

# 5<sup>th</sup> Newsletter

July 2026

Dissemination level - Public



## SUSTEPS : SUSTAINABLE, SECURE, AND COMPETITIVE ENERGY THROUGH SCALING UP ADVANCED BIOFUEL GENERATION



48 Months



10 Countries



8 Work  
Packages



11 Partners



Granted Budget:

€ 3,000,000

(Europe, CINEA)

€1,000,000

(CH, CA, BR National Agencies)

### Project Coordinator

TÜBITAK

Dr. Abdullah Z. Turan

[abdullah.turan@tubitak.gov.tr](mailto:abdullah.turan@tubitak.gov.tr)

[contact@susteps.eu](mailto:contact@susteps.eu)



Funded by  
the European Union

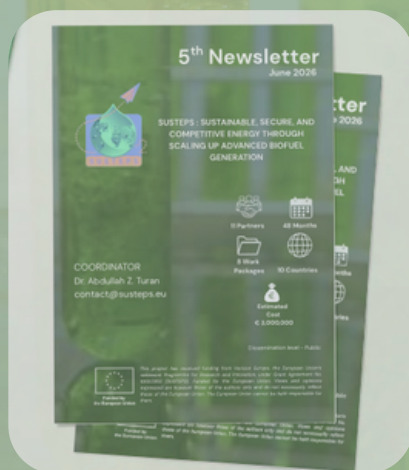
*This project has received funding from Horizon Europe, the European Union's framework Programme for Research and Innovation, under Grant Agreement No. 101122363 (SUSTEPS). Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union. The European Union cannot be held responsible for them.*

# Welcome






## Welcome to the 5<sup>th</sup> Edition of the SUSTEPS newsletter!

As we mark 30 months into the project and look back on a period of meaningful advances. Since our last edition, the consortium has kept pushing forward across all fronts: microalgae cultivation experiments are advancing, HTL campaigns are generating new biocrude and process data, catalytic upgrading studies are ongoing, aqueous stream valorisation strategies are taking shape, green hydrogen production is progressing, and biorefinery simulation and sustainability assessment are moving forward. The international working groups (IWGs) of experts continue to advise and strengthen our project, ensuring that SUSTEPS benefits from the best global knowledge at every step.

The coming months will bring the results the consortium has been building toward, stay with us.



### Newsletter N°5

-  Project Update
-  Research Highlights
-  Social Acceptance
-  Events
-  Publications

Read it here: <https://susteps.eu/resources/>



Join us on: @SUSTEPS



# Project Update

Over this period, the consortium held an in-person meeting, submitted a project report, and met with our Project Officer to gather her valuable feedback. The Coordinator and partners also engaged in workshops, conferences, and online meetings that kept the project moving forward. The interconnectivity between work package leaders, paired with feedback loops from the International Working Groups (IWGs), led by our partner ERINN, has strengthened cohesion across the consortium and accelerated knowledge exchange between partners. With three key milestones reached and four deliverables completed, we are pleased to share our current progress with you.



*SUSTEPS Consortium at KETJEN facilities*

On 18 May 2026, the SUSTEPS consortium held its M30 project meeting at the facilities of partner KETJEN Corporation in the Netherlands.

The visit included a guided tour of Ketjen's catalyst production plant, providing a valuable opportunity to see first-hand the industrial backbone behind the project's catalytic hydrotreatment step, in which advanced catalysts convert SUSTEPS biocrude into drop-in sustainable fuels.



Join us on: @SUSTEPS



# Research Highlights

## Microalgae Growth

This work is being advanced by our partners at Boğaziçi University (BOUN) and the University of Calgary. After screening several promising microalgae strains under CO<sub>2</sub>-rich conditions and pre-treated wastewater, the best-performing candidate has been selected for scale-up based on its strong growth performance and wastewater tolerance. Large-scale cultivation is now in place, and CO<sub>2</sub> capture tests have shown high removal efficiencies.



*Microalgae studies at BOUN Univeristy*

## Hydrothermal Liquefaction & Upgrading



*PSI's continuous HTL experimental setup*

A continuous HTL test rig has been successfully constructed by our partners at the Paul Scherrer Institute (PSI). Batch HTL experiments have identified optimal operating conditions and confirmed promising biocrude yields.

