

Kalundborg Symbiosis

Surplus from circular production



Kalundborg
SYMBIOSIS

Program for besøg af Overvågningsudvalget den 3. juni 2025

- 11.00 **Velkommen til Helix Lab** ved Nanna Uhrbrand Blume, ledelseskonsulent i Helix Lab
- 11.10 **Kalundborg Symbiose** – industriel symbiose som lokal vækstdriver gennem partnerskab og projekter ved Lisbeth Randers, sekretariatschef for Kalundborg Symbiose
- 11.45 **Cases fra udvalgte Regionalfondsprojekter** ved projektleder Sif Kjølby
- 12.00 **Uddannelse i Industriel symbiose** – præsentation af Erasmus+ projekt VINCIS ved projektleder Nadejda Ulstrup-Hansen
- 12.15 **Præsentation af Unibio** ved Eleni Ntokou, New Product Development, Sustainability, and Regulatory Affairs Director
- 12.45 **Guidet Symbiose-tour** med stop ved Unibio ved Nadejda
- 13.30 **Transport til Fermhub i Gørlev**

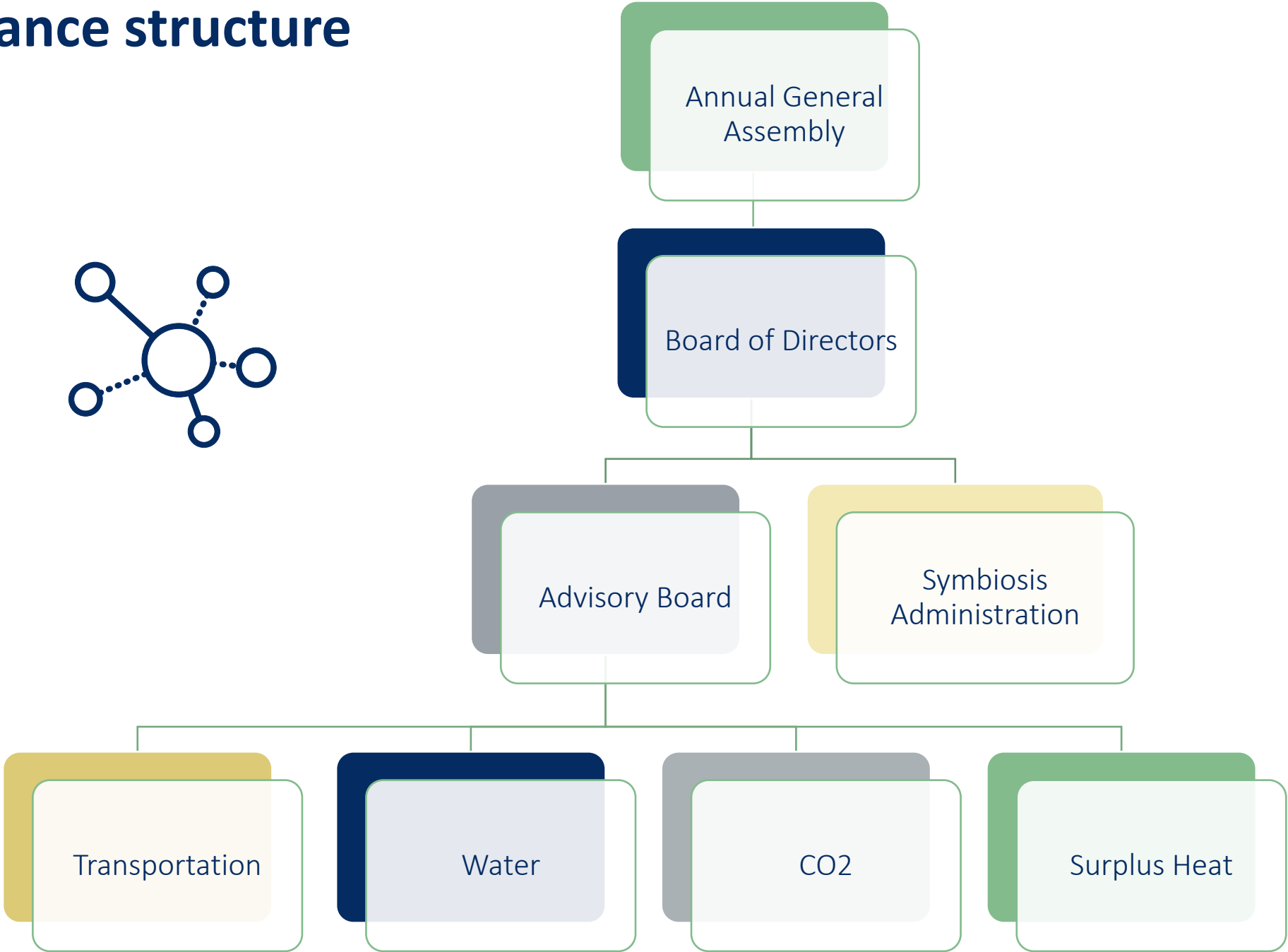
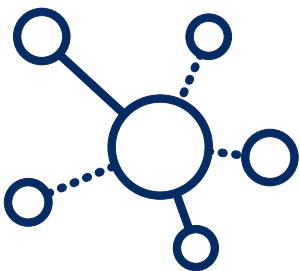




