

A REGIONAL AND LOCAL PERSPECTIVE ON A FUTURE EU ALGAE STRATEGY

Established in 2001, ERRIN promotes the regional and local dimension in European research and innovation policies and programmes. The network gathers over 120 members who primarily collaborate through 13 Working Groups, covering both thematic areas and overarching policy issues. ERRIN supports project development and knowledge exchange between members to enhance regional and local research and innovation capacities, with the aim to foster sustainable and inclusive growth in all regions.

This position has been coordinated by a drafting group led by the Bioeconomy and Blue Growth Working Groups. ERRIN's Natural Resources and Food Cluster – together with the wide ERRIN membership – have contributed to the document.

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Introduction

ERRIN, representing over 120 regional and local stakeholders active in research and innovation from across Europe, strongly supports the development of an EU algae strategy. With the European Green Deal and its section on the contribution of the blue economy to address climate change and alleviate the many demands on the EU's land resources, the enormous potential of algae as a natural product potentially offering a vast range of solutions has become increasingly visible. As such, an EU strategy to set out clear objectives and coordinate policies and instruments to support the development of the European algae sector is timely and well needed. In view of the upcoming strategy, ERRIN wishes to highlight the challenges and opportunities in terms of regulation, policy and finance; the importance of clearly defining algae; improving consumer acceptance of algal products; and the significance of algae in reaching the goals of the EU Green Deal.

An EU-level strategy to increase coherence and visibility

Despite the vast potential and growing interest in algae resources, European algae aquaculture is still at an early phase lagging behind the overall increase seen at a global level, mostly driven by Asia. The sector also suffers from limited and fragmented information, although the EU Joint Research Centre has made an effort to collect and organise the available information by creating a dataset of European algae production.

An EU-level strategy has the opportunity to add coherence by underlining how the algae sector fits into already existing efforts, both on a policy and practical level. On the practical level, the important role of the European Algae Biomass Association and the Seaweed for Europe coalition in advancing the European algae sector has to be recognised, whereas the newly launched Seaweed Manifesto¹ and the report by Seaweed for Europe² demonstrate the role of seaweed in achieving a sustainable future, both at European and global level.

Clear links should also be made to the European Green Deal and the Farm to Fork Strategy, and certain algae applications can be linked to the EU Bioeconomy and Biodiversity strategies. On a practical level, the EU could play an important role in the harmonisation of regulation and market matters, as well as in encouraging existing structures such as biorefineries to also be used for algae.

We also see a clear role at the EU-level in terms of increasing the visibility of the sector, especially when it comes to creating a market pull and the promotion and accessibility of algae products for consumers. For example, through the possible launch of a promotional programme for blue economy products, similar to the existing programme for agricultural products.³

Boost knowledge production and sharing at an EU level

The European algae sector needs significant research, innovation, education and skills efforts to advance and grow to reach its full potential. Programmes such as Horizon Europe, Erasmus+, the

¹ [Seaweed Revolution: A Manifesto for a Sustainable Future.](#)

² [Hidden Champion of the Ocean: Seaweed as a growth engine for a sustainable Europe.](#)

³ [CHAFFEA](#) Programme for the promotion of agricultural products.

BlueInvest Platform and the European Maritime and Fisheries Fund will be crucial in this regard. To ensure efficient access to funding, it is important that the diversity of algae – both in terms of species and application – are reflected when the work programmes and call texts are developed. There is a particular need for support for interdisciplinary research, bringing together natural and social sciences, for example in the marketing of new food resources. Although excellent science is imperative for the algae sector to reach its full potential, the role of Universities of Applied Sciences in providing practical expertise and implementing technologies needed to advance the sector should be reflected in the call texts of the different work programmes. The EU should also explore possibilities to collaborate with more advanced regions (e.g. Asia) to develop the European algae sector further.

Education in algae cultivation and application is still underdeveloped in most countries and on a European level it remains very fragmented. Education, from primary all the way to universities, is needed to provide the necessary skills to make the potential of the sector a reality. A clear role for the EU would be to create a common platform that supports mutual learning and the sharing of best practices between actors in the sector.

