



CIRCALGAE

Food - Feed - Cosmetics

Bridging the Scale-up Gap: BBEPP's Role in Biorefinery Processes and Integrated Biomass Value Chains



Rakesh Nair,
Business Development Manager
Bio Base Europe Pilot Plant

Gothenburg 2026, 22nd Sep

Final Event



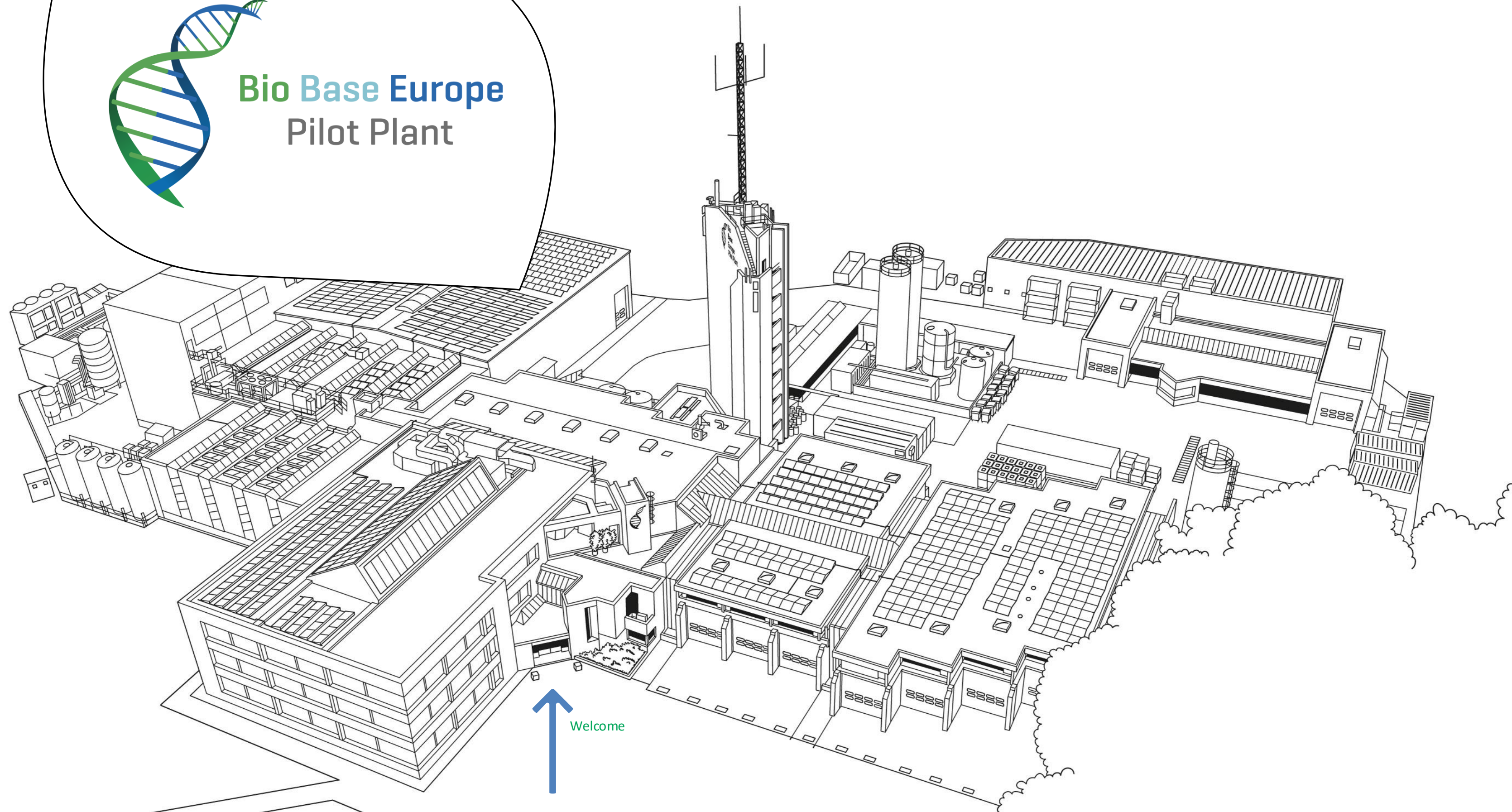
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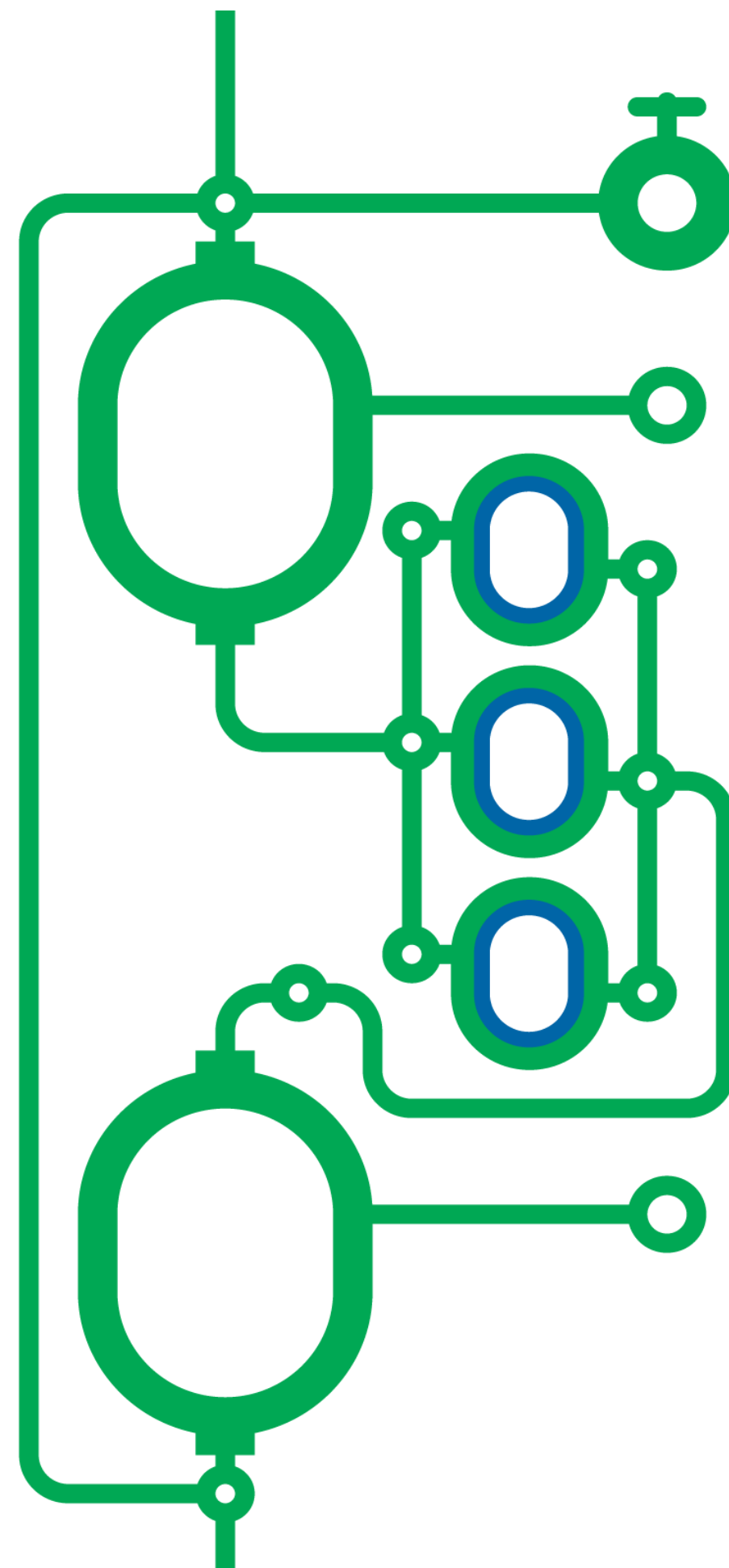
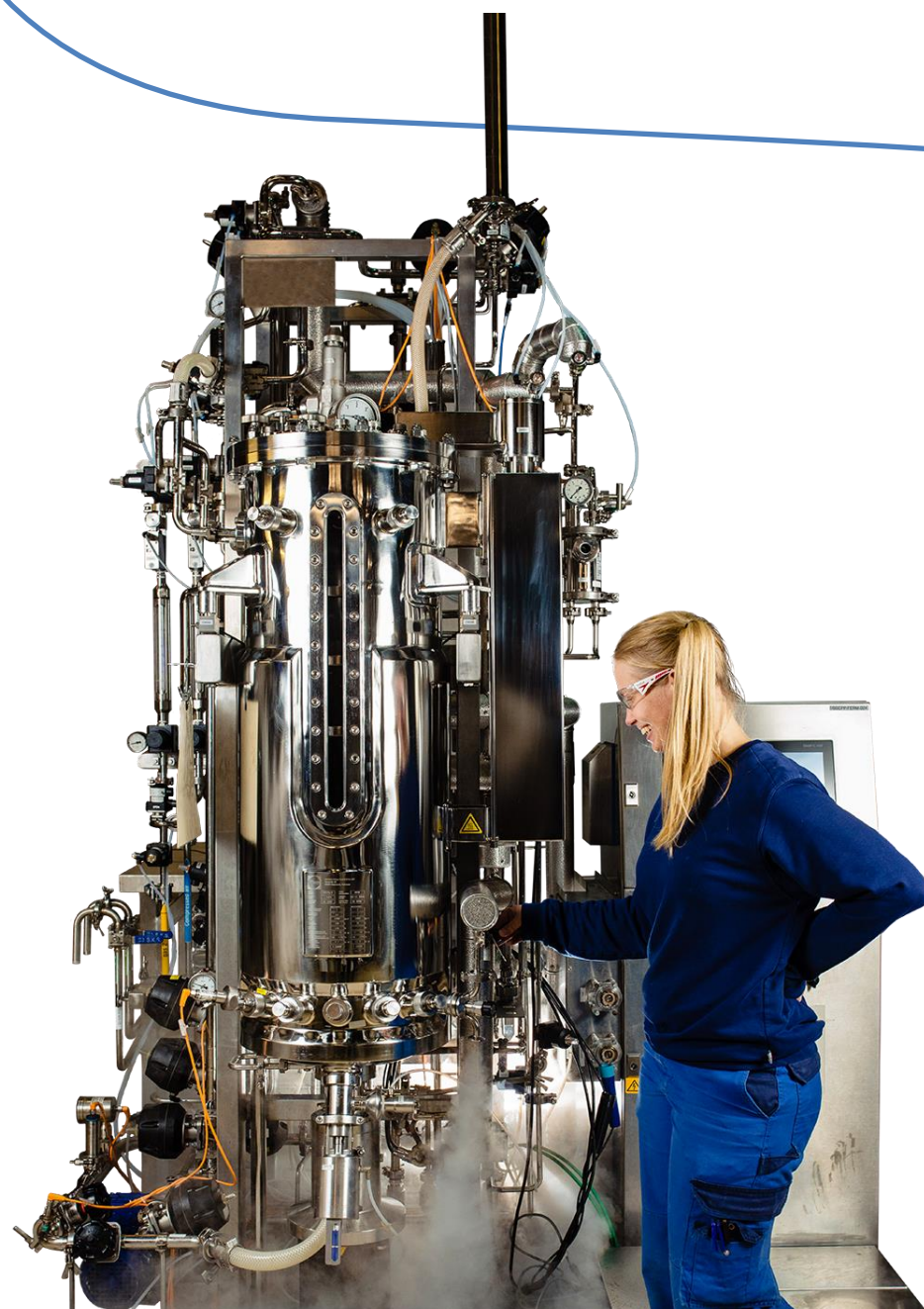
Who we are



