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SUBMARINER Network Aquaculture Working Group meeting. Let's talk about RAS and symbiosis!

The first session of the year of the Aquaculture Working Group was held on May 2nd. About 25 participants gathered online for two hours to discuss different projects and topics related to recirculating aquaculture (RAS) and symbiosis.

Maria J. de la Peña, from [SUBMARINER Network for Blue Growth EEIG](#), moderated the session. After a warm welcome, Efthalia Arvaniti, from SUBMARINER Network as well, gave a short introduction to the SUBMARINER Network, its members, and the topics the network works on. She also pointed out that there are many projects that the SUBMARINER Network is involved in that are interlinked with the TETRAS project, such as [BlueMissionBANOS](#) (Supporting the EU Mission Restore our Ocean & Waters in the Baltic and North Sea), [EU4Algae](#) (algaeponics, macroalgae), [AlgaeProBanos](#) (product development and market access of sustainable algae solutions, Baltic, and North Sea). Besides the Aquaculture Working Group, SUBMARINER Network also hosts working groups on mussels and algae that meet regularly every 2-3 months.

TETRAS – Recirculating aquaculture systems and industrial symbiosis for sustainable food production

Maria J. de la Peña introduced the TETRAS project that will run until 2025 and is led by the Klaipeda Science and Technology Park Lithuania. TETRAS stands for Technology Transfer for Thriving Recirculating Aquaculture Systems in the Baltic Sea Region and is a three-year project co-financed by Interreg Baltic Sea Region. Ten partners from five countries in the Baltic Sea region work on recirculating aquaculture systems (RAS) in combination with other industrial processes. The partners build a strong consortium with different and complementary expertise in RAS systems, business support, commercialisation, finance, or administration. Additionally, associated partners provide feedback on results and the applicability of the results in different regions. The project will also benefit from feedback from the working group.

RAS stands out as a sustainable method of trophic aquaculture. These systems have many advantages, like their independency from natural water bodies, and geographical flexibility, and they allow the intensive production of healthy high-quality food products. Still, there are many challenges to overcome, such as the high investments and costs for their installation and operation, the carbon footprint, and the linearity of many systems. Symbiosis, the combination of RAS with other industrial processes to maximise

the use of resources, might be a solution to tackle these challenges and create a closed resource cycle with increased economic and environmental sustainability. **TETRAS aims at demonstrating new symbiosis concepts to improve the economic and environmental sustainability of recirculating aquaculture systems and develop tools and standards to assess and monitor RAS and promote investment into these food production systems.**

The TETRAS project includes 4 regional pilots:

1. Treatment of RAS water for use as technical water (i.e. Power-to-X)
2. Geothermal resources for heating and mineralisation of marine/brackish RAS
3. Feasibility study for a fully circular agro-industrial park with RAS
4. Small-scale RAS for data collection and awareness building

The project results will be summarised in a portfolio of solutions with investment-ready business cases, licensing, permits and regulation guidelines, communication material for end-users and consumers, and technical and non-technical recommendations for decision-makers.

TETRAS and the Estonian Industrial Symbiosis Agro-Park (EISAP)

Nele Rogenbaum, Business Development Manager at the [Ida-Viru Investment Agency \(IVIA\)](#) in Estonia continued the presentation by giving insights into one of the pilots, the Estonian Industrial Symbiosis Agro-Park (EISAP). IVIA is a regional investment promotion agency and developer of industrial parks.

The pilot in TETRAS is a fully circular agro-industrial park, which currently is in early-stage development. The concept aims at using resources and outputs of different industries in the site by interlinking them. The concept was developed in several co-creation sessions with more than 20 stakeholders. The park covers 1,500 ha of surface-mined land and has water resources and a power plant. In the centre of the park area is planned to have greenhouses connected to all other industries by material flows, one of these will be the RAS. The concept is to build the industries around the greenhouses in a modular style, like Lego blocks, and to build on nature and regenerate the local ecosystems and biodiversity, i.e. through agroforestry. For one year, a spatial planning process together with the local government has been undertaken. Environmental studies have just started. A feasibility study on the whole EISAP is planned, while as part of TETRAS, a feasibility study on the best use of land and resources for a fully circular agro-industrial park will be done, also to demonstrate how to connect RAS in a financially viable way to be attractive to investors. So far, the following risks have been identified: a strong increase in construction prices, fear to invest due to the project's proximity to the Russian border, and lack of financing as well as delays in planning and the permitting process.

Looking forward to the progress of the EISAP throughout TETRAS. Exciting to see more and more industrial symbiosis centres being developed.