Link to the explainer film

<https://youtu.be/Ism7NdQe94I>

Governance structure





The Kalundborg Symbiosis Administration

Mission & Vision



Renew

Strengthening
the partnership



Connect

Full resource
utilization



Promote

Sharing the
symbiotic mindset

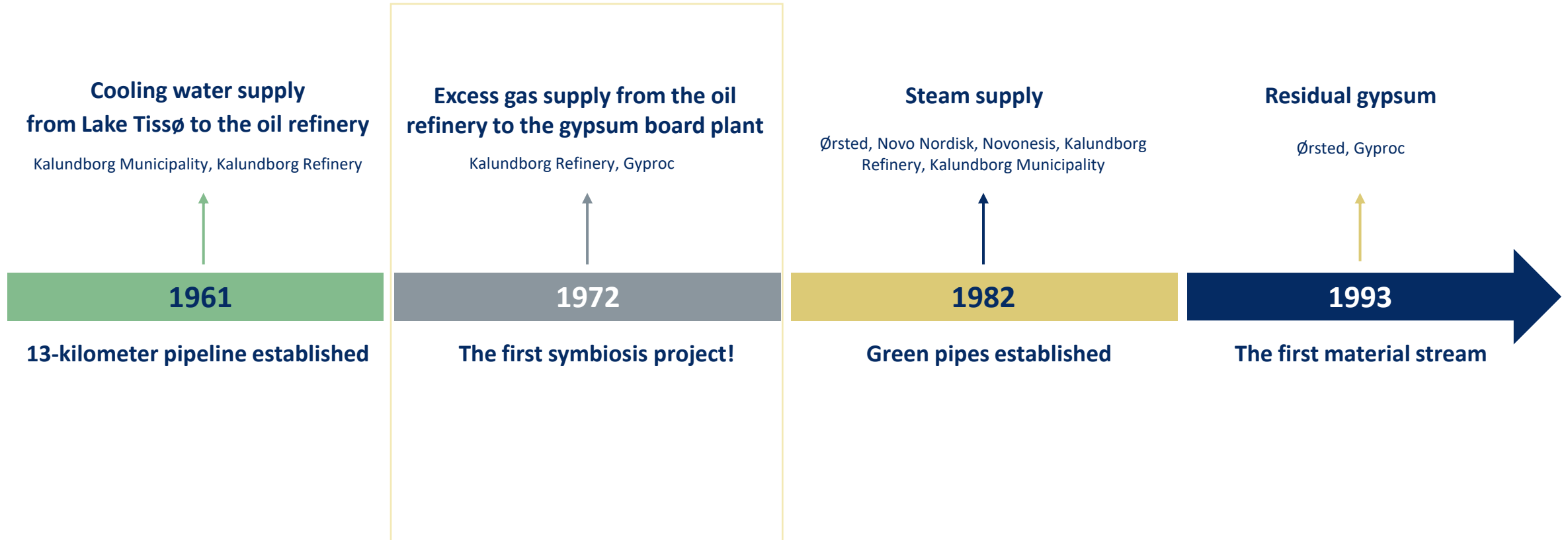


The worlds leading
industrial symbiosis with
a circular approach to
production



Kalundborg Symbiosis
creates sustainable
development in our
companies through joint
projects

