MacroFuels Project

FACTSHEET

Future sustainable seaweed industries in Europe - Social and regional aspects

Findings and recommendations from the MacroFuels Horizon 2020 research and innovation project

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Key Messages

1. Sustainable seaweed industries can have highly positive effects like economic growth and work place creation in rural areas.
2. Positive effects on climate and environment, incl. transport decarbonisation, can result in healthier living environments for coastal communities and society at large.
3. Upscaling and industrialising seaweed cultivation and processing can change the public perception of a seaweed-based bioeconomy and lead to resistance, due to noise and visual pollution, influx of a non-local workforce and unwanted changes to communities.
4. Dialogues with coastal communities provide outside-in perspectives and valuable knowledge on local environments and economic opportunities to maximise social impacts and avoid unnecessary risks for seaweed industries.

The prospect of a seaweed industry in Europe

Seaweed production is undergoing global expansion. With an annual production of 30.4 million tons in 2015 and a predicted growth rate of 8-9% per year[1], cultivated seaweed has been responsible for 29.4 million tons of the overall supply. The large majority of cultivated seaweed is currently being produced outside Europe, *e.g.* in China, Indonesia, Korea and the Philippines. In Europe, seaweed cultivation is in its infancy with the majority of seaweeds cultivated at small scale and mostly for artisan products. Europe, however, faces a growing demand for seaweed, either as "superfood" or as resource for novel animal feed, biomaterials, cosmetics or nutra- and pharmaceuticals, which cannot be met by wild harvest in a sustainable way.

With the urgent need to decarbonise the transport sector the EU recently called for the use of seaweed as a source of renewable energy, stating that: "Advanced biofuels, sourced from seaweed or certain types of waste, should represent at least 2.5% of energy consumption in transport by 2020"[2]. MacroFuels established successful routes for advanced fuels from seaweed and assessed the sustainability of the seaweed-to-fuels value chains with social and regional impacts as one of the sustainability categories.

Social and regional aspects of a seaweed-to fuel value chain in Europe

To establish a sustainable seaweed industry in Europe, a multitude of social impacts, potentially positive and negative, have to be considered. Strategies to maximise societal benefits and to minimise possible social risks are needed. Furthermore wide public acceptance towards a seaweed industry in Europe will be vital. This includes novel seaweed-based products as well as industry-scale production processes. So far both, social impacts and public perception towards seaweed are assumed to be widely positive due to the perceived potential for a sustainable bio-based economy and the 'green', environmentally benign reputation of the biomass. However, very few studies have been conducted to provide systematic insights into the social impacts of large-scale seaweed production and processing. The same applies to public attitudes towards seaweed. MacroFuels assessed a multitude of social and regional aspects and engaged in dialogues with specially set up Citizen Panels, composed by representatives of coastal communities at MacroFuels seaweed test farms (Scotland and Denmark).

Key Findings

Overall, the social impacts of an assumed mature MacroFuels seaweed-to-biofuel value chain are positive, for some impact categories even with the potential for highly positive effects. Assessments consider a value chain built on sound practice and cultivation site selection.

[1] FAO, 2018.

[2] http://www.europarl.europa.eu/pdfs/news/expert/infopress/20130906IPR18831/20130906IPR18831_en.pdf

Nevertheless, even with best practice, a few social risks remain with good mitigation options available for some, others will have to be socially accepted and/or consensus will have to be built.

Positive to highly positive social impacts

✓ **Economic growth.** Highly positive impacts can be expected in terms of economic growth, based on a growing seaweed-based industry. This has a particularly high relevance for coastal communities. The overall socio-economic impacts are expected to be more relevant in rather remote and rural areas than in already more industrialised regions. Establishing seaweed as biomass for advanced fuel could support the change towards a market pull for seaweed-based products. However, policies and the public will for seaweed-based fuels are needed to overcome the initial market barrier of fuel price.

✓ **Work place creation.** A large number of work places will be created in different work areas, requiring varying levels of qualification and training. With a growing demand of seaweed it is likely that further economic players that deploy seaweed as biomass (e.g. the food, feed, biomaterials, fertiliser and pharmaceutical industry) will settle near seaweed production sites. This will result in an even larger number of work places in the processing industry, including high quality and high salary work places in biotechnology, chemistry, engineering etc.

✓ **Fiscal revenues.** In a long term, economic growth and a multitude of opportunities for the bioeconomy could result in an improved economic status of coastal regions, especially through increasing fiscal revenues. However, this depends on local or regional development strategies (e.g. the inclusion of the blue economy in smart specialisation strategies) and policy support.

✓ **Decarbonising transport.** An overall positive impact at societal level can be expected from the decarbonisation of transport by advanced and sustainable biofuels. However, this effect depends on the actual sustainability performance of the biofuel in question.

✓ **Climate change and healthy living environment.** The effects of seaweeds' CO_2 and nutrient uptake, their ability to release oxygen in the ocean and their effect on biodiversity in large-scale cultivation systems could help to lower the societal burden resulting from climate change, improve the health of the ocean and coastal living environment and benefit coastal communities and other users of the ocean space, *e.g.* fishermen, other aquaculture, tourism.

✓ **Coastal protection.** Based on the effects on local wave energy and current patterns, seaweed cultivation structures if located in areas that have proven to be vulnerable towards coastal erosion, may help to dampen the wave energy and that way could help to prevent or decrease the extent of erosion by high wave energy. This could improve the living environment for coastal communities threatened by high erosion rates by the ocean.