Bio Base Europe Pilot Plant



Mission Statement



We enable
the transition

to a sustainable,
biobased economy

through
process development

through
scale-up

through
custom manufacturing

of biobased products and
processes

2026 Key figures

2008
Founded

61
Fermenters

80+ M€
Investment in infrastructure

1000+
Private Collaborations

25+ M€
Turnover

160+
Enthusiastic employees

Fully independent,
no industrial shareholders

Quality labels:

ISO 9001 – FSSC 22000 – FDA-approved – ...



Home: Ghent, Belgium



Why do we need pilot facilities?





Bio Base Europe
Pilot Plant
helps bridging
the valley of death



Valley
of death



Product
development/piloting

Commercialisation

TECHNOLOGICAL RISK

CAPITAL REQUIREMENTS

Basic research

STAGE OF DEVELOPMENT





Advantages of collaborating with a pilot plant

Better

Scale-up is our
CORE business

Cheaper

Service fee instead of
huge CAPEX/OPEX costs

Faster

Clear & reliable timelines,
KEY to stay ahead of
competition

Our Services





Services

Laboratory

Scale-up

Scale-up

downscaling

downscaling

Factory



Process development

Cost Efficiency
Scalability
Sustainability

Technology Transfer
Development &
Optimisation
Proof of Concept



Scale-up

Economic Viability
Robustness
Efficiency & Sustainability
Demonstration

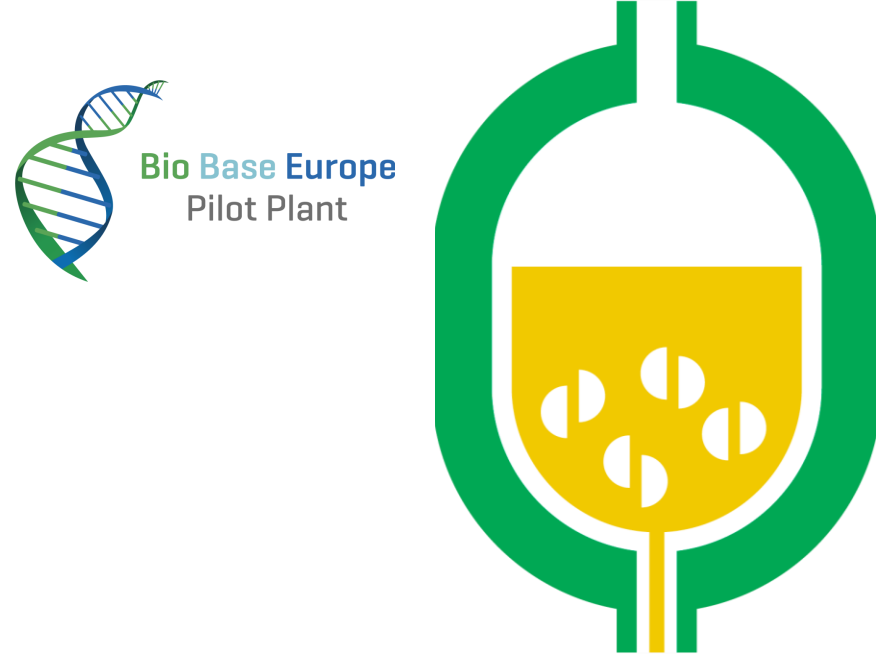
Industrial Equipment
Validation
Sample Production
Product Quality
Specs



Custom manufacturing

Demonstration
Market Introduction
Gain Production Experience
Prepare for Industrial
Production

