

## **Sustainability analysis of an algae-based value chain in North-West Europe**

The fossil-based chemical industry is facing social, economic and environmental challenges such as toxicity, carbon emissions and resource depletion. A possible sustainable solution is offered through the introduction of chemicals from biobased feedstock. However, to ensure a sustainable biobased transition, sustainability assessments available at a low Technology Readiness Level (TRL) need to be developed and applied to validate sustainable outcomes of new products and technologies. Previous research developed a ranked set of sustainability indicators for the assessment of biobased chemicals. The goal of this study is to validate the proposed indicator-set by using an algae-based value chain located in North-West Europe. The use of microalgae as a feedstock for chemicals has great potential because of its unique composition, high productivity rates, low land requirements and CO<sub>2</sub> consumption. Different scenarios for *Nannochloropsis* and *Porphyridium* as algae feedstock are analysed over the entire value chain by combining an Environmental Techno-Economic Assessment (ETEA) and social sustainability analysis. A Multi-Criteria Decision Analysis (MCDA) is performed to combine and weigh the sustainability impacts and communicate a final result to industrial, public and academic stakeholders. This study will be the first to integrate environmental, as well as social and economic indicators for a complete and comprehensive sustainability evaluation, within the field of biobased chemistry.