Developing good regulatory practices for macroalgae cultivation in Northern European countries

BalticSeaSafe project report O.2

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April 2023

Co-financed by the Seaweed Safety Coalition

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Testimony: The Baltic Sea Safe project (2021-2023) is co-financed by the Seaweed Safety Coalition

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About the Baltic Sea Safe project

Baltic Seaweed Biosafety or BalticSeaSafe is a 16-months project (January 2022 – April 2023) funded by Global Seaweed Safety Coalition. BalticSeaSafe project is coordinated by SUBMARINER Network for Blue Growth EEIG, with partners Finnish Environmental Institute & Latvian Institute of Aquatic Ecology.

Website: https://www.submariner-network.eu/BSS

BalticSeaSafe aims for creating a well justified guidance, resulting in recommendations and position papers on environmental monitoring and license conditions for **cultivation of seaweed in the Baltic Sea with regard to environmental safety.** The work is building on the work of Baltic GRASS project (Interreg BSR) and its recommendation for future actions.

BalticSeaSafe raises awareness on environmental benefits and risks of algae cultivation in the Baltic Sea region. In the last 10 years, Baltic Sea Region actors including politicians, authorities, entrepreneurs, consumers are very much preoccupied with eutrophication and future measures to improve environmental status of the Baltic Sea.

BalticSeaSafe also builds capacities among policy makers in suggesting a fair, unified and coherent licensing regulation reflecting the real risks as well as industry's needs. Currently, licensing for setting up new farms is an important barrier for algae investors and entrepreneurs. A new standardised licensing process can effectively unlock investments in-seaweed sector, by including macroalgae cultivation in the maritime spatial plans and allocating areas suitable for algae farming, and developing a licensing process that is robust, fair, functional and effective.

Project outputs

Workshop 1	The 1st workshop focused at the most important environmental risks and biohazards related to the upscaling of seaweed farming specifically for the Baltic Sea. The workshop participants represented academia, consultancies, NGOs, environmental authorities and seaweed farmers. The workshop discussion led to Output 1.
Output 1	A report with recommendations for necessary data collection and monitoring practices at the seaweed farms (December 2022).
Workshop 2	The 2nd workshop focused on the regulatory issues for seaweed cultivation in the Baltic Sea, especially on licensing procedures and permit requirements. The workshop participants included environmental researchers, permit-issuing authorities, ministries, maritime spatial planning experts, legal scholars, and farmers. The discussion of the second workshop led to the formulation of Output 2 and Output 3.
Output 2	A report on developments in standardizing licensing and environmental assessments in the region (April 2023).
Output 3	A position paper on necessary adaptations in licensing and environmental legislation (April 2023).

1. Introduction: macroalgae cultivation: benefits and risks

This report is the second deliverable of the BalticSeaSafe project (funded by Seaweed Safety Coalition), which has the goal to facilitate benchmarking and collaboration between countries and stakeholders to safely scale macroalgae cultivation in the Baltic Sea. To achieve sustainable blue economy and to foster investment in aquaculture, clarifying and improving the environmental permit procedures is of interest for many of the Baltic and Nordic European countries.

At the European level, the discussion on improving the procedures for environmental permits is related to reducing the administrative burden and fostering a sustainable blue economy and investment. Macroalgae and low trophic aquaculture (LTA) is recognized as one of the European Green Deal activities that has potential to reduce pressure on land resources, mitigate climate change, and contribute to the EU Mission: Restore our Ocean and Waters 2030. One of the objectives of Mission Ocean is to make the sustainable blue economy carbon-neutral and circular, and this is tested in the Baltic and North Sea lighthouse. Complexity of the permit system has been identified as one of the main challenges to commercial macroalgae cultivation (Armoškaitė et al., 2021). Furthermore, the new Algae Initiative (DG MARE 2022, https://oceans-and-fisheries.ec.europa.eu/publications/communication-commission-towards-strong-and-sustainable-eu-algae-sector_en) suggests 23 actions among which they aim to improve the governance framework and legislation. The current macroalgae cultivation permits are hereby scrutinized as part of the ongoing discussion.

Entrepreneurs (macroalgae farmers), permit issuing authorities, ministry representatives, maritime spatial planners, Seaweed for Europe coalition, and environmental law researchers were invited to join the BalticSeaSafe workshop on the 30th of November 2022. The aim of the workshop was to discuss and define good regulatory practices that allow risk-based, efficient, and fair permitting of macroalgae cultivation. The workshop was organized by the Finnish Environment Institute SYKE, Latvian Institute of Aquatic Ecology (LIAE) and SUBMARINER Network for Blue Growth EEIG. In the workshop, we had around a dozen active participants from five Northern European countries: Finland, Estonia, Latvia, Germany, and Norway.