Production with
pre-industrial,
state-of-the-art
equipment



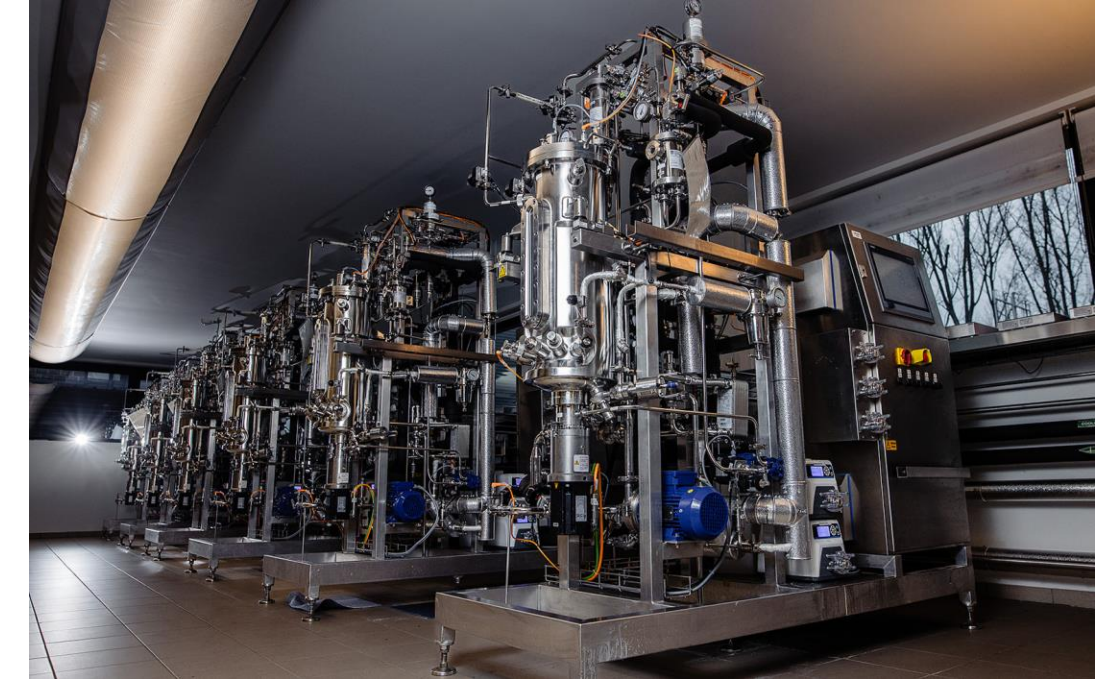
Current Capacity in a Nutshell

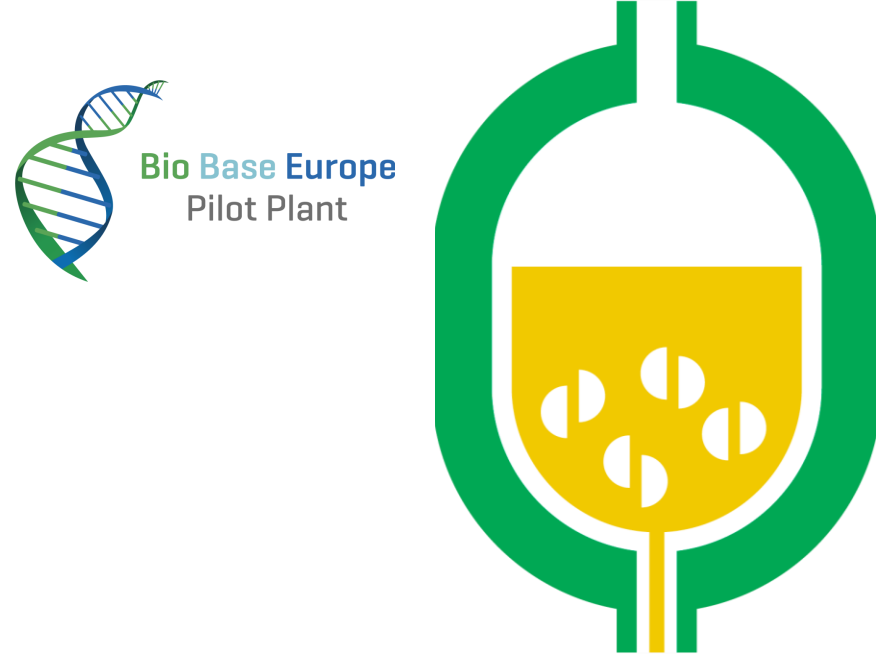
Lab scale fermentation

- **34 lab fermenters**, incl. gas fermenters
- Multiple parallel systems for medium and parameter optimization
- **6*30 L stainless steel fermenters**
- DSP lab for cell disintegration, filtration, chromatography, drying, ...

Pilot scale fermentation

- Hall with **20 stainless steel fermenters**:
2*30 L, 10*150 L, 5*1500 L, 3*15,000 L
- **Pipe connected** to aqueous & solvent based **downstream processing halls** with unique suite of equipment





Current Capacity in a Nutshell

Pilot scale fermentation

- Mobile gas fermentation unit with 150 L and 24 L fermenters

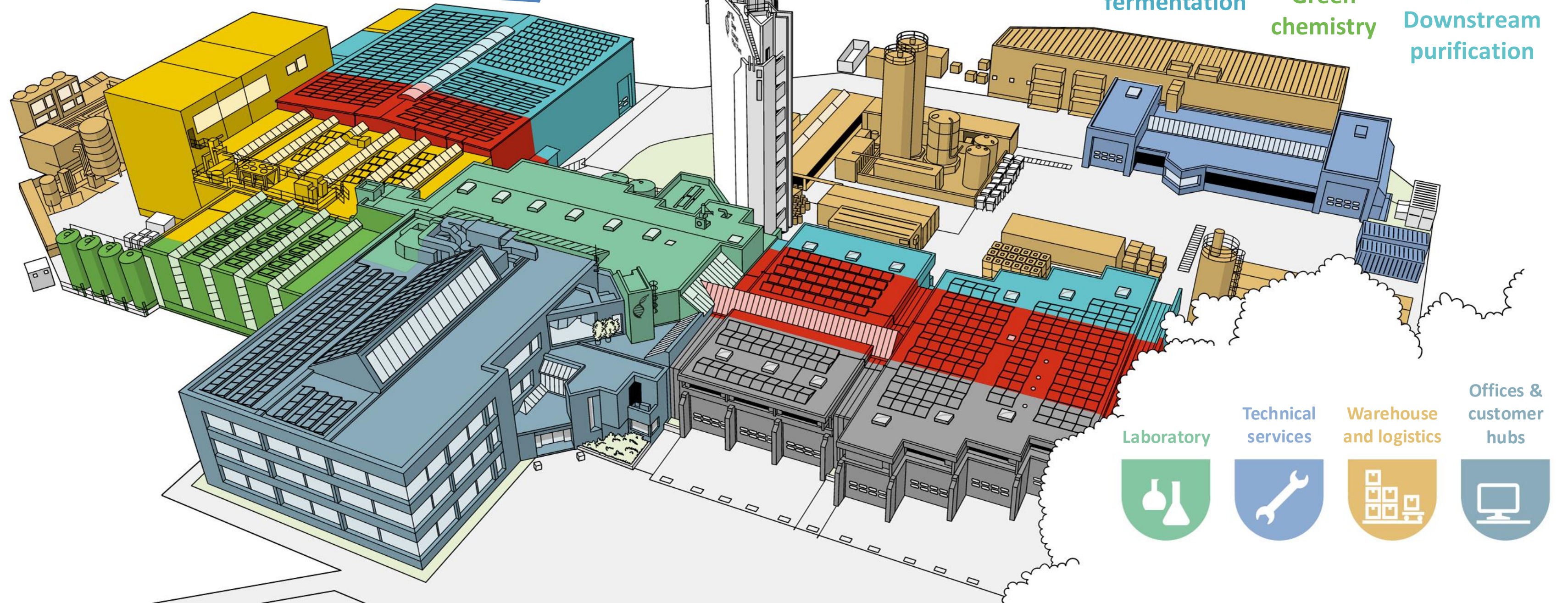
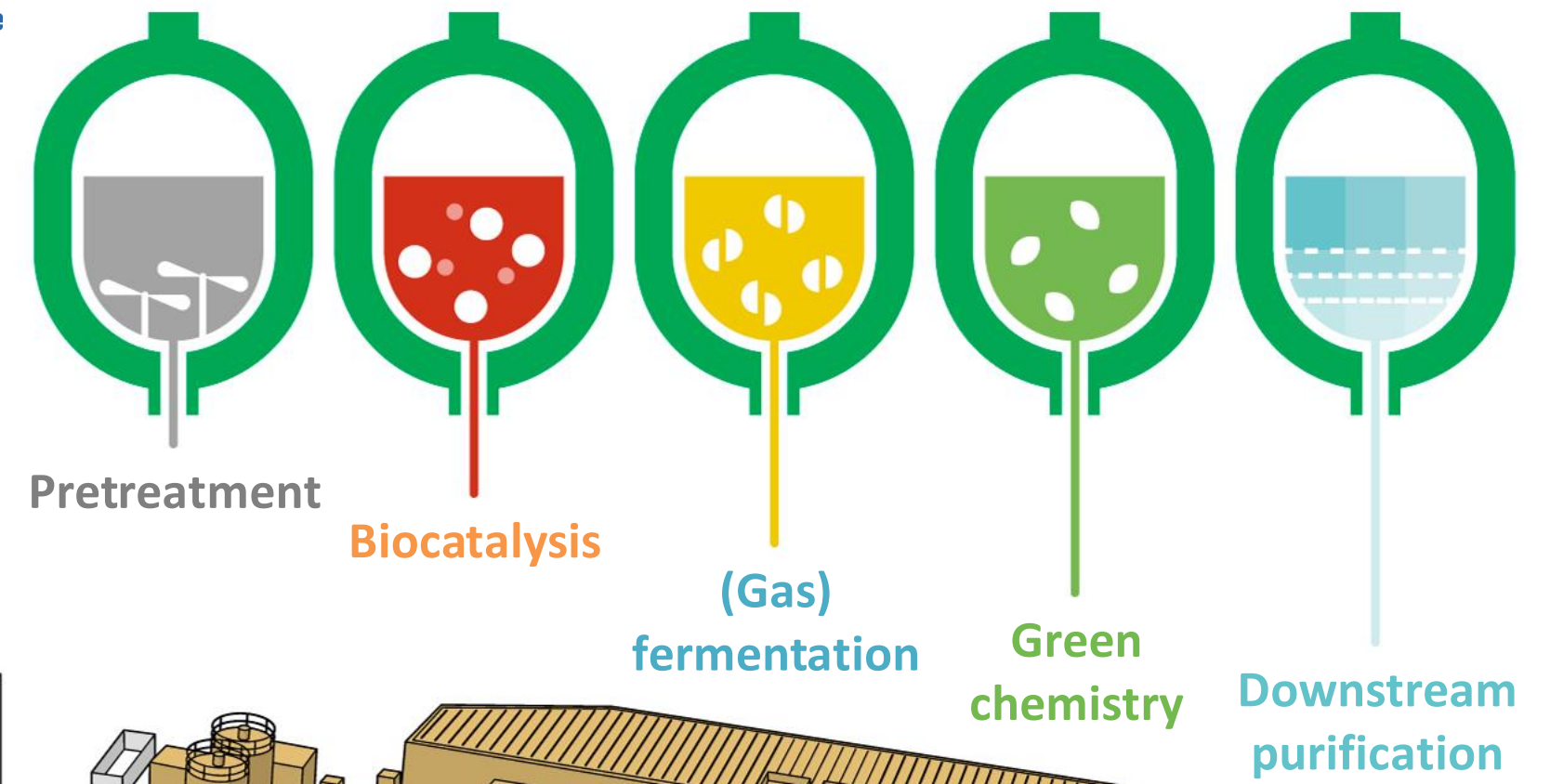
Demonstration scale fermentation

