

# **Stakeholder engagement events and results' evaluation report – Issue 1**

**MacroFuels – Project  
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## Executive Summary

The MacroFuels project aims to advance the technologies for producing liquid transportation biofuels from cultivated seaweed (or macroalgae), thereby providing a sustainable solution for the provision of transportation fuels for heavy goods transport and, potentially, the aviation sector. Seaweeds are amongst the fastest growing plants in the world, producing large quantities of biomass over a short timespan. They do this without the use of fresh water, fertilizers, pesticides, and farmland, as needed for land-based cultivation. To grow, seaweed needs only carbon dioxide (CO<sub>2</sub>), sunlight and the nutrients already present in the ocean.

A specific objective in MacroFuels is to intensify stakeholder dialogue with the aim of gathering and understanding opinions, expectations and ideas, and considering these in project concepts and activities. Engaging with the scientific community, especially with other funded projects in the field of Blue Growth, biofuels and renewable energy will be crucial for knowledge exchange and increase the MacroFuels impact with regard to transferring know-how beyond the project's own community. A number of the key actors in seaweed cultivation, pre-treatment and conversion are already members of the MacroFuels consortium and are or have been involved in relevant other projects funded by the EU or in national programmes. This guarantees the integration of novel knowledge in diverse projects via individual consortium members.

MacroFuels will, besides its progress beyond state-of-the-art in science and technologies, generate knowledge and results that are highly relevant for future strategies and policies for large-scale seaweed cultivation and advanced biofuels. It is of utmost important to enter stakeholder dialogues, thus working towards a sustainable and publicly endorsed novel field within the bioeconomy.

As MacroFuels touches the consumer-sensitive area of energy and biofuels, engaging with the public will generate trust among future fuel consumers and remove potential barriers to acceptance. This is of particular importance as previous efforts in creating biofuels from terrestrial crops have led to controversial discussions, including concerns about the conflict 'Food vs. Fuel'. New breeding and cultivation methods might raise concerns among fishers and/or local authorities who might fear for local and regional acceptance or see a potential threat to tourism.

To this end, MacroFuels takes great care that generated knowledge is shared and discussed with wide stakeholder groups instead of being limited to a small scientific community or 'sitting on the shelf'. However, capturing, storing and preserving knowledge and making sure it can and will be discussed and further shared and used by relevant stakeholders has been and still is a major challenge in science and innovation. Common challenges in knowledge exchange and public engagement are the proper identification, evaluation and selection of knowledge that is relevant for specific target groups and finding suitable channels and formats for knowledge transfer and public engagement.

Open engagement in collaborative projects that aim at achieving breakthroughs which allow economic growth in the long term usually is further complicated by the competition between, on the one hand, sharing and discussing knowledge and data openly and, on the other, protecting knowledge and results that are necessary for securing a competitive advantage for the future economic exploitation of results.

To meet those challenges, MacroFuels has established an implementation strategy, which is built on (a) analyzing the MacroFuels stakeholder landscape and its knowledge



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requirements, (b) collecting and understanding knowledge and data generated by MacroFuels, (c) evaluating them for their suitability for knowledge exchange and (d) finding the most effective formats for engaging with each stakeholder group respectively.

This strategy provides the basis for all engagement activities within the project and is described in detail in this report, together with an overview of activities performed between M1 and M24 of the project and an outlook on planned activities between M24 and M36. Teams that have been involved in activities related to knowledge transfer activities comprised all consortium partners, ECN, supported by Eurida has been responsible for leading those activities and for compiling this report.

## LIST OF ACRONYMS

ACRONYM	DESCRIPTION
<b>CEN</b>	European Committee for Standardization
<b>D</b>	Deliverable (followed by two numbers describing work package and number within that WP)
<b>DEP</b>	Dissemination and Exploitation Plan
<b>IP</b>	Intellectual Property
<b>M</b>	Month (followed by number describing the month from project start)
<b>MEP</b>	Member of the European Parliament
<b>SWOT-Analysis</b>	Structured planning method that sketches strengths, weaknesses, opportunities, and threats as elements of a project (here adopted as parts of the stakeholder analysis)
<b>WP</b>	Work Package



## 1. Introduction

Aim of this document is to report on the engagement and exploitation activities towards the diverse groups of MacroFuels stakeholders carried out within the framework of the project in the period M1-M24, and to describe initial results that emerged from the activities.

## 2. Progress towards objectives

To achieve maximum impact of a project the target groups and potential users of project results have to be fully known and their needs have to be understood. The effective knowledge exchange and transfer of project results and progress towards defined stakeholder groups is a crucial task to assure the uptake of project outputs by the wider research and knowledge community. This will assure the sustainability of project results and maximise the project's impact.