Environmental impacts of macroalgae cultivation differ entirely from (or in fact counteract) those of fish aquaculture. Macroalgae cultivation can have positive effects on the Baltic Sea environment, as macroalgae can remove nutrients, reduce eutrophication and increase biodiversity by attracting fish, bird and mammal species and providing habitats to them. The cultivation activity is not harmful to the aquatic environments, as it does not provide additional nutrients. The positive and negative environmental impacts of macroalgae cultivation are assessed in BalticSeaSafe report 1 (Bārda et al. 2023).

Environmental permit systems are national or regional, i.e., permits are granted by national or regional government authorities. The rationale behind environmental permitting for individual activities is to minimize environmental risks, prevent and reduce pollution, and to ensure that “no significant harm” is caused to the environment. In many of the permit issuing countries and regions, impacts of an activity are assessed, based on which it will be decided whether a permit can be granted for a macroalgae farm. In the Baltic Sea, the benefits of nutrient removal may often outweigh the environmental risks. Risks with macroalgae cultivation include diseases, pathogens, and spore release, see Macroalgae Eklipse report (2022).

In some countries such as Finland and Sweden, a separate water permit is required for activities that take place in aquatic environments. Water permitting is based on interest balancing, where public and private benefits should outweigh the costs and negative impacts of the activity. Water permitting was developed in the rationale to protect water as a public good from private interests that might deteriorate the water bodies or otherwise prevent others from benefiting from the water.

In the European Union (EU) countries, the substantive criteria for environmental protection are based on EU legislation, which is then transposed to national legislation. For aquaculture, the Water Framework Directive (2000/60/EC) and the Marine Strategy Framework Directive (2008/56/EC) are the most relevant regulations. In addition, if the project is in a Natura 2000 area governed by the Habitats Directive (92/43/EEC) and causes a significant risk to the nature values, a Natura 2000 exemption is required. “Do no significant harm” and “polluter pays” as guiding EU principles guide environmental permitting in the EU. Monitoring requirements are typically set as a part of the permit. Norway as a non-EU country has its own laws and principles for environmental protection.

The permitting system includes environmental impact assessment and public participation. EU’s Environmental Impact Assessment directive (EIA, 2011/92/EU) mandates the EIA for major projects and recommends it on a case-by-case basis for other projects that cause direct or indirect impacts on the environmental factors such as human health, biodiversity, land, soil, water, air, climate, landscape, material assets and cultural heritage. Environmental impact assessment is required prior to the environmental permit projects most likely causing significant environmental harm. The involvement and participation of citizens such as local inhabitants and NGOs via written statements and public hearings is an integral part of EIA.

Section 2 summarizes the existing rules on licensing in different Northern European countries, and section 3 discusses the results of the BalticSeaSafe licensing workshop.

2. Permits required in different Northern European countries

Macroalgae cultivation requires an environmental permit, water permit, aquaculture permit and/or specific macroalgae cultivation permit in most Northern European countries, scrutinized in the BalticSeaSafe project (see Table 1, more on the topic in Camarena Gomez & Lähteenmäki-Uutela, GRASS project Interreg BSR 2019-2021, and in Camarena-Gomez et al., 2022). Each country has its unique environmental permitting system as part of its broader regulatory and administrative structure.

Table 1 shows which permits are currently required in different Baltic and North Sea countries.

Table 1. Permits required in different Northern European countries

	Permit requirements in different countries	**Responsible authority**	**Related legislation**
Baltic Sea countries			
Finland	Water permit; environmental permit	Regional State Administrative Agency	Water act 587/2011; Environmental protection act 527/2014

Estonia	Water permit; superficies license	Environmental Board; Consumer Protection and Technical Regulatory Agency	Fishing Act 2015; Water Act 1994
Latvia	Aquaculture permit	National board of fisheries	Marine Environment Protection and Management Law 2010
Lithuania	No permits required for macroalgae cultivation	n/a	n/a
Poland	Permit for cultivation of living organisms; water permit; fishing permit	Ministry of Maritime Economy and Inland Navigation: Fisheries Department	Law on cultivation of living organisms; Water law
Germany	Water permit; fishing permit	Federal Waterways and Shipping Agency; Länder level authorities	Federal Water Act; Water Acts of the Länder
Denmark	Macroalgae cultivation permit	Danish Coastal Authority	Fisheries Act (2006)
Sweden	Water permit (> 0.3 ha)	County Administrative Board; Land and Environment Court	Environmental code 1998:808
North Sea countries			
Scotland: Temporary permit; marine license for inshore cultivation / marine license for offshore cultivation **Iceland:** Macroalgae cultivation bill in the parliament **Norway:** Macroalgae cultivation permit; Environmental assessment for > 10 ha			

3. Workshop results

3.1. Activities requiring a permit

In the first break out room, we discussed which permits are needed in each country, including the size of a farm and whether small macroalgae farms require or should require a permit. We also discussed about how long it takes to receive the required permits in different countries.