Universities working to bring ecology and industry together, and to promote algaepreneurship

Led by Linnæus University, the [Algoland](#) project studies the capacity of microalgae to purify air and water, produce energy and biomass and contribute to sustainable societal development. The project has found a way to wield naturally occurring algae to capture carbon dioxide coming a local cement plant before it enters the atmosphere.

In order to contribute to increased algal literacy in the blue and circular economies, Linnæus University is also promoting algaepreneurship – i.e. ways in which academics can be entrepreneurial in a lab coat, while working with social and environmental responsibility. The usage of MOOCs has an important role in this.

Multi-level governance and the important role of regional and local innovation ecosystems

To create coherence and ensure shared objectives, collaboration and coordination between different governance levels are essential. Regional and local authorities support the economic development of their territory: they have tools and competences to support research and innovation and are often the first point of contact for businesses to develop their activities.

Similarly, engaging a range of actors – public administrations, private sector, academia, civil society, and citizens – is crucial to improve the sourcing of new knowledge and allow for the development of more relevant products, services and solutions. This would also mean that projects are sufficiently demand-driven to ensure further scale-up and a wider uptake and impact of innovative solutions.

A microalgae roadmap for the Pays de la Loire Region (France)

Following a process of consultations with its stakeholders, in October 2020 the Region of Pays de la Loire launched its regional roadmap to support the microalgae sector. The ambition of this roadmap

is to strengthen the whole microalgae value chain on the territory, in order to respond to the environmental, energy, nutrition and health challenges that will be at the heart of our daily lives in the coming years.

In total, three challenges have been identified in the region:

1. To deploy and promote microalgae as solutions to respond to societal challenges;
2. To enhance the growth of the Pays de la Loire microalgae sector;
3. To be identified and recognised as a territory of technical and scientific excellence.

To respond to these challenges, ten actions have been defined and will be deployed between 2020 and 2027, thanks to the co-financing of up to €20M from the regional authorities. The Region of Pays de la Loire hosts several production units for either industrial or artisanal production, and has actors from the whole value chain present on its territory. In the past, the region had already supported the development of the sector through the support to a public microalgae research and development facility, [AlgoSolis](#), and a coordination programme for researchers (AMI Atlantic Microalgae).

Defining algae is a prerequisite for an efficient policy response

The term 'algae' denotes an overwhelmingly diverse group of organisms – in terms of size, cell, physiology, chemistry and the type of ecosystem they populate. With this vast diversity in morphology and habitats comes the enormous breadth in potential application: biofuels, pharmaceuticals, protein for food and fodder, blue carbon, ecosystems services, etc. Needless to say, application and algal type are strongly connected, and thus the policy measures needed will differ accordingly. In this regard clarity around the definition of algae in policy and funding calls is essential.

It is important to note the difference between the types of algae that exist: they do not grow in the same environment (sea, land, fresh water, etc.) and they do not have the same properties. Consequently, the services and uses they provide are not the same. There is a huge difference between macro- and microalgae and indeed many differences within those categories. 'Algae' has become a broad name for a group of taxonomically unrelated organisms that share a number of traits but that are grown in an array of means as varied as their respective uses. It is important in this context to highlight that European regions are also characterised with different types of algal ecosystems.

As such, algae can be used in various application areas, that may increase in the future as more R&I projects are developed. Examples of such application areas include, but are not limited to:

1. Algae for biotechnology,
2. Algae for food and feed products,
3. Algae for nutrition and health,
4. Algae for pharmaceuticals,
5. Algae for blue carbon, climate mitigation and increasing ecosystem services,
6. Algae for biobased materials,
7. Algae for biofertilizer,
8. Algae for biofuel.

Considering the horizontal opportunities algae can bring to our societies, it is even more important to tackle the challenges the sector currently faces and to highlight potential solution pathways at the European level.

Key challenges and opportunities for the algae sector

The algae sector currently faces numerous constraints that inhibit its development and the employment of its full potential. The following section presents the key challenges of the European algae sector in terms of policy and regulations, financing and business development, consumer awareness, and technology and innovation, and highlights the opportunities and benefits this sector can bring to the EU's environmental and climate work.