The specific objectives of MacroFuels' stakeholder engagement activities are to:

- Enhance the project visibility at the local, national and international level
- Show how outcomes are relevant to public, e.g. by creating jobs, positive environmental impacts, that way maximizing support and acceptance and minimizing risks towards project outputs
- Work towards the European knowledge base on energy, blue economy and alternative fuels via targeted knowledge and data transfer
- Ensure that the project results are taken up by decision-makers to influence policy-making, by industry to secure market uptake and sustainable growth of the 'blue economy'
- Connect with the scientific community to ensure project follow-up
- Generate market demand for the products or services developed
- Contribute to skills development via trainings and seminars

The multitude of objectives already highlights the wide variety of stakeholder groups targeted by MacroFuels, among them the scientific community and related projects, end users and industries, technology adopters, policy makers and regulatory bodies, EU-level knowledge groups and stakeholder platforms, other users of the marine space, environmental protection groups, as well as citizens and local residents of projected large-scale seaweed cultivation sites. The detailed results of an in-depth stakeholder analysis are presented in Figure 1.

The intensity of stakeholder engagement activities and the exact formats vary during the different stages of the project as they depend on the knowledge and results that are generated during the different project phases.

Based on the work carried out to date, and as demonstrated by the outputs presented in this document, MacroFuels is on track to meet the objectives of the stakeholder engagement strategy and set of planned activities. However, minor adjustments in stakeholder groups, timelines and/or engagement formats had to be made during the period from project M1 to M24 to adapt the stakeholder engagement strategy to the realities of the project and to maximise the effectiveness of the performed activities.

These changes refer to the:

### ➤ **Organisation of annual meetings with related EU funded and international projects (Inter-project knowledge exchange)**

As generated knowledge and results within the first two years of MacroFuels were mainly related to progress in seaweed cultivation and pre-treatment, the potential for inter-project exchange by means of physical meetings was limited to projects on these two topics. As regards the leading EU or national projects in these two subjects, which were of relevance for knowledge exchange, project partners in those project are either members of the MacroFuels consortium or direct competitors (esp. partners from the private sector).



Table 1.1 below summarises the relevant projects on seaweed cultivation and pre-treatment at EU and national level which featured partners that are involved in MacroFuels and exchange knowledge directly via MacroFuels participation.

**Table 1 Relevant projects for seaweed cultivation and pre-treatment and MacroFuels partners involved**

Knowledge and output topic	Relevant project	Partners involved in MacroFuels
Cultivation and harvesting	AT~SEA	SIOEN, ECN, SAMS
	MAB3 Nordic Algae Network	AU, DTI
	MacroBioTech	DTI, Matis
	IDREEM	SAMS
	ENALGAE	SAMS, WUR,
Seaweed storage	AT~SEA	SIOEN, ECN, SAMS
	MAB3	AU, DTI
	ENALGAE	SAMS, WUR
Pre-treatment	EOS LT Seaweed biorefinery	ECN, WUR
	MAB 3	AU, DTI
	MacroBioTech,	DTI, Matis
	Amylomics	Matis

Hence, intense knowledge exchange was performed at consortium level as results generated in parallel and/or previous relevant project were taken up by MacroFuels directly.

As regards knowledge exchange with projects comprising potential competitors, the protection of Intellectual Property was given priority over intense knowledge sharing, to secure future exploitation and economic interest of MacroFuels industry partners (i.e. SIOEN, Avantium, Fermentationexperts).

➤ **Initially envisaged timeline for the formation of a Citizen Panel and Citizen Survey**

Originally, at the time of the MacroFuels proposal development, it was planned to organise a first Citizen Panel Meeting and a corresponding survey already during the first two years of the project. However, during the implementation of the project and first events with local residents of MacroFuels seaweed cultivation locations (described in this report in 5.7 [Citizen stakeholder engagement](#)), it became evident that an effective engagement with citizens is only possible once more advanced results are available on the expected impacts of large-scale seaweed farming, details on automated harvesting (incl. available a prototype and visual content) and likely techno-economic scenarios, incl. biomass storage options at large-scale, visual impacts of large-scale seaweed farms, environmental impacts, etc.

No robust and reliable results have been available during the first 24 months of MacroFuels on those questions, therefore targeted Citizen Panel Meetings would have been ineffective and, considering the expenses and logistics of such meetings, would not have provided the necessary impact to justify the resources used.

Instead, MacroFuels adjusted its approach towards engagement with citizens by utilising smaller events at partner organisations Aarhus University and SAMS to learn about general attitudes citizens have towards seaweed-derived products and the knowledge and information requirements citizens have to feel enabled to make informed decisions. This stakeholder input is currently being analysed and be made publicly available in a separate report in January 2018 (M25 after project start).



For the coming stages of MacroFuels more innovation related results are expected, as well as crucial knowledge on the impacts that can be expected from large-scale seaweed farming. This comprises results on potential environmental impacts, techno-economic scenarios for industrially viable seaweed-to-biofuels value chains as well as business prospects and risks.

Stakeholder engagement events are already planned and dialogues have been initiated, which are described in detail in [Stakeholder engagement activities – M1-M24](#).