✓ **Revival of rural areas.** Positive socio-cultural impacts result from an overall revival of

rural areas and of regions that lack other economic specialisation opportunities since traditionally, in an economically thriving region infrastructure development follows. This is promoted by the growing need for infrastructures, such as public transport, medical care, schools, kindergartens etc. by a growing workforce (incl. commuters) and the likely influx of non-local workers.

✓ **Access to resources.** Expected impacts are highly positive as the cultivated biomass will for economic reasons not likely to be exclusively used for fuel production, but will represent a novel biomass for local and regional entrepreneurial activity. Existing local entrepreneurs currently self-employed in aquaculture (mussel farmers, seaweed entrepreneurs using wild harvest) could face new sources of income or opportunities for business growth and expansion.

✓ **Regional empowerment.** Highly positive longer-term effects are expected from a good financial status and diversified economic opportunities that often lead to regional empowerment at political levels. Sound regional development strategies could further increase the political influence of regions with a strong seaweed economy.

Social risks and mitigation strategies

A number of socially ambiguous effects and social risks emerge from large-scale seaweed cultivation, even if seaweed farms use best practices and carefully selected cultivation sites:

✗ **Changing public perception and growing resistance towards industrialisation.** Growing industrialisation, the mechanisation of seeding and harvesting and biorefineries/bioethanol plants could lead to public resistance, especially by coastal residents, caused by the fear of visual and noise pollution or the anticipated loss of recreational, touristic and property value in an industrialised area. Although dialogues with Citizen Panels revealed that levels of public acceptance towards seaweed industries rise with the prospects of local economic opportunities, the resistance against perceived negative effect could outweigh local support and pose a significant threat towards upscaling.

Mitigation strategies:

- ✓ Step-wise upscaling concepts and a consensus building process for the industrialisation of coastal communities that includes civil society
- ✓ Involvement of civil society representatives in the planning process as integral part of farming licenses ('social licenses'; similar to ASC-MSC standards for seaweed farms).
- ✓ Local governance and co-operative business models
- ✓ Careful selection of seaweed cultivation sites, utilising abandoned infrastructure (buildings, processing plants, industrial sites) from fisheries & other forms of aquaculture

✗ **Low wage sectors and seasonal work.** Especially the area of seaweed cultivation and harvesting are traditionally labour intensive and, depending on cultivation practices, might include seasonal work (seeding and harvesting) and work places with low salaries (harvesting).

Automated seeding and harvesting concepts could help to avoid those risks, but in itself could pose the risk of labour displacement.

Mitigation strategies:

- ✓ Farm licenses that include social standards for work places, collective agreements and minimum salaries.
- ✓ Social monitoring standards for seaweed farms operating at large scales

✘ **Influx of a non-local workforce.** In a growing seaweed industry, especially in regions with a limited local workforce available, the influx of a non-local workforce can be expected. This could pose a threat to the social cohesion and local culture of communities. Risks could be mitigated by sound integration strategies and measures for non-local residents, including living spaces, public meeting places *etc*. Further, the availability of a local workforce could be increased via targeted training and qualification programmes in seaweed cultivation and processing (as in-school programmes, academic courses, vocational training, internships *etc*.).

Mitigation strategies:

- ✓ Sound integration strategies and measures for non-local residents, including living spaces, public meeting places etc.
- ✓ Increase availability of a local workforce via targeted training and qualification programmes in seaweed cultivation and processing (in-school programmes, academic courses, vocational training, internships etc.).

✘ **Competition with fisheries and other users of the ocean.** The competition over the ocean space, e.g. with fisheries, leisure and tourism, wind parks, and other aquaculture represents a negative social impact.

Mitigation strategies:

- ✓ Focusing on co-use scenarios in which different forms of ocean usages are combined.
  1. combination with other forms of aquaculture, *e.g.* fish or mussel farms
  2. energy infrastructures, such as offshore wind parks, with seaweed cultivation.

✘ **Unwanted negative environmental effects.** Poor site selection or insufficient farming standards pose a social risk as this could lead to a negative environmental performance of seaweed farming, unwanted negative effects on hydrodynamics and an overall diminished living environment for coastal communities. This could further result in bad public perception of large-scale seaweed farming.

Mitigation strategies:

- ✓ Good site selection tools and farming standards
- ✓ Site selection for large-scale seaweed cultivation has to be based on smart decision-making systems and coupled hydrological-ecological modelling is needed.
- ✓ Education and training in best practices of seaweed cultivation and site selection

MacroFuels Engagement with Coastal Residents

MacroFuels puts strong focus on the social impacts and social acceptance of future seaweed-based industries. Therefore, we organize events that foster open discussions with representatives from coastal communities to learn about expectations, hopes and concerns towards a potentially growing economic field that is expected to have significant impacts on the living environments of coastal residents.

Our MacroFuels Citizen Event

1. During boat trips residents saw seaweed farms and got an impression about what a farm looks like, what work goes into it and how the seaweed grows on ropes and nets.

2. The MacroFuels vision and ideas for upscaling were openly shared and discussed.

3. Residents' expectations, concerns and hopes were collected during group discussions, compiled in a report which was basis for this Fact Sheet, and considered in MacroFuels concepts.

To find out more about MacroFuels stakeholder engagement, please read our public report available at

www.macrofuels.eu/results-publications

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