Policy Brief

Achieving Blue Growth and Environmental Objectives:

Legal regulation of novel blue biomass solutions in the Baltic Sea

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1. Introduction

This policy brief aims to guide decision-makers on how to regulate novel blue biomass solutions in the Baltic Sea region. Legal regulation should provide possibilities for both blue growth and environmental protection. Novel blue biomass solutions include macroalgae cultivation, mussel farming and reed and fish biomass removal from the sea.

THE AIM of the European Union's Blue Growth strategy is to harness the untapped potential of oceans, seas and coasts for jobs and growth in a sustainable way (European Commission 2012, 2020). The European Green Deal underlines that the blue economy must be able to protect and restore nature and fight climate change in addition to providing economic growth and employment (EU 2020).

ENVIRONMENTAL SUSTAINABILITY includes that the blue economy must comply with EU environmental law requirements stemming from the EU Water Framework Directive (WFD 2000/60/EC), Marine Strategy Framework Directive (MSFD 2008/56/EC) and Habitats Directive (92/43/EEC).

THE ENVIRONMENTAL sustainability requirement is particularly challenging in the Baltic Sea region due to severe eutrophication resulting in, for example, harmful algal blooms. In order to achieve and maintain a good environmental status of the Baltic Sea in accordance with WFD and MSFD, not only nutrient inflow from the catchment area of the Baltic Sea must be reduced but also nutrient uptake and removal has to be enhanced (Schultz-Zehden et al. 2019; Baltic Blue Growth 2019).

THE BLUE biomass solutions may prove crucial in nutrient uptake from the Baltic Sea. They remove excess nutrients and thus reduce the effect of eutrophication. Simultaneously, blue biomass solutions provide possibilities for circular economy approaches in combination with aquaculture, animal husbandry and agriculture.

THIS POLICY brief discusses the EU blue growth objectives (Section 2), the EU environmental objectives (Section 3) and their reconciliation through the novel

blue biomass solutions in the Baltic Sea area (Section 4). In the end, the policy brief proposes guidelines for the regulatory reforms at national level to enhance the utilization of novel blue biomass solutions (Section 5).

2. Blue Growth Objectives

THE EU BLUE ECONOMY includes all marine-based and marine-related activities such as shipping and shipbuilding, marine living resources, marine renewable energy, seafood processing, blue biotechnology and coastal and maritime tourism. Its relative contribution to the EU Member States economy in 2018 was 1.5 percent regarding the gross value added (GVA) and 2.2 percent regarding employment. (EU 2020).

THE EU ESTIMATES that the output of the global ocean economy is to more than double by 2030 (EU 2017). Seas, coasts and maritime sectors and regions can be drivers for the European economy (EU 2012).

ONE OF THE ESTABLISHED SECTORS of the blue economy is marine living resources such as fishing and fish aquaculture. Still, EU's self-sufficiency of fish and aquaculture products is only around 45 %, and aquaculture production has stagnated in EU in the recent decades (EU 2020).

THE BLUE BIOECONOMY is considered as one of the emerging blue economy sectors. It is defined as comprising of a group of marine organisms such as macroalgae and commercial biomass applications (EU 2020). Marine biomass sources have traditionally been used as food, feed and fertilisers, but new innovative applications are developing including high-value bioactive compounds (nutra and pharmaceuticals, cosmetics), biomaterials, biofuel production, and bio-mitigation services (EU 2020).

TO ENHANCE BLUE GROWTH, EU relies on market forces. Its target is to remove barriers preventing innovation and investment. According to the Commission, bureaucratic barriers for investment in aquaculture have already been significantly reduced by e.g. making administrative processes more efficient (EU 2017).

IN THE BALTIC SEA REGION, especially, the novel blue biomass solutions may be one of the keys for the reconciliation of blue growth and environmental sustainability targets. While fish aquaculture, for example, leads to nutrient input into the already eutrophicated sea, the novel blue biomass solutions can provide opportunities to uptake existing nutrients and thus offset or mitigate possible harmful impacts of human activities.