### **3. The MacroFuels Dissemination, Communication and Exploitation Plan as guiding document**

The project's Advanced Dissemination and Exploitation Plan/DEP during the first two years provided the basis for MacroFuels stakeholder engagement activities by (i) outlining the overall MacroFuels dissemination, exploitation and communication strategy, by (ii) providing the results of an in-depth stakeholder analysis, by (iii) defining the roles and responsibilities and (iv) by providing a work plan at task and stakeholder level, which has been continuously updated during the project course, making it a usable and living working document.

The DEP will serve as such a working document over the entire term of the project, to apply the strategy and principles outlined in the strategy to verified project results and outputs achieved during the term of MacroFuels. This will allow for the systematic implementation of the MacroFuels stakeholder engagement strategy throughout the project and beyond. The Advanced DEP will be updated regularly and includes detailed timelines, dissemination channels, exploitation roadmaps and selected events and networks at work package, deliverable and milestone level.

The first version of the Advanced DEP has been made available to and has been agreed by all partners on the 29<sup>th</sup> June 2016 at the occasion of the second MacroFuels General Assembly Meeting in Reykjavik/Iceland. Based on this agreed version, the Advanced DEP has been continuously assessed and adapted as the project progressed until M18. An updated version of the DEP has been made available to the European Commission via the Participant Portal on the 12<sup>th</sup> December 2017.

The Advanced DEP during all project phases provides the framework of *what* is disseminated *why*, to *whom*, *how* and *when* and defines the:

- Dissemination aims, target groups and appropriate formats;
- Strategy, content and timeline of the dissemination and publicity measures;
- Responsibilities for the implementation of the dissemination and publicity measures;
- Evaluation concept for dissemination and publicity measures

The DEP ensures that all project partners have a joint idea and understanding of stakeholder engagement, the influence of IP protection measures on communication and exploitation activities, and the legal requirements as laid out in the Grant Agreement.

### **4. Stakeholder engagement and knowledge transfer – implementation strategy**

The stakeholder engagement and knowledge transfer methodology applied in MacroFuels focuses on results and newly generated knowledge, 'Knowledge Outputs' of sorts, which are either units of knowledge (also data) generated in the scientific and technical work packages or refer to a more generic progress in knowledge by bundling results and knowledge units from different WPs into an improved understanding of large-scale seaweed farming concepts, the seaweed-to-biofuels value chain or further applications made possible via the valorisation of side products. MacroFuels knowledge units are captured on work package level and transferred internally for further processing in WP7. Management processes include the evaluation of knowledge and the selection either for immediate transfer and exploitation or for protection for future commercial exploitation.

The knowledge management activities underlying stakeholder engagement involve processing originally planned knowledge outputs - mainly the defined project deliverables – but also finding



any additional knowledge generated and captured outside the official deliverables, so-called unexpected knowledge outputs, to assess them for their potentials for specific stakeholder groups.

The overall MacroFuels knowledge transfer implementation strategy is based on four tasks performed in an iterative manner by ECN, the Dissemination Officer Rita Clancy and the Exploitation Officer Bert Groenendaal. (tasks are described in detail in 5. [Stakeholder engagement activities – M1-M24](#)), which are:

- Analysing the landscape of MacroFuels stakeholders
- Collecting and understanding MacroFuels knowledge and results
- Evaluating MacroFuels knowledge and results
- Organising stakeholder engagement to transfer and discuss MacroFuels knowledge and results

Main goal is to transfer and discuss selected knowledge with the various identified project stakeholder groups who have the interest and the capacity to uptake MacroFuels knowledge, who hold knowledge relevant for MacroFuels, to create synergies with project concepts and/or to utilise or further share it with the wider knowledge community. In this context it is important to, besides assessing the MacroFuels knowledge and results, analyse the profiles of stakeholder groups to understand their knowledge requirements and the suitable channels and formats for engagement and transfer of knowledge outputs (e.g. via personal conversations, engagement via workshops/conferences, participation in project-external meetings, round tables or others).

During the first twenty-four months, the work package leaders in MacroFuels collected and assessed the knowledge generated in the WPs 1-6, stored the knowledge in respective templates and internal documentation, analysed and evaluated the knowledge for further processing, and analysed the WP-relevant stakeholder group landscape for their knowledge requirements and suitable channels through which knowledge can be transferred.

Together with the Exploitation Officer, Bert Groenendaal, knowledge and results have been assessed with regards to their innovation level and marked for IP protection where relevant.

## **5. Stakeholder engagement activities – M1-M24**

### **5.1. Analysing the EU stakeholder group landscape and its requirements**

A thorough stakeholder analysis has been performed by EURIDA, building on the initial stakeholder analysis' results from the MacroFuels project development phase.