Policy and regulation

EU regulations are currently not compatible with the reality on the ground in terms of cultivation methods. An example of this relates to the European Organic Production Regulation, which limits the nutrients allowed for organic algae production to those of organic or mineral origin, whereas nutrients of animal origin are allowed in other sectors. The nutrient sources allowed by this regulation cannot guarantee sustainability and competitiveness of the algae production process, as they are unsuitable for algae production due to the increase in water consumption and waste generation caused by the production.

The difficulty in obtaining a permission to cultivate algae in the ocean also poses a challenge for the sector, as the people responsible for approving the permissions do not always have the required knowledge of the sector. Regulations for fish, e.g. salmon, aquaculture are also used for the processing of applications for seaweed cultivation, but cultivating seaweed is non-fed aquaculture and must therefore be clearly distinguished from animal aquaculture. Legal adjustments are also necessary for the valorisation of algae side-streams in order to increase the circularity of the sector, which in turn could increase the global value of algae biomass.

It is generally very difficult for new algae-based products to enter the market and pass the regulatory filters. The Novel Food Regulation is another EU regulation that constrains European algae producers, who have to go through lengthy and heavy procedures to see their products accepted on the market, while actors from outside of Europe have easy access to the European single market due to a favourable equivalence regime.

Additionally, the Novel Food Regulation significantly hampers the further development of the sector, and its strict approach, compared to more flexible markets such as Asia and the US, weakens the EU's competitive position on the global market, ultimately impacting the long-term job creation. The EU makes a significant contribution to algae research by providing funding through Horizon 2020, Interreg and national funding. However, the further use and valorisation of the results obtained through this research is hindered by the Novel Food Regulation, which reduces the return on investment and negatively impacts job growth.

We believe that, in order to address some of the mentioned regulatory constraints, EU policies and regulations should aim to address and diminish the associated discrepancies between countries within the EU. Streamlining processes, such as the introduction of new algae products to the European market, within the EU can to some extent alleviate many concerns. This would facilitate the overall balanced development of the European algae industry and improve the integration of EU algae products to the international market.

Finance and business development

Currently, the main challenge for the algae sector is the feasibility of the economic model. It is yet hard to define the competitive advantages of algae compared to other biomasses, especially superior plants, in order to justify production costs which are still much higher than those of more traditional production. An example of this is the use of algae for the feed sector, in which the cost-effectiveness and economies of scale are the guiding principles. Feed mills welcome innovations, but the new products must be economically competitive compared to traditional inputs such as soy, corn, sunflower, etc.

Relating to the earlier considerations about the definition of algae, the lack of clarity causes specific challenges in European calls for funding. Very often, it is not specified in the call text which type of algae the calls are targeting, e.g. macroalgae or microalgae, which creates confusion for potential applicants. In the future, calls for funding from European programmes such as Horizon Europe or LIFE should more clearly specify the types of algae they are targeting (e.g. microalgae or macroalgae, cultivated on land or on sea or open to both) compared with previous calls from other programmes.

It is important to highlight that the relevant socio-economic effects of the multi-use of algae products, deriving from the emerging algae market and commercial activity, will need proper evaluation in order to bring about the socio-economic benefits of the European algae sector.

Cooperation and competence development between algae companies

The [Algenettverk Nord AS](#) is a coalition of Norwegian companies engaged in production of marine algae for different purposes. The network has 21 partners from the Norwegian coast, from Sør-Varanger in the north to Solund in the south, and is organised as a private limited company. The purpose is to develop micro- and macroalgae production in Nordland and Norway into a significant industry through cooperation between companies, as well as competence development at all levels in the value chain.

Consumers and value chains

To add value and increase the visibility of algae and its potential, it is important to create a market pull for algae products on the European market. This could be achieved by including algae products in normal supermarkets and making the products more visible and common among consumers.

Currently, there is a lack of awareness among consumers about algae products, that are often seen as unaffordable and too 'extravagant'. As a result, there is a need for tools that could help increase the perception and wider acceptance of algae and algal products among consumers and, more generally, among citizens.