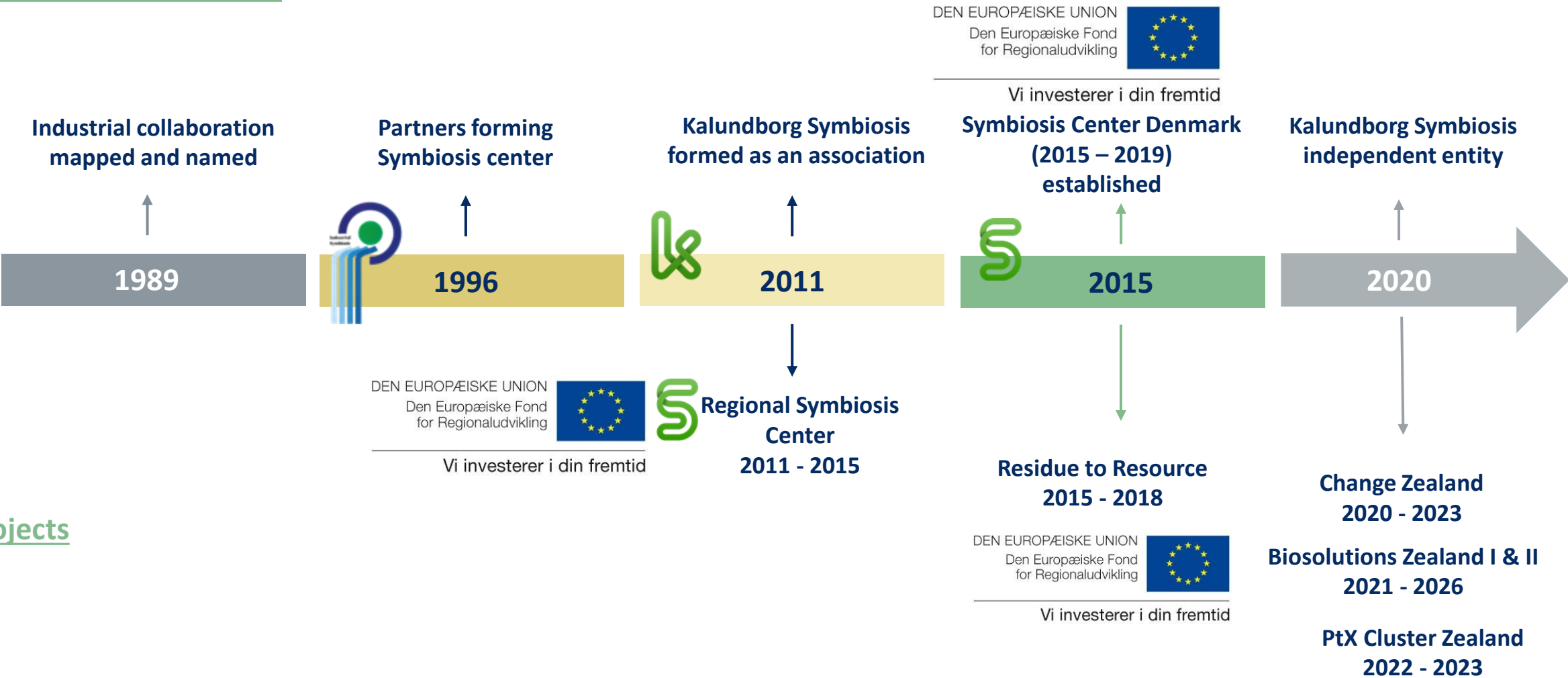
How it all started



EU Regional Development Fund projects

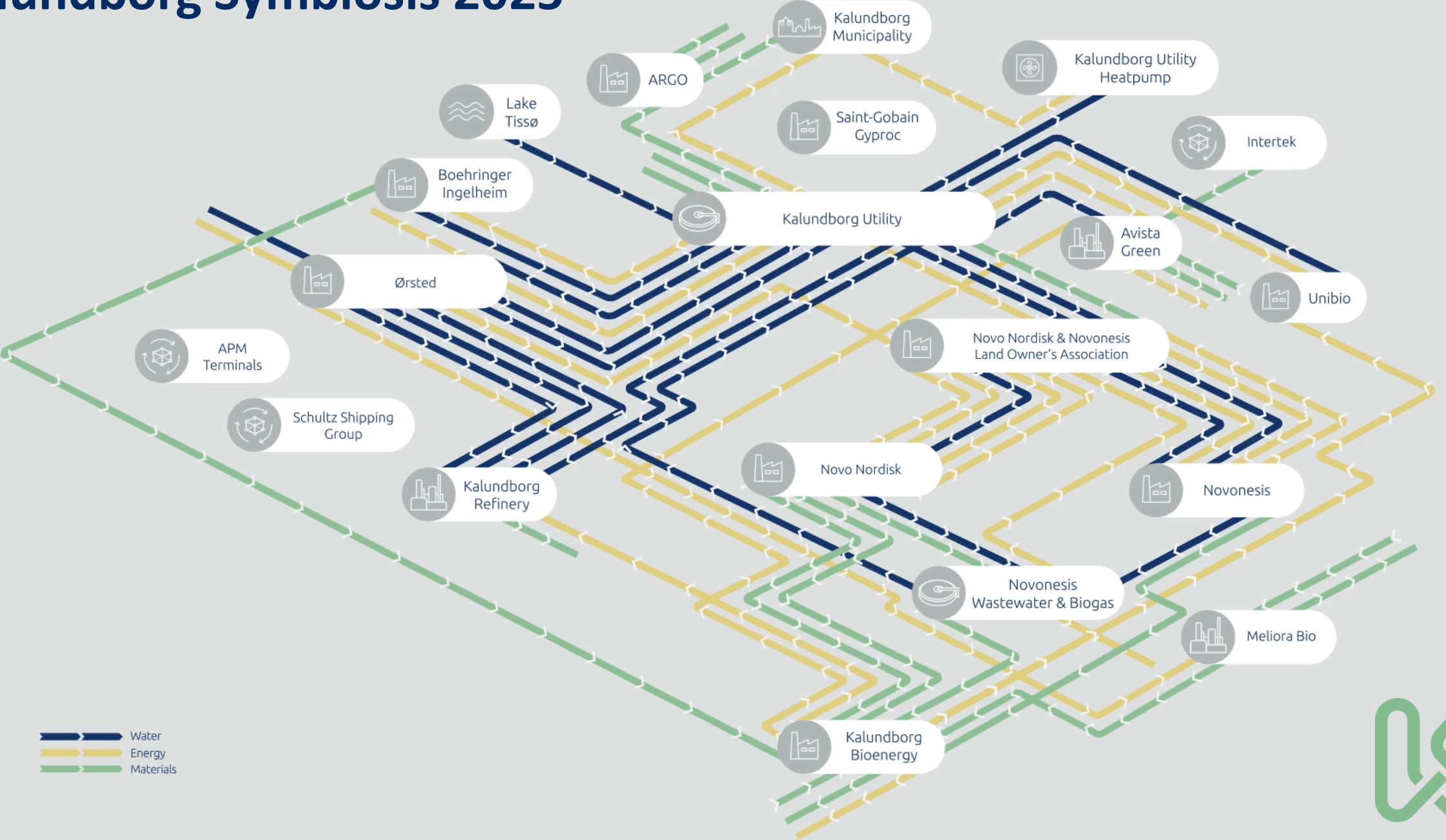