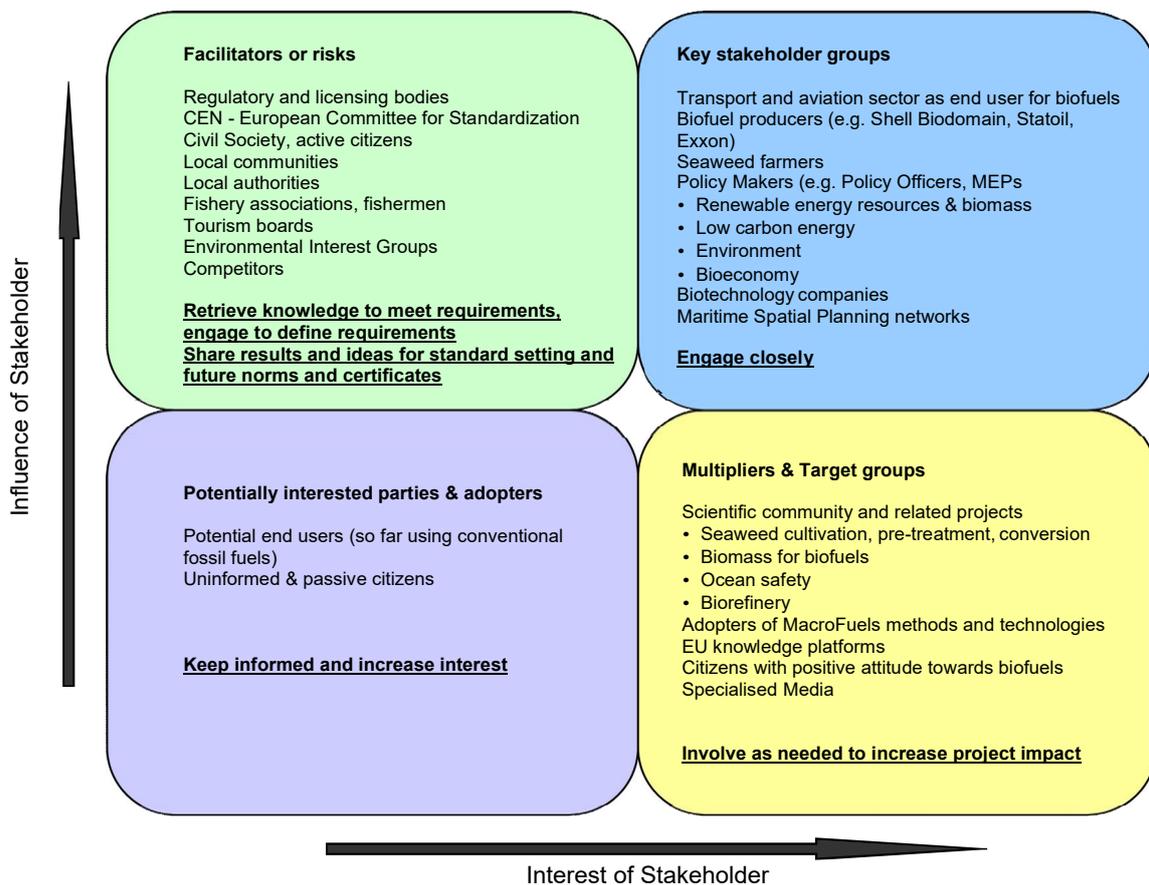
A wide range of stakeholder groups has been identified to be of relevance for MacroFuels knowledge and results. Those groups comprise different scientific areas and/or applications, such as 'Seaweed', 'Biomass', 'Biorefineries', 'Biofuels', 'Renewable Energy', 'Ocean Environment', 'Transport and Aviation', 'Innovation', 'Maritime Spatial Planning' and 'Users of the Marine Space'. In addition, policy makers, regulatory bodies, such as national licensing bodies, and standardisation bodies, such as CEN and CENELEC have been identified to be relevant actors for engagement and two-way knowledge exchange. On the one hand for MacroFuels to meet existing regulations and in the fields of seaweed cultivation and the usage of the marine space respectively, but also for sharing MacroFuels results and ideas for possible future licensing schemes and standard setting for large-scale seaweed farming and biofuels applications.

The identified stakeholder groups have been refined by means of an adopted SWOT analysis (Figure 1: The MacroFuels Stakeholders) with the goal to distinguish between key stakeholder groups, direct target groups, possible facilitators or risk groups and potentially interested parties and adopters of MacroFuels results for application fields beyond the target area of biofuels.

Based on this pre-selection, the EU stakeholder groups' profiles have been analysed in more

detail, so knowledge and results generated during the course of MacroFuels, once collected, could be put against the knowledge requirements and specific areas of interest of each specific stakeholder group.

**Figure 1: The MacroFuels Stakeholders**



### 5.2. Collecting and assessing MacroFuels results and knowledge

During the project period of M1-M24 work package leaders have been requested to identify and report the knowledge and results generated in their respective WPs regularly, starting in Month 1 of the project. Formats in which knowledge and results were stored and reported were either official deliverables reports and/or internal progress reports. All partners were furthermore requested to identify any knowledge and results that could be of importance for stakeholders, even if they are not of direct interest for further MacroFuels project tasks or exploitation activities.