On the upgrading process, our partners at Forschungszentrum Jülich (FZJ) and TÜBITAK are advancing, catalyst screening is progressing well, with candidates identified for improving biocrude quality.



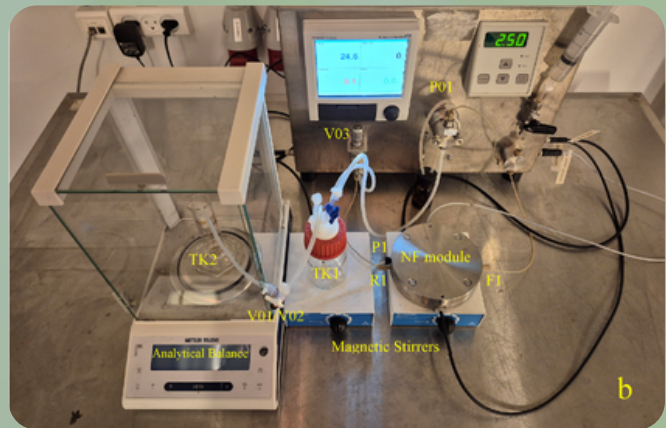
Join us on: @SUSTEPS



# Research Highlights

## Aqueous phase Recycling and Valorisation

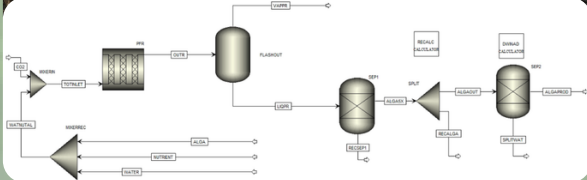
Experimental work on HTL aqueous phase treatment is now underway. Our partners at the University of Southern Denmark (SDU) have already achieved good progress in analytical setups, with initial testing ongoing. Next steps include full validation, further optimisation, and assessment of treated water recycling, with the goal of closing the loop.



Batch membrane Filtration Unit at SDU University

## Biorefinery modelling and Sustainability

Process modelling and life cycle inventory development are progressing in parallel with experimental work. A baseline inventory has been established and is continuously updated as new results emerge from the labs. Techno-economic, social, and health and safety studies complement this work, providing the project's viability perspective and broader impacts as SUSTEPS advances toward scale-up. This work is lead by our partners at TÜBITAK, in collaboration with ARDITEC and UNIFEI. Please refer to the [Press Release](#) on this matter.



A part of SUSTEPS process simulation. Pilot plant at UNIFEI



Join us on: @SUSTEPS

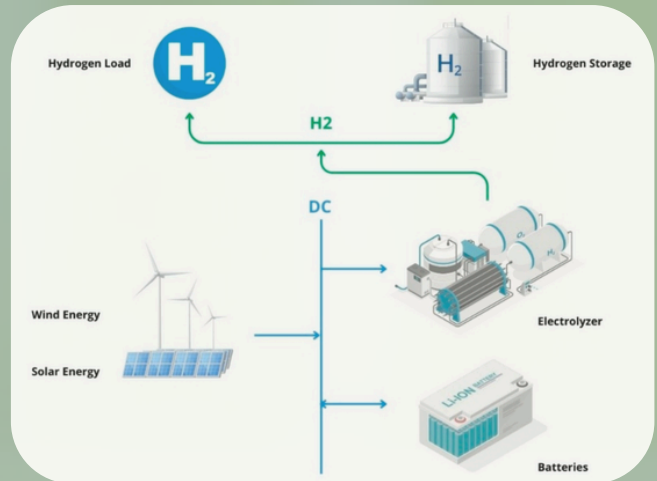


# Research Highlights

## Green Hydrogen Production

Green hydrogen modelling has progressed for Morocco and Brazil case studies. The complete green hydrogen process for the Moroccan case study has been designed, encompassing the overall system configuration that integrates renewable energy sources with electrolysis for hydrogen production, as well as compression and storage.

Related results from our partners at IRESEN have already been published (refers to page 10).



Overview of the IRESEN Solar-Wind Green Hydrogen Production design

## Communication and Dissemination



SUSTEPS Coordinator opening the Workshop organized by SUSTEPS, parallel event at EUBCE 2026.

