



Circular and innovative production of microalgae-based fuels for shipping and aviation

COCPIT is a new EU funded project supporting sustainable transport fuels uptake through a new end-user' decision tool

Transportation plays a crucial role for European Union to reach the Green Deal's targets, accounting for the 25% of total EU greenhouse emissions. In particular, **maritime** and **aviation transports** represent "hard-to-electrify" sectors, due to the high energy densities required: they currently rely almost on fossil fuels and constitute about one-third of overall EU transport emissions¹.

In order to reduce these sectors environmental footprint, the European Council adopted the *FuelEU maritime* and the *RefuelEU aviation initiative*, setting targets of GHG intensity reduction for shipping fuels of 2% in 2025 and up to 80% by 2050², as well as a minimum share of SAF (Sustainable Aviation Fuels) equal to 2% in 2025 and up to 70% in 2050³.

The COCPIT project fits into this virtuous trajectory supporting to the large-scale production of microalgae-based transport fuels delivering an innovative, circular and complete production chain through two pathways: HEFA (Hydroprocessed Esters and Fatty Acids) and HTL (Hydrothermal liquefaction) followed by hydrotreating. COCPIT will also develop a decision tool - based on economic, social and environmental indicators - analysing different scenarios that will guide investors to the best solution for their specificities.

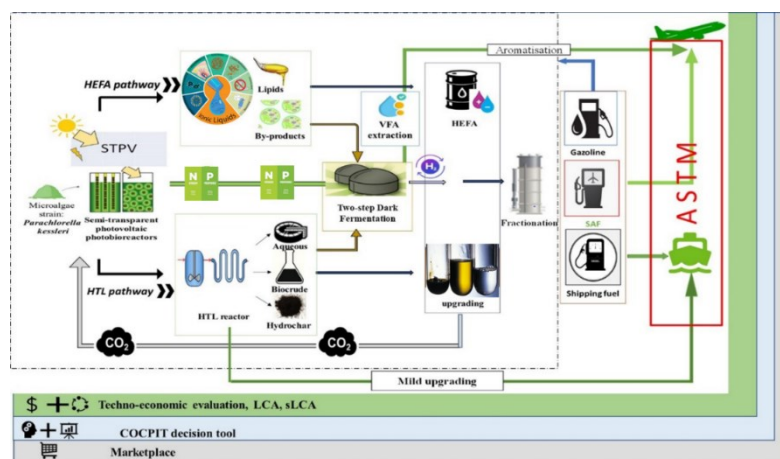


Figure 1: COCPIT concept

¹ [Fit for 55: increasing the uptake of greener fuels in the aviation and maritime sectors - Consilium \(europa.eu\)](https://consilium.europa.eu/en/press/press-releases/2023/05/11/)

² [FuelEU maritime initiative: Council adopts new law to decarbonise the maritime sector - Consilium \(europa.eu\)](https://consilium.europa.eu/en/press/press-releases/2023/05/11/)

³ [RefuelEU aviation initiative: Council adopts new law to decarbonise the aviation sector - Consilium \(europa.eu\)](https://consilium.europa.eu/en/press/press-releases/2023/05/11/)

Innovations within the production chain

COCPIT will enable innovations at multiple phases of the production chain: in the **cultivation stage** the algae strain will be combined in a thin film reactor - to intensify photosynthesis - and covered with a semi-transparent photovoltaic (STPV) shell - to produce electrical power. At the **transformation stage** of algal biomass into sustainable fuels, ionic liquids will be used to extract lipids and to catalyse the *HEFA pathway* at the same time, making the process more affordable, efficient and eco-friendly. In the *HTL pathway* the main obstacles to HTL upscaling (clogging and biocrude separation) will be overcome and a more accurate design tools for reactor and heat exchangers will be implemented. In order to ensure flexibility towards the desired fuel output distribution between shipping and SAF, different upgrading approaches of HTL biocrude will also be established. Furthermore, COCPIT will adopt different techniques to reduce the nitrogen content on the final **SAF** allowing its **certification under** American Society for Testing and Materials (**ASTM**) norms.

Circular approach

The circularity of the value chain will be enhanced by recirculating all coproducts and power streams: **dark fermentation** will valorise different byproducts to generate hydrogen for fuel refining purposes, aromatics as fuel boosters and to recirculate nitrogen and phosphorus to the PBR. Moreover, using STPV panels feeds the system with power from the infrared spectrum of solar radiation, all along with reducing PBRs cooling utility. Circularity within installation environment will also be ensured by studying different scenarios involving biogenic effluents, waste-to-energy facilities and CO₂ existing in the vicinity of the production site in order to create industrial symbiosis.

Comprehensive sustainable aviation and maritime fuels marketplace

The **COCPIT** AI based decision **tool** will be fast and flexible, allowing the examination of several prospective scenarios, the comparison of established and novel technologies and the identification of the most sustainable conversion pathways. Moreover, COCPIT will work towards the centralisation of sustainable transport fuels innovations, delivering a **comprehensive marketplace** where the COCPIT decision tool and a range of technological solutions will be at investors' service, helping them to choose the best solution for their algal-based fuels project.



Figure 2: The COCPIT team at the kick-off-meeting at IMT Atlantique in Nantes, France, October 2023.



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About COCPIT

COCPIT – Scalable solutions Optimisation and decision tool Creation for low impact SAF Production chain from lipid-rich microalgae strain is a 4-years Horizon Europe Research and Innovation Action project started the 1st October 2023.

Partners

Coordinated by IMT Atlantique, COCPIT has a consortium of 11 partners from 6 different EU countries. The project is carried on by an international consortium composed by 5 academic partners and 6 non-academic partners, whose activities cover the whole production process, from microalgae treatment to sustainable fuels pre-screening and the scenario development, as well as the decision tool and marketplace development.



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