Based on the reports, ECN as responsible partner, supported by the Dissemination and Exploitation Officers then performed an initial review on whether:

1. The reported knowledge and results were consolidated and verified (e.g. was underlying data available, were results reproducible etc.);
2. The knowledge and results descriptions were comprehensible, applicable and understandable for stakeholders that are non-experts;
3. Conflicting results and knowledge existed within or outside the project that would have to be addressed;
4. Details were missing or unclear so that knowledge and results could be described in a more



comprehensive manner before being evaluated for the transfer to selected stakeholders;

As a result of these analyses steps, a first internal knowledge and results repository has been built for further evaluation with regards to potentials and restrictions in knowledge transfer towards above listed stakeholder groups.

### 5.3. Evaluating Knowledge and results for transfer and stakeholder engagement

During the evaluation activities all reported knowledge and results stored in the internal knowledge repository have been assessed with regards to their suitability for being shared and discussed with selected stakeholder groups. The wider goal of all knowledge evaluation activities was twofold:

- To generally identify MacroFuels knowledge and results of interest for the respective stakeholder groups;
- To identify those knowledge outputs and results that had to be treated as confidential, due to IP protection for future commercial exploitation.

Once the knowledge outputs had been separated into ‘public’ and ‘confidential’, the knowledge evaluation has been continued under more detailed aspects, such as:

- Which specific stakeholder groups would benefit from what type of knowledge and which specific project results?
- Which topics and knowledge fields exist which MacroFuels requires input from specific stakeholder groups
- Which engagement formats would be most suitable to reach each selected group?
- How could the knowledge and results shared and/or retrieved in engagement activities be effectively stored and made publicly available in the longer-term to assure the sustainability of engagement efforts?

### 5.4. Stakeholder engagement activities towards specific stakeholder groups

Works performed and results gained during the stakeholder analysis and MacroFuels knowledge evaluation revealed that during the first 24 project months the knowledge and results that have been generated were mostly suited for targeted knowledge transfer with the limited scientific community in seaweed cultivation and pre-treatment.

Therefore, stakeholder engagement so far has been mainly performed via channels and formats that are most suitable to reach a large part of the community and convey and discuss scientific knowledge and results that, after checked for IP, was assessed as ‘public’. Those channels and formats were mainly conferences specialised on seaweed and scientific publications.

Table 2 below outlines the conferences at which MacroFuels partners engaged with the scientific community.

**Table 2. Overview of conferences and events for MacroFuels engagement with the scientific community.**

Conference	Target	Participant(s)
<b>2016</b>		
<b>EUBCE 2016</b> Amsterdam/NL, 6 <sup>th</sup> -9 <sup>th</sup> June 2016	Science/Industry	Wouter Huijgen, ECN
<b>International Seaweed Symposium</b> Copenhagen/Denmark, 19 <sup>th</sup> -24 <sup>th</sup> June 2016	Science/Industry	Anne-Belinda Bjerre, DTI Jaap van Hal, ECN Annette Bruhn, AU Bert Groenendaal, SIOEN Phil Kerrison, SAMS
<b>International Seaweed Symposium</b>	Science/Industry	Bruhn A, Quéguineur B,



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Copenhagen/Denmark, 19 <sup>th</sup> -24 <sup>th</sup> June 2016		Soler-Vila A & Edwards M.: <i>European production of kelp – an overview</i>
<b>EERA-Bioenergy Algae Workshop</b> Brussels/Belgium, 13 <sup>th</sup> September 2016	Science	Anne-Belinda Bjerre, DTI (Keynote Speaker)
<b>Biofuels and Alternative Fuels Projects Contractors' workshop</b> Brussels/Belgium, 15 <sup>th</sup> September 2016	Science/EU Projects	MacroFuels presentation: Anne-Belinda Bjerre, DTI Bert Groenendaal, SIOEN
<b>SeAgriculture</b> Aveiro/Portugal, 27 <sup>th</sup> -28 <sup>th</sup> September 2016 <a href="http://seagriculture.eu/">http://seagriculture.eu/</a>	Science/Industry	Paulien Harmsen, Wageningen UR
<b>Nordic Seaweed Conference</b> AlgeCentre Danmark, 12 <sup>th</sup> -13 <sup>th</sup> October 2016 <a href="http://www.algecenterdanmark.dk/conferences/nordic-seaweed-conference-2016.aspx">http://www.algecenterdanmark.dk/conferences/nordic-seaweed-conference-2016.aspx</a>	Science/Industry	Bert Groenendaal, SIOEN Anne-Belinda Bjerre, DTI Jens Legarth, Fermentationexperts
<b>AlgaEurope 2016</b> Madrid/Spain, 13 <sup>th</sup> -15 <sup>th</sup> December 2016 <a href="http://algaecongress.com/">http://algaecongress.com/</a>	Science/Industry	Michele Stanley (Scientific Committee), SAMS
<b>2017</b>		
<b>CBM12 12<sup>th</sup> Carbohydrate Bioengineering Meeting.</b> Vienna/Austria, 23 <sup>rd</sup> -26 <sup>th</sup> April 2017 <a href="https://cbm12.org/">https://cbm12.org/</a>	Science	Matis Poster presentation: <i>'Thermostable alginate lyases'</i>
<b>World EXPO 2017</b> Astana/Kazakhstan, 10 <sup>th</sup> June-10 <sup>th</sup> Sept 2017 <a href="https://expo2017astana.com/">https://expo2017astana.com/</a>	Science, Industry, Citizens	MacroFuels short movie and Science Show
<b>EUBCE 2017</b> Stockholm/Sweden, 12 <sup>th</sup> -15 <sup>th</sup> June 2017 <a href="http://www.eubce.com/home.html">http://www.eubce.com/home.html</a>	Science/Industry	Wouter Huijgen/ECN Oral presentation: <i>'Carbohydrates and Furans from Seaweeds for Fuels and Chemicals'</i>
<b>6<sup>th</sup> conference of the International Society for Applied Phycology (ISAP) 2017</b> Nantes/France, 18 <sup>th</sup> -23 <sup>rd</sup> June 2017 <a href="https://isap2017.sciencesconf.org/">https://isap2017.sciencesconf.org/</a>	Science/Industry	Jaap van Hal/ECN Oral presentation: <i>'Driving on sunshine, converting seaweed to furanic biofuels'</i>
		Bruhn A, Boderskov T, Magnusson M, Pulino C, Neiva J, Rasmussen MB & Serrão E.: <i>Comparing productivity, biomass quality and genetics of 4 Danish populations of Saccharina latissima.</i>