Sötenas Symbiosis & Testbed for Land-based Aquaculture

Peter Carlsson, representing the [Sötenäs municipality](#), talked about the Sötenas Centre of Symbiosis & the project “Testbed for Land-based aquaculture in circular systems”. Sötenäs municipality has a population of 9,200 people and is known for tourism with 1 million visitors per year, especially in summer. Apart from tourism, food, and marine food (fishing, big fish processing companies) are the main business areas.

The Sötenäs Centre of Symbiosis (Industrial & Social Symbiosis), founded in 2015, is a symbiosis network where companies exchange resources such as side-streams, energy, and other benefits to create added value and improve industrial productivity. Everything started when some large fish processing factories faced a common challenge, the management of their wastewater. To obtain permits to expand production, they required solutions for the treatments of their wastewater. Since 2018, processed water from the local industries and bio waste of the companies is used to produce biogas, which is then used by one of the processing plants. Additionally, eco-labeled fertilizer is sent to local farmers.

The same owners looked for new business opportunities in aquaculture and started Smögenlax –a land-based salmon farm with RAS technology currently at pilot scale– and the Swedish Algae Factory, the first inland-based greenhouse commercial farm for algae.

At the beginning of the symbiosis centre, the project had a testbed for aquaculture and symbiosis, where companies were able to run tests, verify technology and try out symbiosis synergies. Currently, they are working on the development of a large-scale Testbed for Land-based aquaculture in circular systems together with 15 partners from Sweden and Norway.

The technical concept of the project is to build and operate a large-scale reference centre for recirculating aquaculture with a flexible design –including a R&D small-medium-scale systems– that allows testing technologies, potential synergies between processes, management of waste streams, strategies to optimise energy, among other functions. The goal is to establish a reference centre for recirculating aquaculture in circular systems at the international level.

Currently, they are looking for partners to engage in this project for the next stages of this project. If interested, please contact peter.carlsson@sotenas.se.

The Blue-Green Bio Lab project

Cathy Brown Stumman, representing the [Skive municipality](#), presented the [Blue-green Bio Lab project](#). It is an **Interreg Baltic Sea Region** project, that started in October 2022 and **for the following eighteen months will** help local authorities **initiate** bio-industrial symbioses among aquaculture, **agriculture**, and industry to reduce emissions while producing more consumer goods.

Six partners and associated partners grouped to follow their common interests to find win-win alternatives to cope with environmental challenges and climate issues regarding agricultural and marine ecosystems and to enable local development. To mention a few of the challenges faced are nutrient deposition from agricultural systems with negative impacts on water quality (inland and sea); over-fishing, and the need for higher degrees of self-sufficiency for feed, food, and energy. Aquaculture, agriculture, and industry can provide solutions to these challenges through industrial symbiosis by using side streams or waste products to develop new products.

The project has a main output: the Blue Green Bio Lab Tool Kit. **The Target group of the guide is primarily the local public authorities (that play an essential role as facilitators/initiators of discussions with key actors), but also businesses and business organizations.** Biomass briefs, bio-industrial symbiosis briefs, policy briefs, and key learnings will contribute to the tool kit. 5 briefs on biomasses are finalized very soon and will be published on the website. National-level workshops and a final conference in Q1 2024 are planned.

Cathy Brown shared a few of the learnings gained so far, among them: the readiness for discussions is very different across the three partner countries (how to engage the local stakeholders and especially in which phase, at what point the policymakers need to be informed and when to involve the citizens; level of knowledge from different stakeholders is very different and communication is key. What are opinions, what are facts? Brown concluded that **the framing of the discussions and adaptation of the language is crucial.**

Open space & pitch

Jonas Eliasson, based in Copenhagen, entrepreneur, and architect, presented his project idea Blue Desert Plantations, a project developing methods for sea-based eco-farming (regenerative food production at scale and reconstructing local failing ecosystems) and a communication strategy (solution-based positive vision, state of the world, exhibitions in a museum in June this and next year).

- Key research areas: reef design /best practice, Bio design/selection/limitations; Biological impact /risks; Growth modeling, business modeling
- Looking for partners with experience in multi-trophic aquaculture, sea-based farming, sustainable business modeling, regulation, food industry.

Contact: Jonas.o.p.eliasson@gmail.com

Up-coming AWG activities

From now on, TETRAS will coordinate the Aquaculture Working Group activities, so we invite you to follow the project's progress to stay tuned for future meetings. It is important to highlight that despite the meeting evolved around the topic of RAS and industrial symbiosis, all aquaculture-related projects and topics are invited to participate in the Aquaculture Working Group meetings.

For feedback or topics for our next meetings, please contact **Maria J. de la Peña** (mp@submariner-network.eu).

TETRAS – Technology Transfer for Thriving Recirculating Aquaculture Systems in the Baltic Sea Region



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