Thus, research and innovation efforts need to focus more on consumer understanding, and not solely on products and technology. It is therefore imperative to involve and seek dialogue with consumers as early on as possible in the process development stage in order to create products which they have a level of acceptance of.⁴

Specific interventions that are seen as essential to gaining consumer acceptance and that require financial support include:

1. Proving algal products are not dangerous with lab testing,
2. Proving algal products are healthy with lab testing,
3. Proving algal products are tasty, through media and culture campaigns.

Future calls for funding should therefore support lab testing, which generally is expensive to conduct for actors in algae sector.

Algae as experience economy and public awareness

The Municipality of Norddjurs (Denmark) is a blue hotspot with many maritime activities such as the Port of Grenaa, corridor to offshore wind farms, Kattegat Center and AlgeCenter Denmark. The local authority's vision is to strengthen local business, tourism, and competencies with a focus on marine resources. AlgeCenter Denmark has research and demonstration activities on how to use seaweed and macroalgae for e.g. healthy and nutritious animal feed, food, sustainable energy, and fertilizer in organic farming, or high-value products such as ingredients in skincare products. Research is also being carried out on the use of seaweed cultivation as a means to recover nutrients from the marine environment. Together with university partners in the AlgeCenter, the Kattegat Center hosts the annual international Nordic Seaweed Conference for researchers, authorities, and companies. To the wider public, schools, and tourists, Kattegatcenter is a showroom for life in the sea, but also its many resources. AlgeCenter Danmark and Kattegatcenter disseminates and informs about blue biobased products and their research and demonstration in macroalgae to create public awareness and more attention to the hidden sustainability potentials in our seas.

Science, technology, and innovation

The bridge from basic science, through technology and innovation, to consumer should be strengthened. This can be done through the establishment of new full-scale research infrastructures, marine, terrestrial and freshwater alike, which are available to the industry and which will foster problem- and knowledge sharing. Data sharing platforms, such as Copernicus and NEXTGeoss, can

⁴ One such project example: [Marine food resources for new markets.](#)

contribute to the dissemination of results, with the potential to also reach consumers and the public sector.

An important objective for the development of the European algae sector is to improve the resilience and automation of the production chain, by implementing technologies which can lower the production costs and reduce the water and energy consumption, and which can guarantee the sustained availability of biomass batches with a consistent degree of quality as requested by the food, feed and processing industry.

Upscaling capacity on the European level is essential to fully explore the potential of algae. Investment should therefore be directed towards such upscaling opportunities, in order to ensure the sustainable production of biomass on a larger scale.

Blue carbon, climate adaptation and increasing ecosystem services

Algae provides several benefits in terms of climate change adaptation and ecosystem services. Acting as natural carbon sinks, algae can be used to capture carbon from the atmosphere and help to reduce ocean acidification. Climate positive solutions deriving from seaweed farming include both the impact of seaweed farming itself, as well as products that contribute to the removal of carbon from the carbon cycle. However, clear business models for carbon offsetting are still needed. Seaweed aquaculture also offer other ecosystem services, such as bioremediation for coastal pollution and habitat for other marine organisms.

Through regional innovation ecosystems, the algae sector can therefore contribute to achieving the objectives of the European Green Deal and its related strategies. It has already been identified in the Farm to Fork Strategy, but links can also be found with the Biodiversity Strategy or the Action Plan on Circular Economy. Additionally, there is a link to the FOOD2030 Strategy of DG Research and Innovation, and its pathway on alternative proteins, as well as the European Bioeconomy Strategy and the Blue Bioeconomy Strategy currently under development.

Algae for municipal wastewater treatment

This year, the Norwegian Institute for Water Research (NIVA) started a new algae-based collaborative research project - ALGECO - funded by the Research Council of Norway, together with six research departments and two industry partners. The project intends to establish a 3R concept (reducing waste, reusing waste and regenerating value) for the management of municipal treated wastewater. Overall, the project will provide a scientific blueprint to effectively mitigate pollution pressure in the coastal waters and fjords, and potentially create new value chains to ensure the circular development of wastewater treatment plants.