### 5.5. Inter-project knowledge exchange and engagement with related initiatives

As outlined in *Section 2, Progress towards objectives (p. 6 ff.)*, knowledge and results within the first two years of MacroFuels were mainly related to progress in seaweed cultivation and pre-treatment. Therefore the potential for inter-project exchange by means of physical meetings was limited to projects on these two topics. As highlighted in section 2, project partners in leading projects are either members of the MacroFuels consortium (Table 1) or direct competitors for future exploitation, which therefore were and will be excluded from engagement activities.



From M24 onwards, more innovation related results and knowledge will be generated by MacroFuels.

The knowledge outputs that can be expected have been screened ex ante, based on project work plans and internal status reports. Based on this assessment, there are two priority topics that will be most promising for stakeholder engagement and/or that need intense stakeholder dialogues due to knowledge or inputs required by MacroFuels:

- **Establishing concerted strategies for biofuels' integration** (not limited to seaweed-derived biofuels, but considering advanced biofuels from various sources) to meet the EU targets to have 10% of the transport fuel of every EU country come from renewable sources such as biofuels by 2020.

To maximise MacroFuels impact in this context, first contacts have been initiated with representatives from the following bodies and/or projects:

- **Waste2Fuels**, a Horizon 2020 funded project on biofuels derived from agrofood waste streams <http://www.waste2fuels.eu/>
- **BRISK2** – a Biofuels Research Infrastructure for Knowledge Sharing <http://www.brisk2.eu>
- **Ambition** <http://www.ambition-research.eu/>, a Horizon 2020 project on innovative key unit operations in biofuels production, such as biomass pre-treatment, gasification, gas cleaning and conditioning and syngas fermentation

In addition, an interview was held with **MEP Nils Torvalds** on the status quo of biofuels for the heavy transport sector, future EU policies and most pressing bottlenecks in seaweed-derived biofuels and advanced biofuels in general.

The key messages conveyed by Nils Torvalds were:

- Despite the technology progress in seaweed cultivation and conversion technologies, there is still a lack of an industrially viable scenario, incl. a lack of licencing schemes for large-scale cultivation
- Integrated approaches are needed for biofuels coming from different resources
- The heavy transport and aviation sectors, despite electrification efforts in other mobility sectors, will still depend on liquid fuels for at least the coming 50 years, so sustainable and realistic solutions for biofuel production are urgently needed.

- **Contributing to strategies and policies for licencing of large-scale seaweed farms and integrated and multi-use approaches for the marine ocean space.**

Entering dialogues with stakeholders that use the ocean marine space for creating economic value is crucial to understand and exploit the potentials of integrated solutions and the synergetic effects of multi-use approaches.

This ecosystems approach will be vital for the seaweed-to-biofuels value chain as rather large amounts of biomass are needed to make the process economically feasible. To this end it is important to avoid potential concession and licensing problems for the ocean space that will be required to cultivate sufficient amounts of seaweed. Here, a potential mitigation strategy could be to utilise sites for the cultivation of seaweed that are already licenced for other types of aquaculture and/or other economic purposes, e.g. offshore wind parks, mining and dredging etc.

First contacts and dialogues have been initiated with representatives from the following organisations and/or projects:



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- **‘Marine Scotland’**, the responsible Scottish governmental body for ocean site licensing and the responsible body for one of the MacroFuels cultivation sites (Oban/Scotland, SAMS)

‘Seaweed Cultivation Policy Statement’ , which was published in March 2017, gives an understanding of the type of seaweed cultivation development that may be given governmental approval in the future.

