



## **PHD RESEARCH PROPOSAL**

Doutoramento em Engenharia da Refinação, Petroquímica e Química (EngIQ)

### **SUSTAINABILITY ASSESSMENT FRAMEWORK TO SUPPORT DECISIONS ON BIO-BASED SOLUTIONS FOR DECARBONIZATION**

#### **Summary / Framework**

A comprehensive multicriteria assessment framework will be developed to select the most sustainable bio-based solutions for decarbonization. Despite the fact that there are several indicators and assessment methodologies used to characterise the sustainability of a technology/product, an integrated approach to supported decision making on the most sustainable solutions towards decarbonization is still missing. This project intends to develop such approach taking into account the three pillars of sustainability (environmental, social and economic), efficiency, TRL and regulatory aspects. The feasibility of the proposed framework will be tested in the assessment of 3 different cases studies: 1) Carbon sequestration and use with microalgae cultivation and processing; 2) Macroalgae cultivation and processing, 3) Substitution of fossil-based by bio-based polymers produced by fermentation. Additionally, the impacts of applying the targeted technologies will be evaluated at three scales sector level, country and at a global level. Stakeholders' advice from different societal sectors will be also used throughout the development of the project to improve the decision-making tool and make it fit for propose. Regulatory aspects will be taking into account to define system boundaries and to develop a tool that could be used for future certification requirements.

New methodological innovations on sustainability assessment will be achieved during the development of this project and the research plan is divided in 3 tasks.

Task 1. Development of the sustainability assessment framework

Task 2. Sustainability assessment of bio-based technologies

Task 3. Stakeholders engagement and advice