- Demonstration hall with **7500 and 75,000 L fermenter**
- Pipe connected to DSP halls

All process halls food grade certified (FSSC22000, FDA, Kosher, Halal)

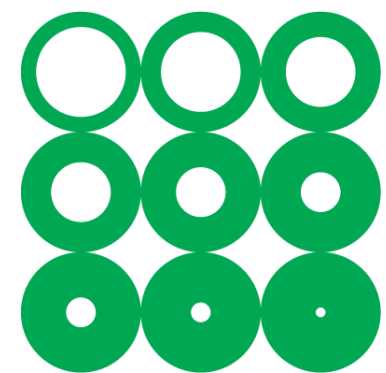


Technologies





**A one-stop-
shop for ...**



**Biobased processes
and products**

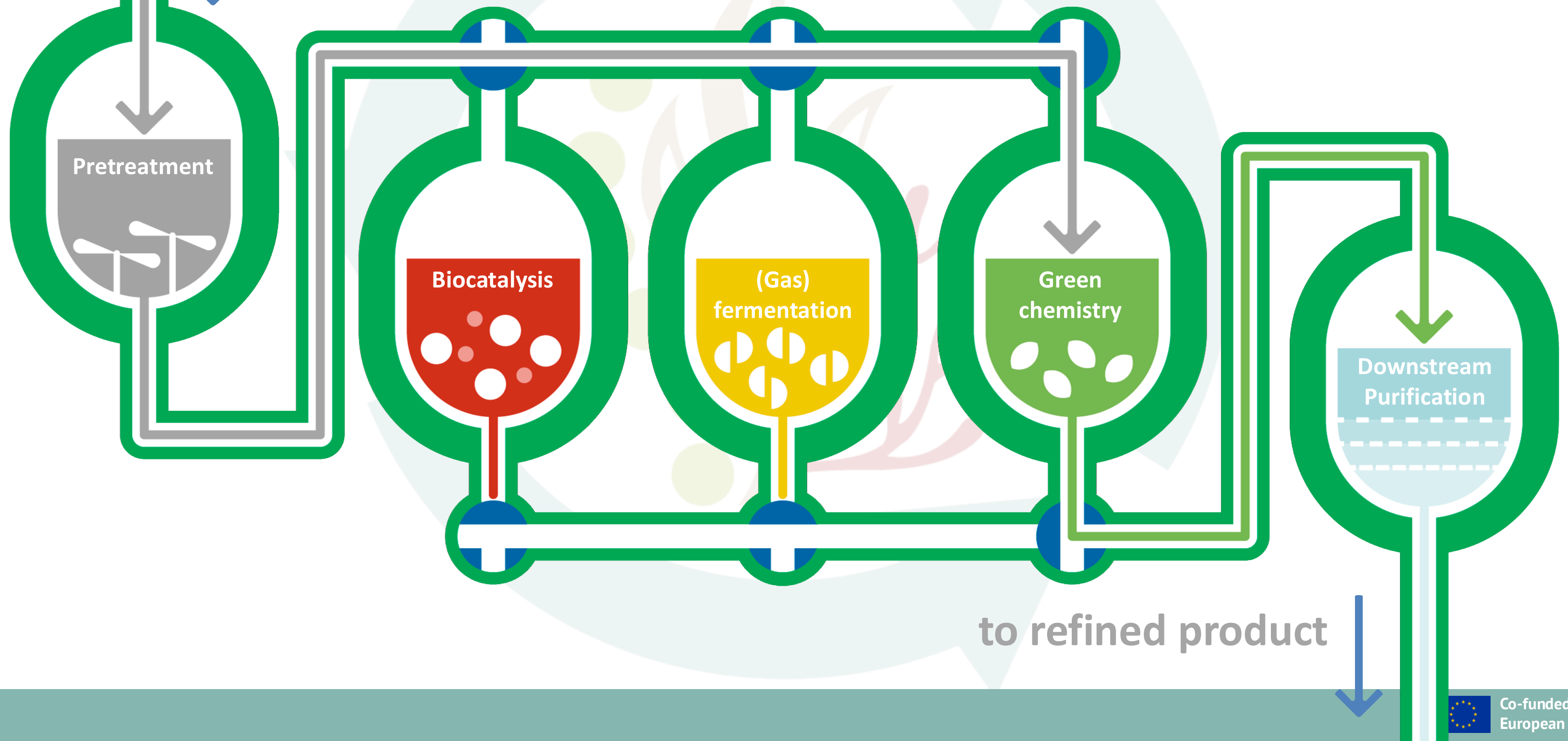


**from
biomass**

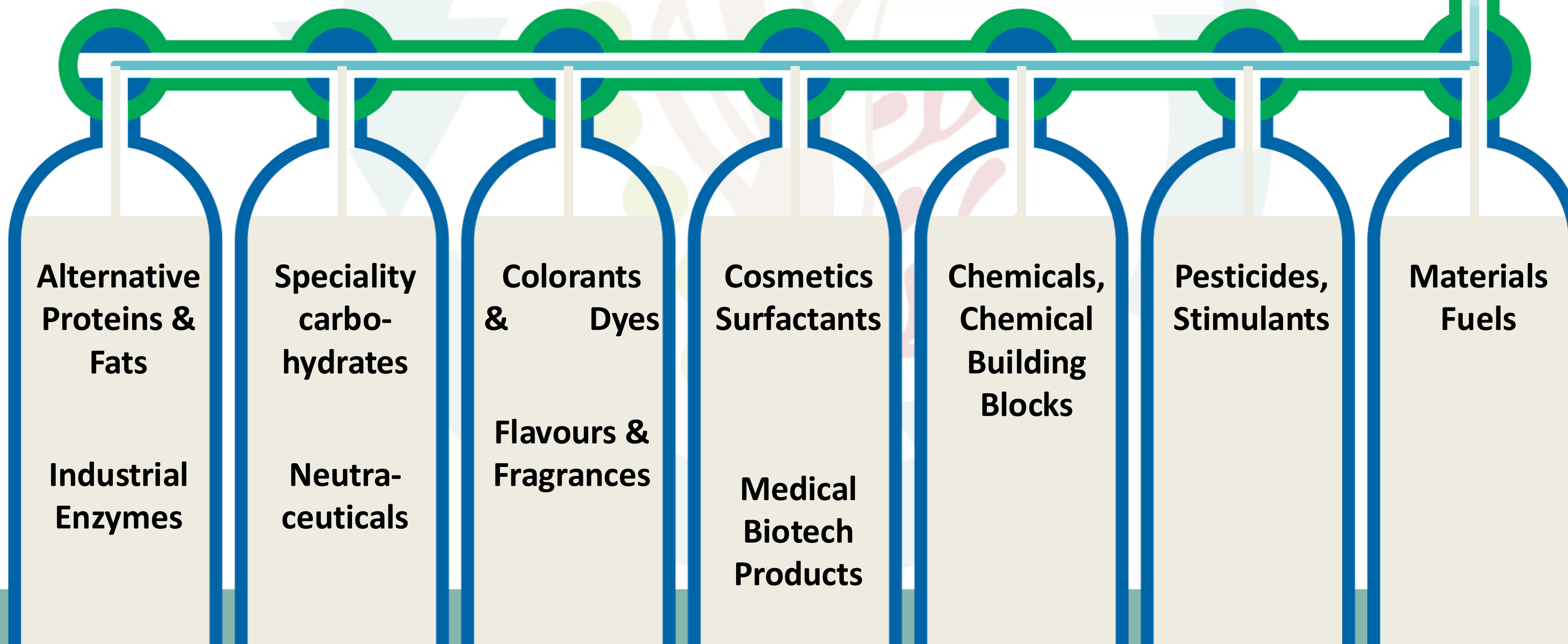