In Finland, any water management activity requires a water permit. Activities that are causing risk of deteriorating water quality, also require an environmental permit. Macroalgae cultivation is generally understood as an activity that does not cause a threat to the environmental status of the Baltic Sea, and therefore it typically requires a water permit only. The average timeline for granting a water permit is 9 months. Regional State Administrative Agency is responsible of the granting of

water permits, which are usually permanent, when not for a particular reason granted only for a temporary period. There is only one macroalgae plant operating on a trial permit in Finland.

In Estonia, aquaculture production that exceeds 1 ton per year needs to be registered. The Environmental Board shall decide on the registration of applicant's activity or a refusal of registration within 30 days after receiving of an application. The operator also needs an environment permit called the superficies license. The granting of this permit is decided within 90 days as of the receipt of a due application. In addition, aquaculture production requires a water permit, granting of which can take up to 6-8 months. Aquaculture requires also a building permit.

In Latvia, there is no separate macroalgae cultivation permit for marine areas. General aquaculture permitting applies if farm is planned on land (i.e., in tanks). In the marine areas, the general use areas in the Maritime Spatial Plan (MSP) are allowed for macroalgae cultivation. The procedure for receiving a permit in the sea involves a tender on license/permit areas and granting of construction permit. The planned activity should also be evaluated based on the Environmental Impact Assessment (EIA) legislation. If EIA is deemed necessary, it can last up to 400 days to receive a permit. EIA has not yet been applied in Latvia to macroalgae cultivation as there are no farms.

In Germany, a water permit is required for macroalgae cultivation, which is granted by the regional Waterways and Shipping Administration (Wasserstraßen und Schifffahrtsverwaltung – WSA, Ostsee) (see also Camarena-Gómez et al., 2022). The overly complicated multi-level administrative system in Germany may cause delays in obtaining the permit. No detailed timelines were given by the participants, but the process can be very time costly. Therefore, pilot projects have played a role in clarifying the licensing conditions together with the environmental administration.

3.2. Permit conditions and acceptable risks

When asked, "should macroalgae cultivation require an environmental permit based on the benefits/risks before the start of the operations?", most of the workshop participants were in favor of some environmental permitting to manage the potential risks of macroalgae farms. The discussion focused on providing favorable permitting conditions for macroalgae cultivation, as the activity can be considered beneficial for the environment. In many Baltic Sea states, macroalgae cultivation is treated with similar permitting practices as salmon farming which can cause detrimental impacts to the aquatic ecosystem. According to the participants, this should be improved to facilitate macroalgae cultivation in the Baltic Sea.

Overall, the environmental risks caused by seaweed cultivation were considered as low (see also EKLIPSE report). The discussion on the risks was mainly related to choosing a location which does not have valuable benthic habitats as macroalgae cultivation can cause changes in light penetration, on which the species in these habitats are dependent. This refers to protecting seagrass meadows, macroalgae forests or beds of drifting red seaweeds, reefs, or peddle fields. According to participants, "a construction above soft sediment ground without macroscopic vegetation can be regarded as safe and should not require further investigation".

As regards environmental impact assessment and monitoring, the participants thought it should be facilitated and implemented, "but much less requirements than in full EIA", "based on existing experience and not an all-round monitoring requirement for any theoretical risk". Before setting up cultivation it is important to see it is not threatening biodiversity and ecosystems in protected marine areas. Risks with the biological materials and with other equipment need to be assessed. The participants stated that during the operations, it would be important to provide data and information about the positive effects of macroalgae cultivation, too.

3.3. IMTA

In the break-out session on integrated multi-trophic aquaculture (IMTA), we were asking "How should IMTA be regulated? What exactly is/are the problem(s)? Please elaborate."

IMTA is a polyculture, where two or more aquatic species with different trophic levels are farmed together. Fish farming can be a significant source of localized nutrient loading. Nitrogen and phosphorus are the main stressors in the Baltic Sea basin. Cultivating seaweed, mussels, mollusks, oysters or other low trophic species alongside salmon or other fish can help to absorb a part of the nutrients from fish farms.

The discussion was then on how much are macroalgae assimilating nutrients and how could this knowledge be applied to compensate for fish farms in IMTA. The participants stated that more data are needed on the impacts of macroalgae farming on eutrophication caused and nutrients released from the fish farms. Compensation mechanisms for fish farms could be developed based on the data on how much nutrients algae can assimilate.

