the market, functionality and application of these services is expected 4-5 years later commercialization

Parties, partners and stakeholders

Exploiting parties. Main parties exploiting this service are oyster farmers and those participating in the oyster supply chain - reseller, wholesalers, logistics companies, etc. For producers the service can be applied to provide additional information on their oyster health, their maturity and growth potential, influence of external factors, help plan harvesting, estimate potential bio risks based on quality parameters, choose the best storage and logistics conditions, etc. For those with the oyster supply chain, the service will be used to estimate the quality of received oysters, their freshness, nutritional value, assess the need for additional laboratory research, identify spoiled produce, etc.

Key exploitation partners. Partners who have worked on product development will participate in exploitation process:

Nature Research Center: knowledge dissemination in cooperation with various institutions

ART21 – after commercializing will provide infrastructure service, further develop and update system, maintain operational environment (hardware and software)

Main partners in the exploitation process are specialized organizations, cooperatives, local partners and distributors with previous experience, expertise and specialization in the oyster market.

Stakeholders and relevant parties. The main stakeholders are oyster growers and everyone in the supply chain, while all end customers - consumers - benefit indirectly from the product.

Costs and resources

Cost structure:

Cost category	Cost description	Estimate annual costs
Assets investments	investing in equipment, instruments, computers etc.	13.000 €
Production costs	R&D costs, sales and marketing costs, production costs	142.500 €
Investment in working capital	salaries, other expenses	8.000€

Internal resources. Benco Baltic d.o.o. is a newly established company owned entirely by BENCO Baltic Engineering Company, UAB. Throughout, Benco Baltic gained scientific expertise and know-how for research and development. The company will use the experience

developing this product and newly gained knowledge to develop further solutions for the food sector. Foreseen resources include human and financial resources and know-how developed through development and commercialization of this product.

Business prospects

Business development scenarios:

Realistic scenario of exploitation - In the first 3 years after commercialization the target market share is estimated at 4% or around 1 mil. EUR in revenue. Due to expected low costs of service delivery because of the digital scaling effect, and average 50% margin rate is expected that will provide the necessary means to continually develop and expand the service portfolio offered to clients, as well as enable the expansion of business operations in other (primary East Asian) markets and therefore further progressing service sales.

Optimistic scenario of exploitation - In the first 3 years after commercialization the target market share is estimated at 8% or around 2 mil. EUR in revenue and average 100% margin rate is expected as well as expansion of business operation in other markets (Asian, South America…) and further progressing service sales.

Pessimistic scenario of exploitation - In the first 3 years after commercialization the target market share is estimated at 1% or around 0,5 mil. EUR in revenue and average 25% margin rate is expected; there is no expansion of business operation in other markets and progressing service sales.

Business risks and risk mitigation

Identification of main business associated risks and mitigation strategies:

Risk	Risk description	Risk mitigation strategy
Internal	Limited financial resources for rapid commercialization	Attracting additional funds for commercialization project results through European Structural Funding for late-stage innovation, additional direct investment and attracting other private investment after the demonstration of innovation.
Internal	Unforeseen technological limitations selected approach product development	Experimenting with different spectroscopic techniques (FTIR, Raman, microwaves, etc.) and data analysis techniques using the same developed technological base and, accordingly, correcting the vision of the product.
External	Limited market interest in the product	Establishing partnerships with government and scientific institutions in different markets, promoting products as a standard express solution for on-site testing for these institutions, thus encouraging companies to similar procedures

Change management

Full technical, business and logistical support will be available to business partners at all times, and business planning will reduce the risks of unforeseen events. Careful preparation and planning together with business partners will reduce the risks of adverse events and will reduce the risks of adverse events and prepare all participants in advance for changes in

circumstances and business.

Business Model Canvas

<table>
<tr><th>Key Partners</th><th>Key Activities</th><th>Value proposition</th><th>Customer relationship</th><th>Customer segments</th></tr>
<tr><td rowspan="3">NRC

ART 21

specialized organizations

cooperatives

distributors</td><td>R&D – improve product and build new ones

manage software and hardware

distribution</td><td rowspan="3">fast and cheap method to assess the main parameters of oyster quality

solution compatible with third-party NIR spectrometers

easy to use by non-professional users

access to shared knowledge</td><td>automatic when possible

personal assistance

online support</td><td rowspan="3">oyster producers

oyster supply chain - wholesalers, restaurants, retailers</td></tr>
<tr><td>Key resources</td><td>Channels</td></tr>
<tr><td>intellectual resources

IT infrastructure

R&D investments

distribution channels</td><td>online platform

personal sales and distributors</td></tr>
</table>

Cost structure	Revenue streams
investing in equipment, instruments, computers etc. R&D costs, sales and marketing costs, production costs salaries, other expenses	on-site oyster quality assessment service direct product sales third-party NIR spectrometer users service

Conclusions

The aim of this document was to present and report on planned and implemented IEs workshop events that constitute the outcome of task Task 2.1 "Knowledge exchange and capacity building workshops with IEs [M05-M10] and Task 2.2 " Supporting IEs in innovation

commercial exploitation strategy development". The document also reports on reaching M3. "Knowledge exchange and capacity building workshops (3 in total) with IEs [M10]" and constitutes the outcome of part of WP2 "Supporting Innovation Experiments with DIH services" of the AquaHubs project.
The general aim of Task 2.1 was to enable cross-regional knowledge transfer from DIHs to IEs and developing IEs capacities and capabilities in innovation management and exploitation.
4 workshop events were held, each one led by the respective appointed partners, 2 events were held by XAMK and one AFL and AFC each. The outcomes of the events were presented by the same event outcome reporting methodology that was developed in D3 "Programme of cross border knowledge exchange and IE capacity building", which was developed under WP1" Development of common DIH services and capacities". All 4 events were implemented according to the event outcome reporting methodology and provided all necessary documentation and outcomes; events were in compliance with DAP and reaching their KPIs.
The general aim of Task 2.2 was to support IEs with the cross-border expertise of DIHs in developing commercial exploitation strategies, business models, value propositions, commercial benefit analysis and market entry plans of their technologies, products or services. So, to achieve that the outcomes of the events were incorporated into completing the task. A common Commercialization plan and go-to-market guidelines were presented under which IEs had commercial strategy developed.