through our processes

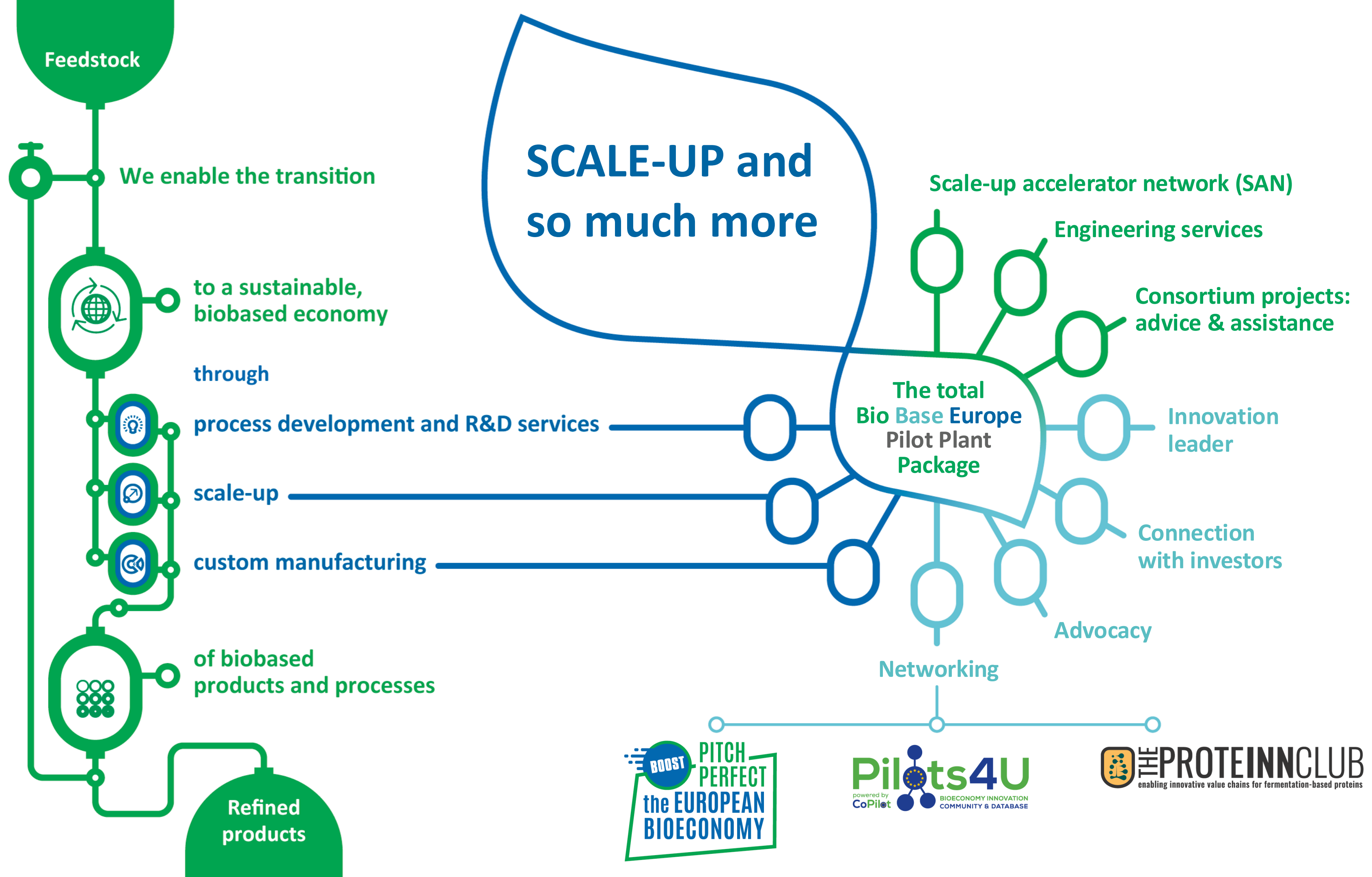


refined products



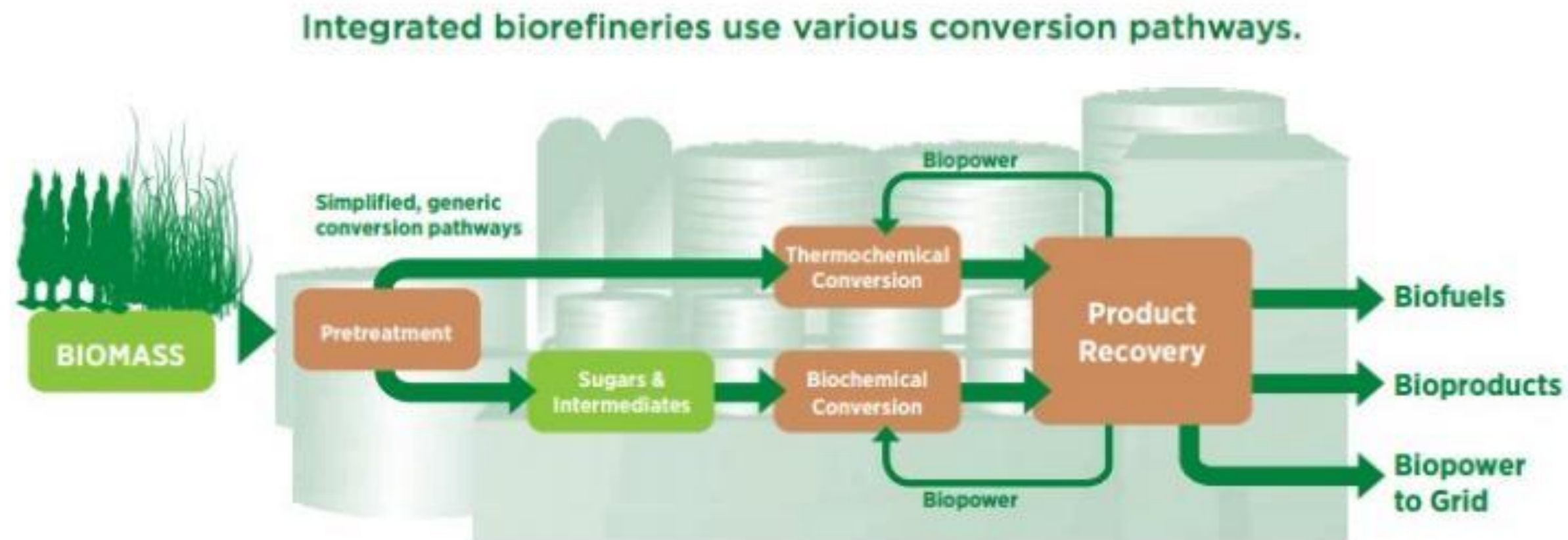
**Scale-up and
so much more**





What is a Biorefinery?

- ✓ A facility that integrates biomass conversion processes and equipment to produce **fuels, power, and chemicals** from biomass.
- ✓ Analogous to today's petroleum refineries