3. Environmental Objectives

IN THE BALTIC SEA REGION, the environmental objectives of coastal water bodies and marine regions stem from the EU's Water Framework Directive (WFD), the Marine Strategy Framework Directive (MSFD) and the 1992 Convention on the Protection of the Marine Environment of the Baltic Sea Area (HELCOM). All these legal instruments aim to enhance the environmental status of the Baltic Sea.

THE WFD'S geographical scope of application covers freshwater (groundwater, lakes, rivers) and coastal waters (Art. 1). The Directive aims to prevent deterioration of and to achieve good status of water bodies. Currently, the overall ecological status of coastal waters in the Baltic Sea is below good. For example, in Finland, only 13 % of the area of the coastal waters is characterized as having a good ecological status (https://www.ymparisto.fi/pintavesientila). The MSFD protects marine waters further away from the coastline.

TO REACH the environmental objectives of the WFD and MSFD, the Member States need to produce and review river basin management plans and programmes of measures (Arts. 11, 13). In the 2015 Weser-judgment (C-461/13), the European Court of Justice stated that the environmental objectives are binding when new projects are authorised. Accordingly, 1) the Member States must – unless a derogation is granted – refuse authorization for an individual project that may cause a deterioration or jeopardise the attainment of good water status; and 2) there is deterioration as soon as the status of one of the quality elements of a water body decreases by one class.

IN THE FIELD OF BLUE ECONOMY, fish aquaculture increases the nutrient load of water bodies although its contribution to overall nutrient input of the Baltic Sea is small compared to nutrient runoff from land. This may increase the risk that good ecological status cannot be achieved and pose legal challenges in relation to reaching the environmental objectives (Soininen et al. 2019).

THE MSFD is applicable to all marine waters (Art. 2). Its aim is to achieve and maintain good environmen-

tal status in the marine environment. For that purpose, the Member States must develop and implement marine strategies (Art. 1).

ONE OF THE QUALITY descriptors for determining good environmental status for marine environment is human-induced eutrophication (Annex I). The effects of eutrophication on the ecosystems of the Baltic Sea are broad (Kostamo et al. 2020). Policies regulating maritime activities and the MSFD must be strongly interlinked to reach the Green Deal objectives (EU 2020).

THE GOOD environmental status requirement of the MSFD is applied in large sea areas. While individual activities such as fish farms may have a relatively small impact within that area, multiple activities may cause cumulative environmental impacts and thus prevent achieving the good environmental status. The requirements of the MSFD especially when combined with the requirements of the WFD, may affect the permissibility of fish farming activities (EU 2016).

THE MEMBER States must consider the whole marine regions such as the Baltic Sea when they implement the obligations of the MSFD (Art. 4). Nutrient reduction is also one the key aspects of the 1992 Convention on the Protection of the Marine Environment of the Baltic Sea Area and the 2007 Baltic Sea Action Plan (BSAP). The target of the BSAP is that the Baltic Sea is unaffected by eutrophication and reaches good environmental status by 2021. The BSAP includes a nutrient reduction scheme that guides Baltic Sea countries to substantially reduce nitrogen and phosphorus inputs from land and air (see Schultz-Zehden et al. 2019).

TO SUM UP, the WFD, MSFD and BSAP all require countries to reduce eutrophication of the Baltic Sea. To achieve that, it is important not only to reduce nutrient inflow but also develop nutrient uptake and removal as a mitigation strategy. Thus, the WFD, MSFD and BSAP allow and even support blue biomass solutions as far as they contribute to the achievement of the environmental objectives (see Schultz-Zehden et al. 2019).

4. Novel blue biomass solutions reconciling blue growth with environmental objectives

BLUE BIOMASS solutions may prove to be important for sustainable blue growth in the Baltic Sea in three ways. First, they improve the environmental status of marine areas by removing excess nutrients from the sea (EU 2020). Second, they can offset increased nutrient loading resulting from other blue economy activities such as fish aquaculture. Third, mussel and macroalgae biomass can be used for fish feed and for other purposes that reduce environmental pressures on wild stocks (Przedrzymirska et al. 2019).

