The MacroFuels consortium brings together specialists along the entire chain of biofuel production, from seaweed cultivation up to fuel testing via fuel production. Feedback loops between the experts ensure crosspollination of ideas, concepts and insights. The cultivation, pre-treatment and conversion experts are further complemented by experts in the field of sustainability assessments, risk analysis and mitigation, commercial deployment and IP monetisation, as well as communication.
MacroFuels in a Nutshell

MacroFuels aims to produce advanced biofuels from macroalgae, commonly known as seaweed. The targeted biofuels are ethanol, butanol, furanics, and biogas. The project will achieve a breakthrough in biofuel production from macroalgae by:

- Increasing biomass supply by developing a rotating crop scheme for cultivation of seaweed, using native, highly productive brown, red and green seaweeds, in combination with the use of advanced textile substrates resulting in a year round biomass yield.

- Improving the pre-treatment and storage of seaweed and to yield fermentable and convertible sugars at economically relevant concentrations (10-30%)

- Increasing bio-ethanol and bio-butanol production to economically viable concentrations (10-30%)

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- Increasing biogas yield to convert 90% of the available carbon in residues by adapting the organisms to seaweed.

- Developing thermochemical conversion processes of sugars to furan-based fuels.

- Performing an integral techno-economic, sustainability and risk assessment of the entire seaweed to biofuel chain.

- MacroFuels will not be an isolated effort. Indeed, the links with other projects and networks will ensure that MacroFuels will be up to date on the latest trends and support maximising the project’s impacts.

- MacroFuels will achieve a breakthrough in biofuel production from macroalgae by:
  - Performing an integral techno-economic, sustainability and risk assessment of the entire seaweed to biofuel chain.
  - Improving the pre-treatment and storage of seaweed and to yield fermentable and convertible sugars at economically relevant concentrations (10-30%)
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  - Developing thermochemical conversion processes of sugars to furan-based fuels.
  - Performing an integral techno-economic, sustainability and risk assessment of the entire seaweed to biofuel chain.

Qualification of the side- and waste-streams

Side- and waste-streams will be valorised by screening them for high value marketable components and identifying the most viable products. We will further assess the proteins isolated during the entire process for their use to augment feed supply in the EU, as well as the mineral streams for use as inorganic fertilizer in terms of primary, secondary and trace elements. This assessment will result in a potential value and market of these streams.

Economic viability and sustainability

MacroFuels will determine the economic viability of the seaweed to biofuel production chains by using accurate verified experimental data, obtained under relevant conditions. The data from the assessment will be used in a feedback loop to further inform the experiments, thus ensuring that the chances of commercial implementation are maximised.

Fuel assessment under realistic conditions

Fuel assessment under operating conditions will be performed by utilising the DTI fuel assessment facilities. Fuel mixtures will be prepared and tested in the relevant engines to assess the suitability of these fuels under different realistic transport conditions.

Techno-economic and sustainability assessment

As part of MacroFuels, a multi-criteria assessment of the sustainability of substituting conventional, fossil-based transportation fuels and currently available biofuels with seaweed-derived fuels will be performed. The sustainability assessment will take into account economic, environmental, social, health and safety, and risk aspects and will consider the entire value chain of the transportation fuels using a life cycle comparison approach.