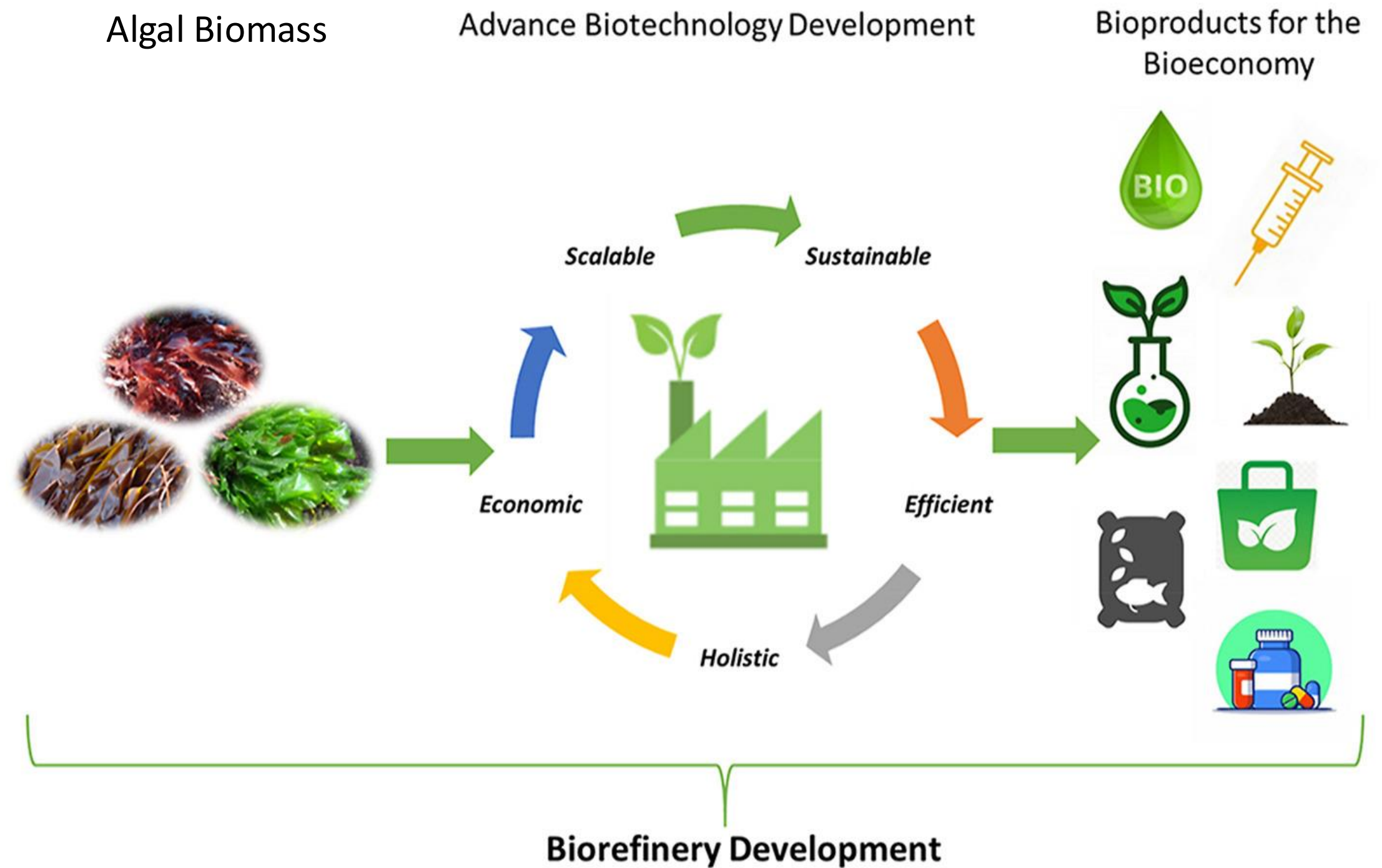
- ✓ The sustainable processing of biomass into a spectrum of bio-based products (**Food, Feed, Ingredients, Chemicals**) and bioenergy (**Fuel, Power, Heat**)

Source: US Dept of Energy

From Algal Biomass to a Sustainable future

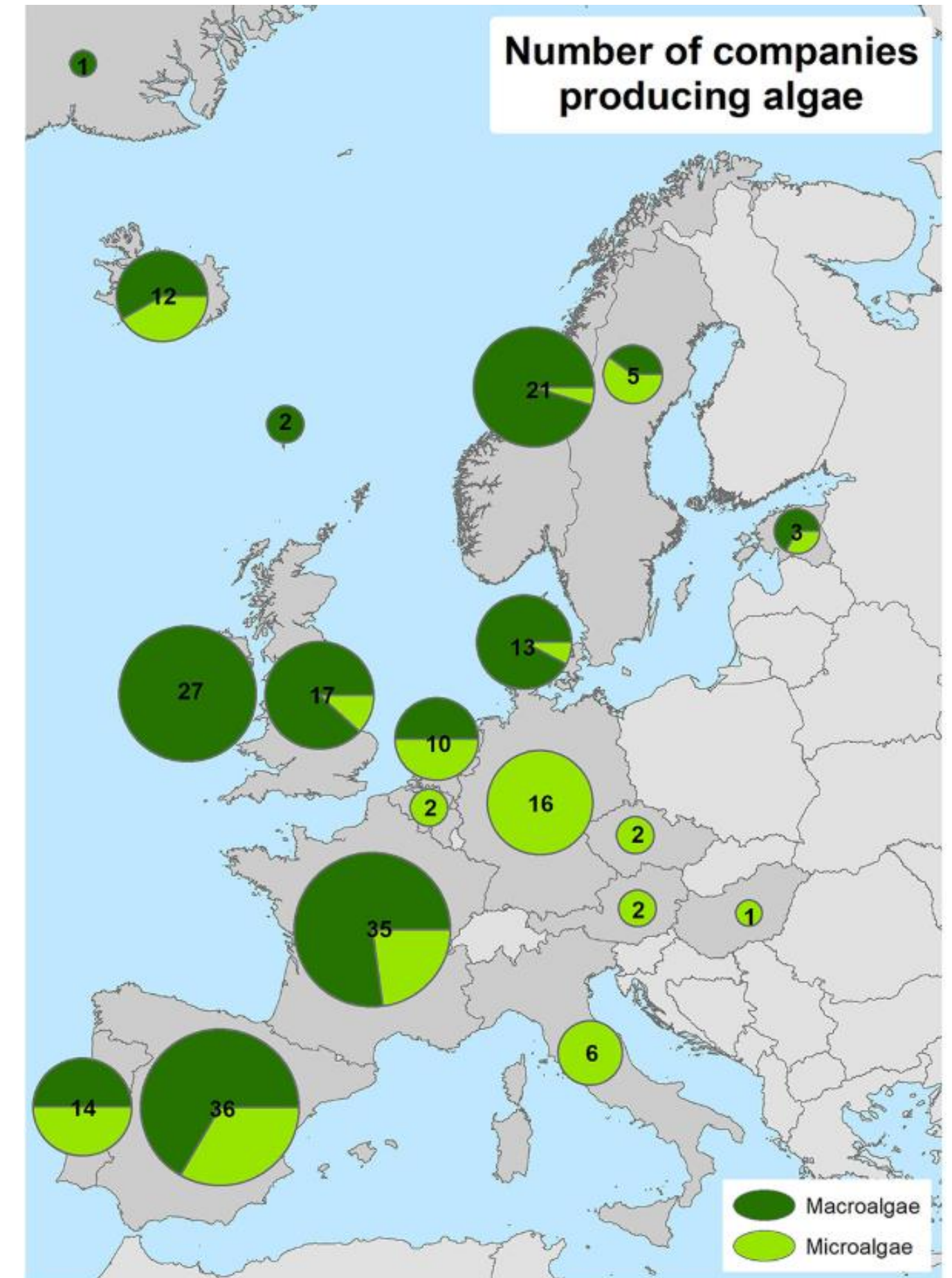
Key drivers

- ✓ Complying with net-zero targets
- ✓ Reducing greenhouse gas emissions
- ✓ Sustainable Developmental Goals
- ✓ Transitioning economies to an environment, economic, and socially sustainable



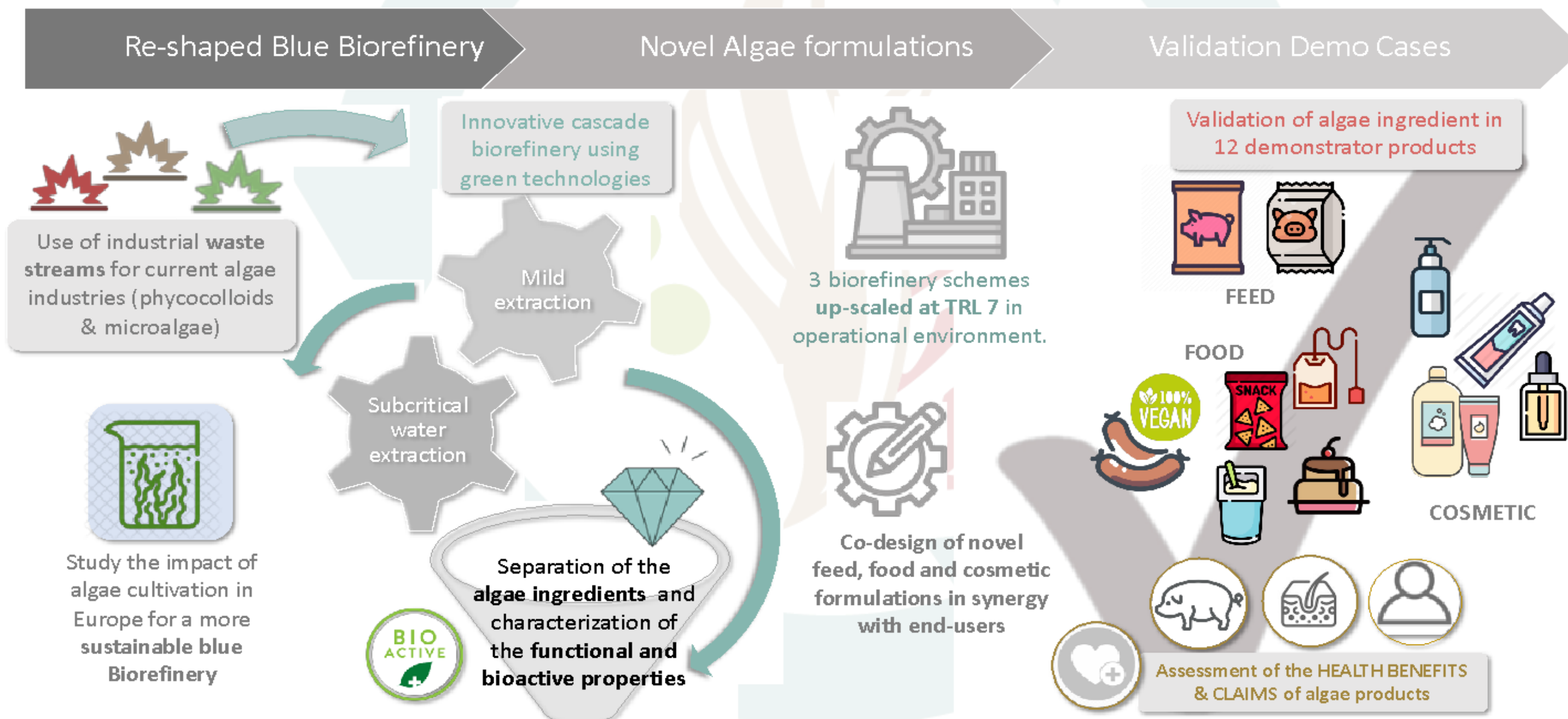
Algae offer advantages over lignocellulosic feedstocks for biorefineries due to their high yields, rapid growth, non-reliance on land, and simpler composition, enabling less energy-intensive processing and improved environmental and economic performance.