ACTIVE MEASURES to remove nutrients from the Baltic Sea are crucial for the realization of its recovery in the foreseeable future due to the internal load of the sea (Submariner 2019, Schultz-Zehden et al. 2019; Przedrzymirska et al. 2019). On a local scale, already a small reduction of excess nutrients often has positive impacts (Suutari et al. 2016).

THUS, IN ADDITION to being considered as economic activities, the blue biomass solutions can be considered as environmental measures that further the achievement of the environmental objectives of the Water Framework Directive, Marine Strategy Framework Directive and Baltic Sea Action Plan (see Submariner 2019).

CURRENTLY, MUSSEL farming is the most researched biomass solution for extracting nutrients from water (Schultz-Zehden et al. 2019). However, macroalgal cultivation also has a lot of potential in many subregions of the Baltic Sea (Kotta et al. 2020), with ongoing pilot projects in many Baltic Sea countries.

IN NUMERIC terms, the nutrient removal potential of the blue biomass solutions is as follows (see Kostamo et al. 2020):

- **ANNUAL FILAMENTOUS ALGAE** 2,2-3 g/kg in dry weight (DW) particulate organic phosphorus (POP) and 23-42 g/kg particulate organic nitrogen (PON)
- **BLUE MUSSELS** 2,3 g/kg DW POP and 18 g/kg PON
- **FISH** 2-7 g/kg POP and 22-24 g/kg DW PON.

NEVERTHELESS, ONE must note that not all the interactions between novel blue biomass solutions and the environment are positive. These biomass solutions may cause some emissions and have negative local impacts. For example, large-scale macroalgal cultivation may cause ecosystem changes and mussel farming degradation of living organisms on the local sea floor (Campbell et al. 2019; Przedrzymirska et al. 2019). Therefore, a large-scale assessment concerning all the blue biomass sectors is needed to assess fully their socio-economic and environmental impacts.

CONSIDERING THE reconciliation of blue growth and the environmental objectives in the Baltic Sea, the relationship between fish aquaculture and the novel blue biomass solutions provides a concrete example. The fish aquaculture, both open-net rearing units and recirculating systems, causes nutrient inflow to the sea. Therefore, it is uncertain whether any new or continued permits can be granted for fish aquaculture in areas that have not achieved the environmental objectives of WFD and MSFD (see Soininen et al. 2019). To allow permitting, EU Member States may consider different means, such as the biomass solutions, to remove nutrients from the sea (EU 2017).

5. National policy measures needed

MARINE AND COASTAL AGUACULTURE in the Baltic Sea comprises of fish farms, mussel farms and algae cultivation. Fish farms are operated on a commercial basis, while mussel farms and algae cultivation, which are two of the novel blue biomass solutions, are currently (2021) mostly pilot-scale research projects (Przedrzymirska et al. 2019).

ACCORDING TO THE EU, the blue bioeconomy faces many challenges and constraints. Two of these are the complexity of the regulatory and administrative procedures and the lack of reward schemes for the provision of environmental services to the marine ecosystems (EU 2020).

THE WATER FRAMEWORK DIRECTIVE, Marine Strategy Framework Directive and Baltic Sea Action Plan all support novel blue biomass solutions that enhance the achievement of the good environmental status of the Baltic Sea. However, they also leave a lot of discretion for States to regulate the biomass solutions and to reconcile them with the blue growth objectives (see Schultz-Zehden et al. 2019).

AT THE NATIONAL LEVEL, the advancement of the novel blue biomass solutions requires different types of policy measures. On the one hand, a lot can be done based on current legal regulation. On the other hand, also legislative changes may be needed.

1. Promote novel blue biomass solutions through maritime spatial planning

ONE OF THE BOTTLENECKS of the novel blue biomass solutions is the integration of the different uses of marine areas. Macroalgae cultivation, for example, may require large marine areas of operation and must be integrated with nature conservation areas and other activities such as shipping, fisheries, wind power production, recreational uses and national defense. Some of these uses, e.g. offshore wind energy, may be combined with blue biomass solutions (see Przedrzymirska et al. 2019). Furthermore, space on land is needed for the storage and processing of wet algal material.