SUSTEPS has grown its online presence over the past months, with a 64% increase in followers. The project delivered three high-audience events, two new videos and four press releases. The project has remained active in clustering and stakeholder engagement through the SUSTAFUELS Cluster and EU Booster supported activities, strengthening collaboration with sister projects including co-organising joint webinars, workshops and meetings with the wider advanced biofuels community.



Join us on: @SUSTEPS



# Social Acceptance

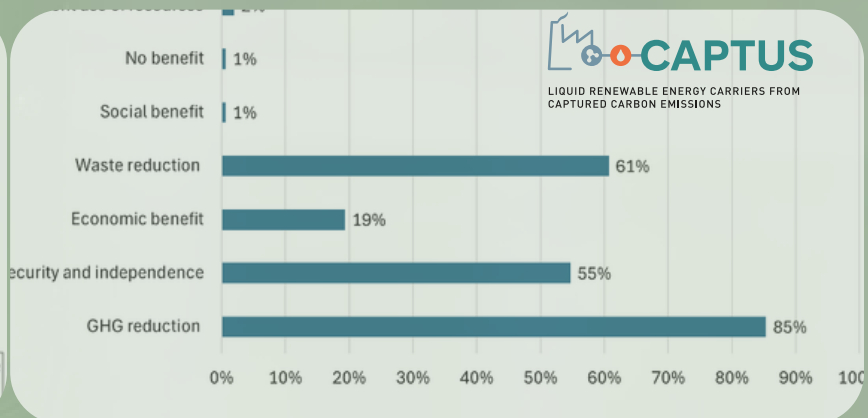
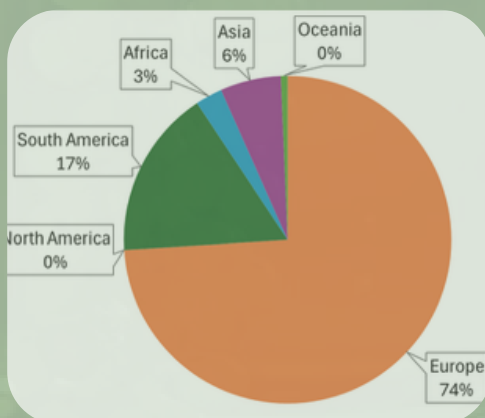
SUSTEPS already covers environmental (LCA), economic (TEA), and social (S-LCA) dimensions, public and technical-audience perception research is the piece that captures how those dimensions are actually received and trusted by the people who will eventually use, regulate, invest in, or live near this technology.

SUSTEPS joined and contributed to CAPTUS's survey, it gives both projects and the broader SUSTAFUELS cluster a cross-validated analysis rather than each project running smaller, less statistically robust surveys in isolation.

SUSTEPS Partner ARDITEC, co-organized both the December 2025 webinar and the May 2026 joint workshop, where CAPTUS presented the ongoing social acceptance survey results (Depicted in the chart below).



Biofuels and carbon-neutral fuels are therefore not only perceived as environmentally beneficial but also as strategically important for enhancing national energy resilience.



CAPTUS EU Project – Preliminary results from social acceptance study lead by Chiara Monacchini, PhD candidate at the University of Genoa.

A survey developed by CAPTUS, in collaboration with SUSTEPS, exploring public and technical audience's perception.



Join us on: @SUSTEPS



# Events participation

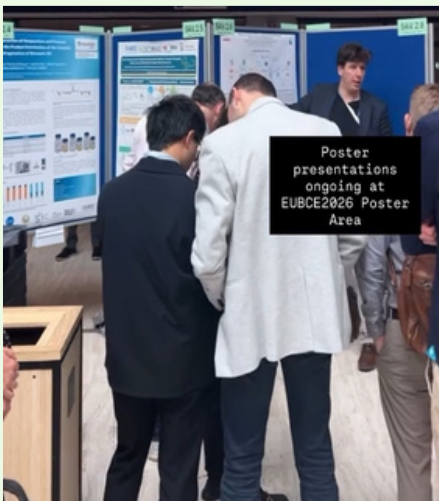


*SUSTEPS Coordinator presenting on the CINEA event.*

On 17 March, SUSTEPS joined **CINEA's advanced biofuels event** alongside 30 EU-funded project coordinators, where two Commission reports took centre stage: one warning that planned biofuel capacity won't meet demand by 2030, and the other concluding that no single pathway can cover more than 50% of that demand, underscoring the need for a diverse portfolio of deployable technologies.