Unfortunately, technologies developed for lignocellulosic feed stocks are incompatible with the unique biochemical composition of the macroalgal biomass, necessitating the development of new macroalgae-specific bioprocesses.



Circalage Approach

The CIRCALGAE project: a set of **cross-sectorial and systemic innovative strategies** to create a sustainable and competitive algae biorefinery by fully utilizing its biomass into **high-value healthy and functional ingredients** for a climate-neutral thriving blue bioeconomy in Europe.





Sustainable Proteins from Seaweed

An integrated biorefinery design for different types of seaweed to yield proteins and other high-value compounds in a sustainable manner

SUPROSEA strives to strengthen the position of Flanders in the protein shift context, and to contribute to meeting the increasing global demand for sustainable proteins

- Optimization of seaweed farming: Improve local farming conditions to increase the yield and quality of components to be extracted
- Cascade biorefinery approach: Test mild extraction techniques for proteins and pigments, valorise the remaining biomass via fermentation into microbial proteins (zero-waste)
- Characterization and applications: Evaluate proteins and high-value compounds in food and feed trials
- Process modelling and sustainability evaluation: Model biorefinery processes to simulate scale-up scenarios and evaluate them against an integrated sustainability methodology, including life cycle analysis, biodiversity impact, and market analysis

BUDGET

€ 2,364,899

DURATION

Oct 24 – Sept 28

TRL

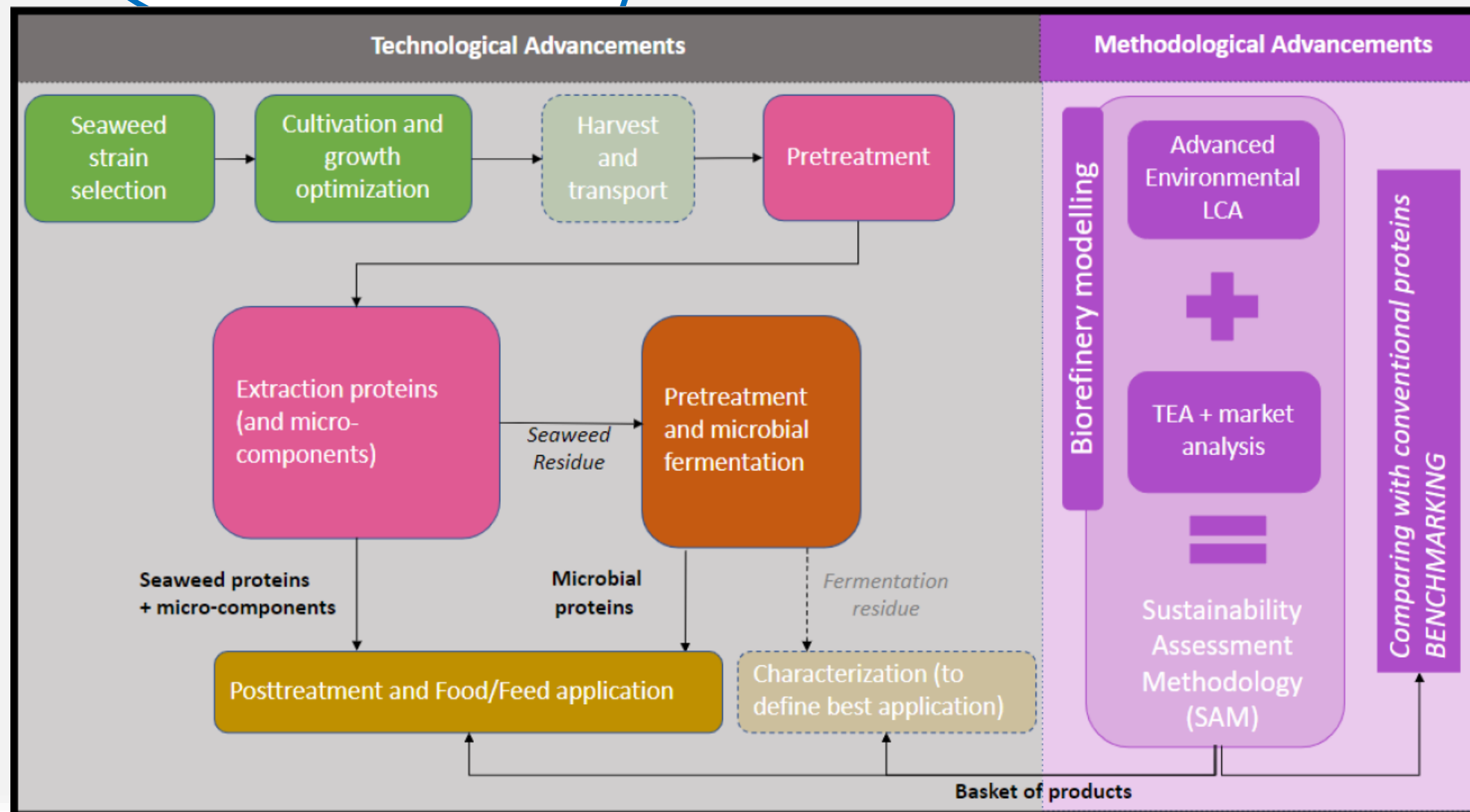
3-4

ROLE BBEPP

R&D



This project has received funding from the Research Organisation – Flanders (FWO) under file number: S002525N



BUDGET
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TRL
3-4
ROLE BBEPP
R&D

COORDINATOR



PARTNERS



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COMBO - Innovative Cultivation Methods for Marine Biodiscovery

COMBO will:

- allow the transfer of knowledge from terrestrial to marine biotechnology through the engineering of marine metabolic pathways using Omics approaches
- exploit the recent advances in co-cultures systems
- expand the potential offered by underused marine sponges and seaweeds known to produce bioactives such as terpenoids and alkaloids for the cosmetic and pharmaceutical markets