ONE OF THE POLICY TOOLS to enhance macroalgae and other novel biomass solutions at sea is maritime spatial planning. The main objective of the EU Maritime Spatial Planning Directive (2014/89/EU) is to promote sustainable development and growth in the maritime sector (Art. 5). To achieve this, maritime spatial plans should be able to reduce conflicts between sectors and create synergies and balance the development of a wide range of maritime activities (EU 2016). Maritime spatial planning process can specifically address the novel blue biomass solutions. In addition, regional and local level planning is needed to enable the storage and processing of blue biomasses.

2. Plan how to manage nutrient balances

THE NOVEL BLUE BIOMASS solutions could benefit from a mass balance approach to evaluate the nitrogen and phosphorus pools at the Baltic Sea level and the national level. In the framework of the Baltic Sea Action Plan, states could consider how to allocate their nutrient targets between different activities and how the novel blue biomass solutions may support synergies between sectors or offset emissions from other activities by removing nutrients from the sea.

THE BLUE BIOMASS SOLUTIONS can also be included in the water management plans and marine strategies. In this way, countries may plan in more

detail how they can use these solutions as environmental measures to offset nutrient loading resulting from different sea- and land-based activities.

TO MITIGATE eutrophication stemming from the fish aquaculture, States may consider applying nutrient-neutral schemes and other means to remove nutrients from the sea (EU 2017). National and international nutrient trading schemes and co-location solutions could be enhanced. They could include the development of integrated multitrophic aquaculture systems where fish farms are combined with nutrient extracting species such as macroalgae or shellfish to provide environment remediation in the form of the bio-mitigation of harmful impacts (see EU 2016; Przedrzymirska et al. 2019).

3. Recognise blue biomass solutions as environmental measures

THE NOVEL BLUE BIOMASS SOLUTIONs should be officially recognised as a nutrient mitigation tool. This could provide incentives to support these solutions and their use as nutrient offsetting/compensation measures in relation to economic activities (see Submariner 2019). However, at the same time the environmental impacts of the novel blue biomass solutions such as large-scale macroalgal cultivation must be monitored, since they may disturb marine ecosystems (Suutari et al. 2016). An extensive assessment on their total environmental and socio-economic footprint should be conducted.

ECONOMIC INCENTIVES are needed to develop infrastructure for the blue biomass solutions (see Suutari et al. 2016). There could be payments for the ecosystem services they provide. While different public funding schemes are available for the purpose, payment schemes could also be based on markets for ecosystem services either under the polluter pays or beneficiaries pay principle (Schultz-Zehden et al. 2019).

4. Make permitting work

PUBLIC AUTHORISATION relates to novel blue biomass solutions in two ways. First, these solutions usually require a permit due to their need of marine operation area. Second, they can be supported as environmental measures through the permitting of other activities such as fish aquaculture.

TO MAKE THE PERMITTING of the blue biomass solutions work, first, these solutions should be integrated with other activities in planning instruments. Maritime spatial planning as well as the water management plans and marine strategies provide a platform for the permitting process to locate and permit the blue biomass activities and, in general, to reconcile them with other uses of marine environment. Second, the largely positive environmental impacts of the blue biomass solutions should guide the permitting process and required environmental assessments.

THE LACK OF UNDERSTANDING of the environmental impacts of novel biomass solutions (e.g. mussels and seaweed farming) may cause lengthy licensing processes. Public and private sectors should work together to improve the gap of knowledge of novel biomass and provide sufficient information, such as recommendations and guidelines, to the authorities.

WHEN PERMITTING fish aquaculture or other activities causing nutrient loading to the sea, blue biomass solutions should be considered as environmental measures that may mitigate or offset their impacts. States could develop payments for the ecosystem services that blue biomass activities provide (a trading system) and consider the cumulative impacts of different activities (EU 2016; Belinskij et al. 2018).

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