The policy statement, although mainly referring to mid-scale seaweed cultivation, emphasizes that the Scottish Government is in strong support of an ‘Integrated Multi Trophic Aquaculture (IMTA)’ approach. The IMTA refers to the co-culture of species for environmental and economic benefit. In IMTA systems, species which are fed or farmed (for example Atlantic salmon) are grown alongside species whose culture results in nutrient (or energy) extraction, which is the case for seaweeds. The aims are “for greater efficiency in resource use such as feedstuffs, space, and labour, with a consequent reduction in negative environmental impacts.”

Seaweed grown in such systems will therefore be co-located in areas of aquaculture production. To be able to not only respond, but also to proactively contribute to this policy, MacroFuels will have to be aware of other aquaculture’s needs, and that the equipment for other aquaculture and/or seaweed aspects must be installed and maintained so as to not compromise the integrity of the whole system.

- **The Province of South Holland**

Another example for the commitment to integrated approaches of seaweed farming and other offshore activities is the latest project funded by the province of South Holland on exploring the economic opportunities of growing seaweed on wind farms at sea.

In this exploration project, The Noordzeeboerderij Foundation, the Province of South Holland, the municipality of The Hague, the Ministry of Infrastructure and Water Management, Rabobank Regio Den Haag and Rederij Van der Zwan deployed two thousand meters of seaweed line between wind turbines.

To create synergies with ongoing policy efforts and pilot projects on integrated aquaculture and ocean multi-usage, MacroFuels initiated dialogues with the stakeholders and initiatives described above. Main goal of collaboration from a MacroFuels perspective is to gain knowledge from policy and industry stakeholders involved in such initiatives, and, in return, to provide stakeholders with knowledge and expertise from MacroFuels.

This important focus of the MacroFuels public engagement strategy and activities will be extended to other MacroFuels countries and potential seaweed cultivation sites, such as Denmark, Norway and Belgium to maximise MacroFuels’ impacts by working towards future integrated ocean-based infrastructures in several North Atlantic littoral states.

- **SOMOS: Technical Standards for Safe Production of Food and Feed from marine plants and Safe Use of Ocean Space**

The project is funded by Lloyd’s Register Foundation, to investigate safety aspects of combined activities at sea. The focus in SOMOS is on renewable energy production in combination with seaweed, used not only food but also feed, bio-chemicals, energy and other valuable products.

- **The European Maritime Spatial Planning Platform/EU MSP Platform**

The EU MSP Platform is an information and communication gateway designed to offer support to all EU Member States in their efforts to implement Maritime Spatial Planning (MSP) in the years to come.



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- MERMAID, an EU project on multi-use offshore platforms and approaches to for example combine food and energy production in such platforms

## 5.6. Engagement with industrial stakeholders and end-user representatives

Direct knowledge exchange and engagement with industrial stakeholders and future end users via meetings will between project M24 and M48 mainly be implemented via an Advisory Board, which includes selected representatives from the transport sector. The current members of the MacroFuels Advisory Board are:

- Shell Biodomain
- SkyNRG
- Novozymes

Input is sought from the Advisory Board members on the specifications of biofuels (or precursors thereof) for the successful integration in transport fuels as required by industrial end users. That way, needs and requirements can be taken into account at an early stage of MacroFuels, which will assure the market relevance and feasibility of MacroFuels' products and results.

MacroFuels is looking for specific input in terms of trace impurities in the biochemically produced biofuels (ethanol and butanol) and to what extent they may effect the entire production and distribution train. Furthermore, input will be sought on structures and properties of the furanics based molecules which we envision in the project. Input will also be sought into the logistics of large scale production, storage and distribution of seaweed based biofuels.

In the current planning, the large scale fermentation tests will start in September 2018, but prior to that, representative samples of the biochemically produced fuels will be analysed. The results of these analyses will be shared with the AB for their input. Towards the end of 2018, similar results will be obtained for the furanics based fuel(s) and similar discussions will be initiated. Based on the input, credible scenarios can be developed for the production of seaweed based biofuels.

## 5.7. Citizen stakeholder engagement

As emphasised in Section 2, Progress towards objectives, no verified results (mainly coming from WP6) for effective targeted stakeholder engagement events, such as targeted Citizen Panel or Focus Group Meetings are expected until after M24.

However, initial preparatory work was carried out during the first project phase for setting up the MacroFuels Citizen Panel, incl. (a) performing research on relevant local and regional stakeholders for targeted information campaigns and involvement, incl. authorities in seaweed cultivation areas to get in touch with local communities, (b) drafting an information campaign towards local communities, (c) collecting information for developing a draft for a citizen survey (to be performed between M29 and M30).

More general stakeholder engagement formats, however, have been performed by MacroFuels during the first twenty-four months, mainly with the aim to raise awareness among the non-scientific community and citizens.