BUDGET

€ 4,195,408.75

DURATION

Jan 2024 – Dec 2026

TRL

3-5

ROLE BBEPP

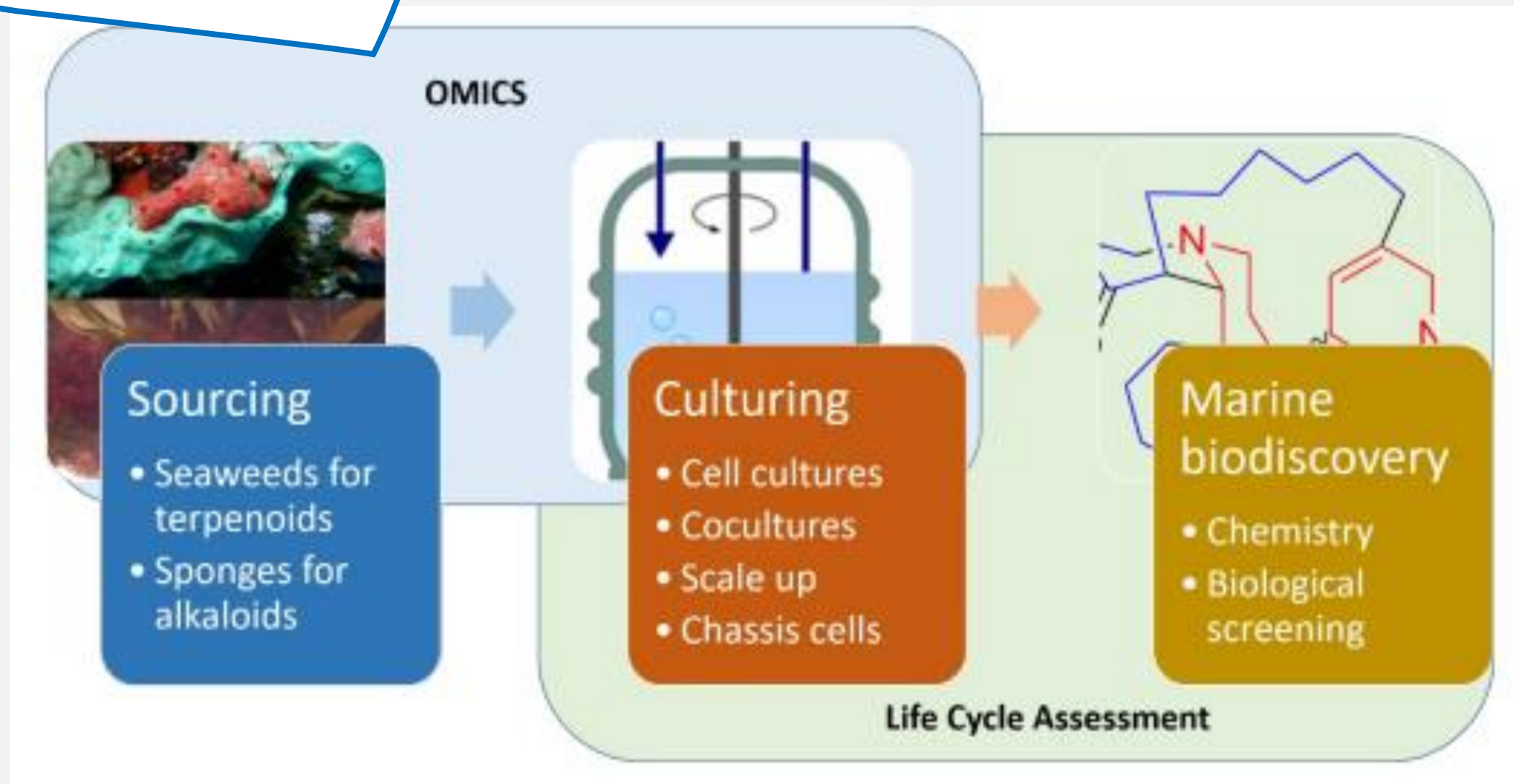
process development &
scale-up

WEBSITE

<https://www.combo-eu.org/>



This project
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Grant Agreement number:
101135438



BUDGET

€ 4,195,408.75

DURATION

Jan 2024 – Dec 2026

TRL

3-5

ROLE BBEPP

process development & scale-up

WEBSITE

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COORDINATOR



OLLSCOIL NA GAILLIMHE
UNIVERSITY OF GALWAY

PARTNERS



National
and Kapodistrian
University of Athens



This project has received funding from the European Union under Grant Agreement number: 101135438



CleanAlgae2Value

Demonstrating a cost-competitive, sustainable, scalable intensified micro-algae bioprocess for the production of food-grade medium value, carbon-negative ingredients exceeding Market Standards



BUDGET

€ 7,483,217

DURATION

Oct 25 – Sept 29

TRL

4-7

ROLE BBEPP

Partner, process development & scale-up

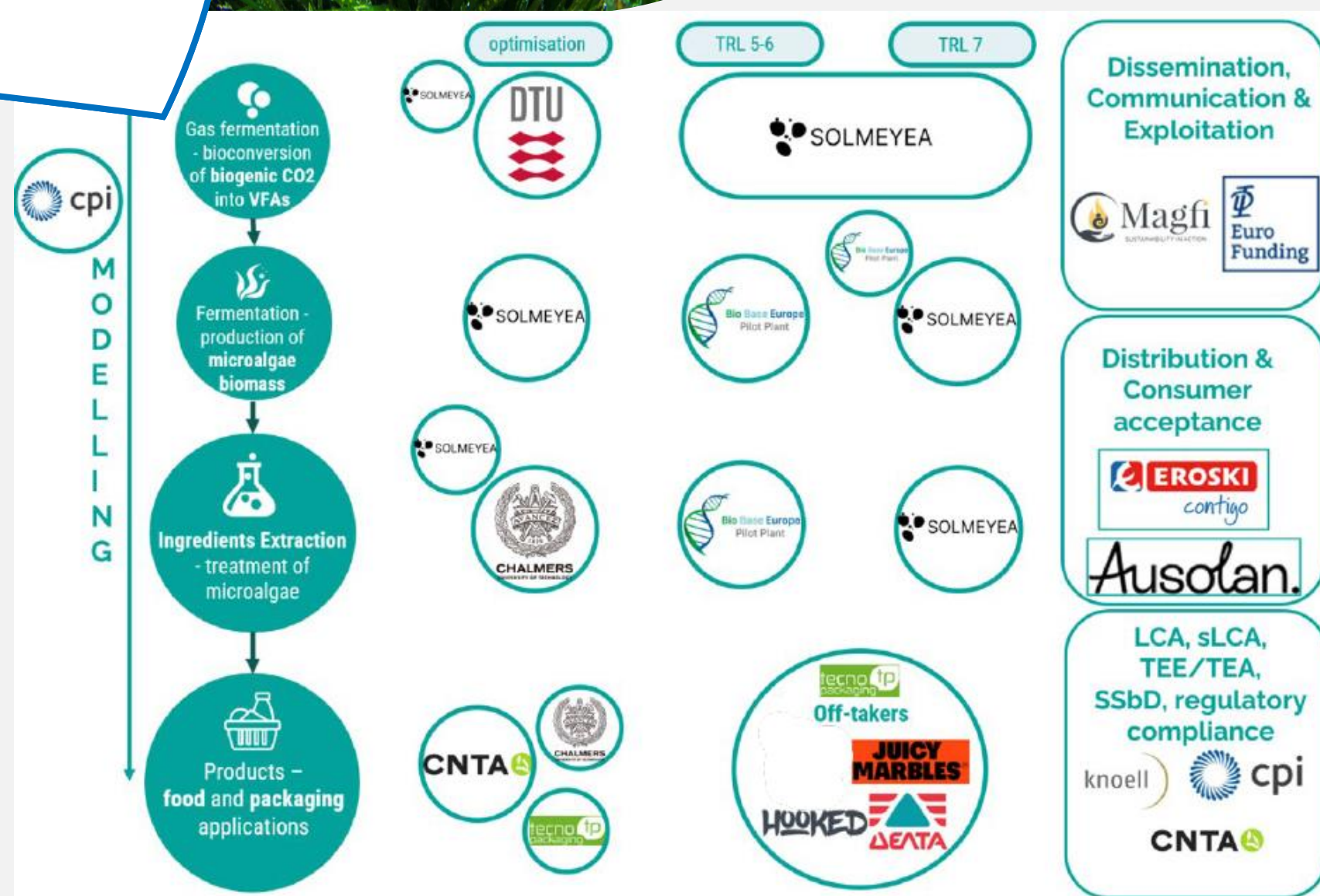
WEBSITE

<https://cleanalgae2value.eu/>



The project is supported by the Circular Bio-based Europe Joint Undertaking and its members under Grant Agreement no.: 101213354

Clean Algae 2Value



BUDGET

€ 7,483,217

DURATION

Oct 25 – Sept 29

TRL

4-7

ROLE BBEPP

Partner, process development & scale-up

WEBSITE

<https://cleanalgae2value.eu/>

COORDINATOR



PARTNERS



worldwide registration



Challenges and Solutions in DSP



•Planning for scalability.

- Biologics often exhibit complex, scale-dependent behaviours
- Technologies and processes must frequently be redesigned at intermediate stages to resolve unanticipated production challenges.

•Managing costs while ensuring product safety

- Streamlining processes and reducing the number of unit operations can lower costs and improve efficiency.
- Scaling up production can reduce per-unit costs by spreading fixed costs over a larger volume of product.

•Maintaining product quality through process optimization

- High-throughput screening is one solution that quickly identifies optimal conditions for yield and purity.
- Advanced mechanistic modelling techniques predict and optimize process performance, while integrated automation and control systems enhance process consistency and efficiency.

Conclusions

- Complete valorisation of marine biomass is challenging though achievable
- Transformation and translational approach is the key
- Technologies are available at lower scale, but requires innovative translation
- Adoption of circular economy/Bio-refinery is the key



Let's connect

ME



BBEPP



Contact us:
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www.bbeu.org



Scan the code
for a direct link
to our website,
equipment
& expertise folder



30 November: Keynote, Investor Pitches,
Speed Dating & Informal Networking Dinner

1 December: Pitching, Matchmaking, Networking Event

2 December: Open Day for Start-Ups, SMEs, Corporates
and Investors at the Bio Base Europe Pilot Plant

Sheraton Brussels Airport Hotel

www.pitchperfectbioeconomy.eu