The environmental permit and water permit systems in many of the Baltic Sea states are regulating the cumulative impacts. This means the conditions for granting an environmental permit for a project depends on what activities are already taking place in the area. The authorities may not be able to grant any more permits for fish farms if they will not compensate their nutrient emissions with low-trophic aquaculture. This is what makes IMTA interesting also for investors.

Very few examples of the IMTA exist in the Baltic Sea region. In Estonia, compensation mechanisms are accepted, for example for IMTA that combines fish and/or mussel cultivation with macroalgae cultivation. Redstorm is an IMTA commercial project that produces fish and mussels in Estonia. Also, Kieler Meeresfarm cultivates mussels and seaweed in Germany, and it is also planning to start fish production as soon as the mussel and algae production is established (www.kieler-meeresfarm.de). In Finland and Latvia, there are no concrete examples of IMTA.

3.4. Environmental monitoring requirements

In the last break-out session, we asked, "In your opinion, should there be continuous environmental monitoring requirements for macroalgae cultivation?"

In some of the Baltic Sea states, the environmental costs and benefits of the project are weighed beforehand, and the granting of the permit is based on these prior assessments only. In other Baltic Sea countries, monitoring requirements are a part of the environmental permit, and permits can be modified based on new data. In Estonia for example, monitoring requirements are more frequent in the beginning of the permit. Parameters of oxygen, dissolved organic carbon (DOC) through using DOM (digital optical monitoring), nitrogen, and phosphorus are monitored.

Monitoring was seen as providing fact-based decision making and filling the gaps of knowledge on concentrated risks. However, monitoring can be costly and time-consuming. Opinions on the need for monitoring were somewhat divided. One participant for example thought that monitoring should be frequent. As one participant formulated: "yes, there should be monitoring, maybe on a yearly basis, especially when it comes to diseases and pathogens that could spread to the native habitats". On the other hand, some thought that if the location of the farm is chosen properly in the first place, no further environmental monitoring is necessary.

4. Conclusions and ways forward

Environmental licensing of macroalgae cultivation falls within the national competence and therefore it cannot be harmonized. Yet, what can be done as a first step is searching for best practices. We organized a workshop on 30th of November 2022 to gather and develop best practices for environmental licensing of macroalgae cultivation in the Baltic and North Sea.

We emphasize the need to gather the knowledge on existing macroalgae permits in a findable and accessible form to ensure that the future macroalgae producers and investors can benefit from that knowledge. Pilot projects in the Baltic Sea region play a significant role in building the capacity for macroalgae permitting, both for the operators and for the environmental administration.

The countries scrutinized in this report vary to the type of the permit required, the time and effort needed for the environmental permit process and the type of the authority granting the permits. Depending on the type of the permit and whether several permits are required, the average time of issuing a permit varies between a few months and several years. Each country scrutinized in the BallticSeaSafe project has its unique administrative system that has been developed to implement EU and national laws. For that reason, it would be unjustified to suggest an ideal type of permit system.

Environmental permitting is the main instrument for managing environmental impacts of individual activities. Permitting and environmental legislation can impact technological innovation positively through setting strict and clear rules, but also negatively if it creates frustrating bureaucracy. A main critique of the permitting system from a business perspective is that it is intermittent, multi-step and resource-intensive, and that it can therefore hinder green investment. The main issue is how to streamline environmental permit systems to foster green economic development and projects that support sustainable development. From this perspective, the concept of acceptable risk is relevant. What kind of activities should be allowed with or without environmental impact assessments, what kind of control mechanisms should be in place in advance and after granting the permit to minimize the environmental risk? As macroalgae have mainly beneficial impacts on the water quality, should it be treated differently than the activities with generally detrimental impacts?

Cumulative impacts are considered in the environmental permitting, which is why granting more permits for fish farms is not possible in many places, and IMTA is gaining interest. Albrecht & Lukkarinen (2020) have found that de-coupling from fish-based aquaculture would allow a transition to macroalgae cultivation. Main challenge for permitting IMTA is to gain enough data on how much nutrients seaweeds, mussels or mollusks are uptaking. Lack of data and IMTA being in the pilot phase in the Baltic Sea causes challenges for the operators and for environmental administration.

Most countries set emphasis on the advance control within the environmental permit systems, although control and monitoring during the operations are also required in some. Environmental monitoring produces data that can be beneficial for reducing the uncertainty about the environmental risks and fill in knowledge gaps about the impacts of the activity. Increasing knowledge forms a base for more realistic requirements in the permitting systems. Environmental permits can also be granted for a temporary period, which allows environmental administration to revisit the permit conditions. In a rapidly changing regulatory and operational environment and with the urgency of reaching the water quality goals and mitigating climate change, society might go towards a system where temporary permits are granted fast and then later adjusted.

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