Consortium partner Aarhus University has held a citizen's Open Day in Sept 2016 (M9), during which local coastal residents have been informed about MacroFuels concepts on seaweed cultivation and exploitation. Project scientists engaged in discussions with visitors and demonstrated seaweed applications.



Figure 2 'MacroFuels' at the Open Harbor Day at Aarhus University

## 6. Knowledge Transfer activities – Outlook from M24 onwards

Based on the results of the stakeholder group analysis and the foreseeable knowledge outputs and results that will be generated between month 24 and 48 of MacroFuels intense knowledge transfer activities with various stakeholder groups and the wider knowledge community are planned.

All targeted activities, planned engagement formats and timelines for coming activities between M24 and M36 are summarized in Table 3 below.

Engagement activities that are added to the action plan after this report and/or planned for the final year of MacroFuels will be added and updated in the MacroFuels Advanced DEP.

**Table 3** Summary table of planned knowledge transfer activities towards EU stakeholder groups

Action	Partners involved	Target Group	Planned Timeline/ Status
<b>Stakeholder engagement via conferences – Scientific community and industry</b>			
<b>Conference Participation</b>			
AlgaeEurope 2017, Berlin/Germany	WUR, SAMS	Scientific Community, Industry	5-7 Dec 2017
EUBCE 2018	ECN, DTI, AU, SIOEN	Scientific Community, Industry	14-17 May 2018
International Seaweed Symposium 2019	AU, DTI, WUR, SAMS	Scientific Community, Industry	tba
Nordic Seaweed Symposium 2018	AU, DTI, WUR, AVT	Scientific Community, Industry	10-11 Oct 2018
SeAgriculture 2018	DTI, WUR, ECN	Scientific Community, Industry	tba
<b>Stakeholder engagement via White Papers and planned follow-up discussions</b>			
White Paper and policy brief: 'Ecological impacts of large scale seaweed cultivation'	AU, SIOEN, EURIDA	Policy Makers, Scientific Community	Available in April 2018



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White paper and policy brief: 'Seaweed-based biofuels vs terrestrial plant derived biofuels'	WUR, SIOEN, EURIDA	Policy Makers, Scientific Community	Available in June 2018
White paper and policy brief: '(Inter)national legislation and policies regarding seaweed based biofuels'	SIOEN, EURIDA, ECN, SAMS	Policy Makers	Available in December 2018
<b>MacroFuels Stakeholder Events &amp; Workshops</b>			
Stakeholder round-table on 'Ocean multi-use concepts for an integrated offshore energy infrastructure'	ECN, EURIDA	Industry, Policy Makers	February 2018 (detailed planning in progress)
1st MacroFuels Conference in Oban/Scotland (at SAMS) with stakeholder events targeting policy makers, industry representatives and citizens (Citizen Panel)	SAMS, all partners	Scientific Community, Policy Makers, Citizens	23 <sup>rd</sup> -25 <sup>th</sup> May 2018
Stakeholder events at the occasion of the Nordic Seaweed Symposium (Aarhus/Denmark), incl. - Industry workshop - Workshop on environmental impacts of seaweed cultivation - Round table with local residents for knowledge exchange (Citizen Panel)	AU, all partners	Scientific Community, Policy Makers, Citizens	10-11 October 2018
Knowledge transfer towards EU stakeholder groups	AVT, EURIDA, ECN, SIOEN, DTI	EU knowledge community	First knowledge identified and channels established by June 2018



## 7. CONCLUSIONS

The stakeholder engagement activities carried out within the MacroFuels project are designed to maximise the project's impact and to facilitate the uptake of results and newly generated knowledge by all stakeholder groups.

During the first project period between M1 and M24 the generated knowledge and results have either not been found suitable for transfer and engagement towards stakeholders besides the scientific community, or was found to be subject to IP protection.

The ground for more intense engagement with wider stakeholder groups has been paved with a comprehensive set of events planned for the coming stages of the project, as more innovative knowledge and results with relevance for policy makers, industrial stakeholders and citizens will become available.

Based on the stakeholder engagement activities performed so far and based in the evaluation of preliminary results, derived from the input from various stakeholders we have come to the conclusion that multi-use approaches of the sea, i.e. eco-systems concepts or Integrated Multi-Trophic Aquaculture/IMTA, is one of the most important areas for stakeholder engagement.

During the first twenty-four months, it has been reported by most MacroFuels consortium members, that policy makers are explicitly asking for input and prior art and know-how to use for future strategies and policies for large-scale ocean-based activities.

This area is not only addressed by the seaweed community, but also by for instance by the off-shore wind community as well as the off-shore oil and gas community, maritime transport, and other aquacultures to name but a few.

Traction for large scale seaweed is increasing, thus further emphasising the need for proper stakeholder engagement across disciplines. MacroFuels has laid the foundation over the last two years to properly engage with the key stakeholders and potential facilitators who are necessary to bring this technology and its spin-offs forward towards a sustainable field of the bioeconomy.