The conclusions reveal the challenge now is deployment, financing, and policy frameworks, since 2030's capacity gaps will not stem from a lack of biomass, but from lagging investment and mobilisation.

At **EUBCE 2026 Conference** (19–22 May), several SUSTEPS partners presented research advances on the project as a whole, including catalytic HTL and biocrude upgrading.



*SUSTEPS presenting results of the ongoing research at EUBCE Conference. From the left to the right, Researchers Rene Buettgen (FZJ), Alexander Rauch (PSI) and Gamze Behmenyar (TÜBITAK).*



Join us on: @SUSTEPS



# Events organization

## Workshop on Advanced Biofuels: Industry, Market & Policy perspectives

Co-organised by SUSTEPS · CAPTUS · SUNFUSION ·  
34th EUBCE & Exhibition World Forum, The Hague



Experts sharing perspectives during the round table

Dr. Kyriakos Maniatis delivered a keynote to a standing-room-only audience, mapping the complexity of the advanced fuels ecosystem. He highlighted the potential role of technologies developed within SUSTEPS, CAPTUS, and SUNFUSION. He opened by framing the urgency of the challenge: fossil fuel demand is declining across most sectors, yet aviation remains a critical outlier.



Dr. Kyriakos Maniatis delivering his presentation

SUSTEPS participated at the European Biomass Conference & Exhibition (EUBCE), and exchanged knowledge with attendees at Booth #12.



Join us on: @SUSTEPS

# Publications



**Bioresource Technology**

Contents lists available at ScienceDirect

Journal homepage: [www.elsevier.com/locate/biortech](http://www.elsevier.com/locate/biortech)

### Unveiling the factors shaping variability in biomass productivity: Meta-analysis of outdoor pilot-scale microalgal cultures

Alhassan Younis<sup>a</sup>, Adnan Ullah<sup>a</sup>, Josée Bergeron<sup>b</sup>, Hector De la Hoz Siegfier<sup>c</sup>

<sup>a</sup>Department of Chemical and Petroleum Engineering, University of Calgary, Calgary, Alberta, Canada  
<sup>b</sup>Faculty of Science and the Biomass, National University of Irkutsk, Irkutsk, Russia  
<sup>c</sup>Faculty of Science and the Biomass, National University of Irkutsk, Irkutsk, Russia

**Highlights**

- Natural factors controlling productivity in 53 outdoor culture studies
- Productivity correlates negatively with culture depth, growth period, and media
- Temperature, pH, and light have limited potential to improve productivity

**Graphical Abstract**

**ARTICLE INFO**

Received 15 October 2020; Received in revised form 18 April 2021; Accepted 23 April 2021  
Available online 21 April 2021  
© 2021 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/by-nc/4.0/>).

**Energy Conversion and Management: X**

Contents lists available at ScienceDirect

Journal homepage: [www.elsevier.com/locate/engconm](http://www.elsevier.com/locate/engconm)

### Techno-economic assessment and modeling of green hydrogen production using renewable energy: a case study of Moroccan regions

Ourane Derly<sup>a</sup>, Tassime Bouanou<sup>a</sup>, Nouhayla Amami, Louisa Bouabanti<sup>a</sup>, Myrème Aarrouj, Nouhalla Nabil, Ayoub Hrit

<sup>a</sup>Research Center on Solar Energy and the Energy Storage (IRESEN), Morocco

**ARTICLE INFO**

Received 15 October 2020; Received in revised form 18 April 2021; Accepted 23 April 2021  
Available online 21 April 2021  
© 2021 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Since its launch, SUSTEPS has generated five scientific publications in top-tier journals. We invite you to click on each paper to discover the main results delivered.

These publications validate the project's technical and methodological approach, and extend its impact to the wider scientific community, reinforcing SUSTEPS's role in advancing the development of advanced sustainable biofuels.



Our partners at SDU recently reached a milestone, three peer-reviewed publications. Read about these research results [here](#).

**Separation and Purification Technology**

Contents lists available at ScienceDirect

Journal homepage: [www.elsevier.com/locate/sepatec](http://www.elsevier.com/locate/sepatec)

### Towards sustainable bio-oil Production: Recycling and separation techniques applied to the aqueous phase byproduct of algae biomass hydrothermal liquefaction

Sorena Garbhan<sup>a</sup>, Maximiliano Erico<sup>a</sup>, Knud Villy Christensen<sup>b</sup>

<sup>a</sup>Department of Chemical Technology, Faculty of Engineering, University of Southern Denmark, Campus 51, 5230, Odense, Denmark  
<sup>b</sup>Department of Chemical and Biomolecular Engineering, University of Southern Denmark, Campus 51, 5230, Odense, Denmark

**ARTICLE INFO**

Received 15 October 2020; Received in revised form 18 April 2021; Accepted 23 April 2021  
Available online 21 April 2021  
© 2021 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/by-nc/4.0/>).

**Journal of Membrane Science**

Contents lists available at ScienceDirect

Journal homepage: [www.elsevier.com/locate/jms](http://www.elsevier.com/locate/jms)

### Nanofiltration of synthetic HTL-AP: rejection, fouling analysis, and membrane autopsy

Sorena Garbhan<sup>a</sup>, Knud Villy Christensen<sup>b</sup>, Rine Bahji<sup>c</sup>, Morten Enggaard Simonsen<sup>b</sup>, Maximiliano Erico<sup>a</sup>

<sup>a</sup>Department of Chemical Technology, Faculty of Engineering, University of Southern Denmark, Campus 51, 5230, Odense, Denmark  
<sup>b</sup>Department of Chemical and Biomolecular Engineering, University of Southern Denmark, Campus 51, 5230, Odense, Denmark  
<sup>c</sup>Department of Chemical and Biomolecular Engineering, University of Southern Denmark, Campus 51, 5230, Odense, Denmark

**ARTICLE INFO**

Received 15 October 2020; Received in revised form 18 April 2021; Accepted 23 April 2021  
Available online 21 April 2021  
© 2021 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

**Journal of Environmental Chemical Engineering**

Contents lists available at ScienceDirect

Journal homepage: [www.elsevier.com/locate/jecce](http://www.elsevier.com/locate/jecce)

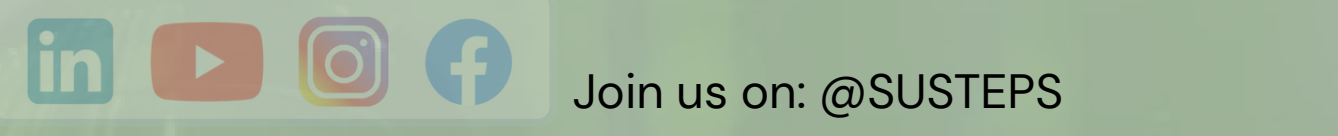
### Phosphate recovery by struvite production from synthetic wastewater using a highly scalable 3D printed filter-press electrochemical reactor

Benjamin Bismuthoff Hay<sup>a</sup>, Sorena Garbhan<sup>a</sup>, Maximiliano Erico<sup>a</sup>, Knud Villy Christensen<sup>b</sup>

<sup>a</sup>Department of Chemical Technology, Faculty of Engineering, University of Southern Denmark, Campus 51, 5230, Odense, Denmark  
<sup>b</sup>Department of Chemical and Biomolecular Engineering, University of Southern Denmark, Campus 51, 5230, Odense, Denmark

**ARTICLE INFO**

Received 15 October 2020; Received in revised form 18 April 2021; Accepted 23 April 2021  
Available online 21 April 2021  
© 2021 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).



## Join our growing community

Subscribe to our newsletter to stay up to date on the latest insights into our high-oil-yield biocrude generation process, built on the optimisation of microalgae conversion, along with regular updates from the SUSTEPS project, including upcoming events and workshops.

Join a growing community of more than 570 subscribers, and follow us on LinkedIn, Instagram, Facebook, and YouTube to stay connected.

<https://susteps.eu>  
Join us on: @SUSTEPS