Organizational evolution

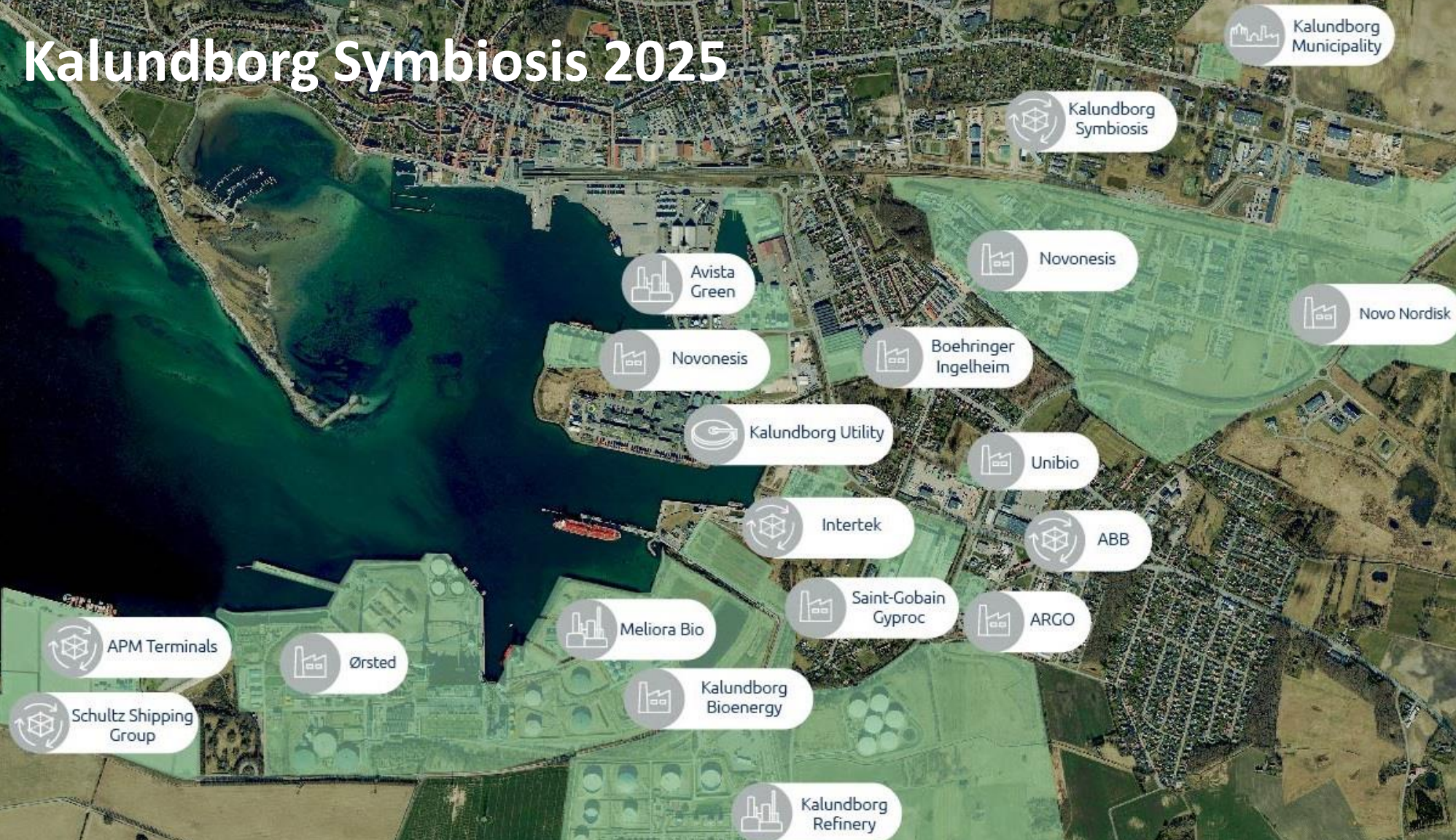


Projects

Kalundborg Symbiosis 2025



Kalundborg Symbiosis 2025



Kalundborg Symbiosis 2025





Examples of local growth



€10 billion
investment



The investments
create
1,300+ new,
permanent jobs

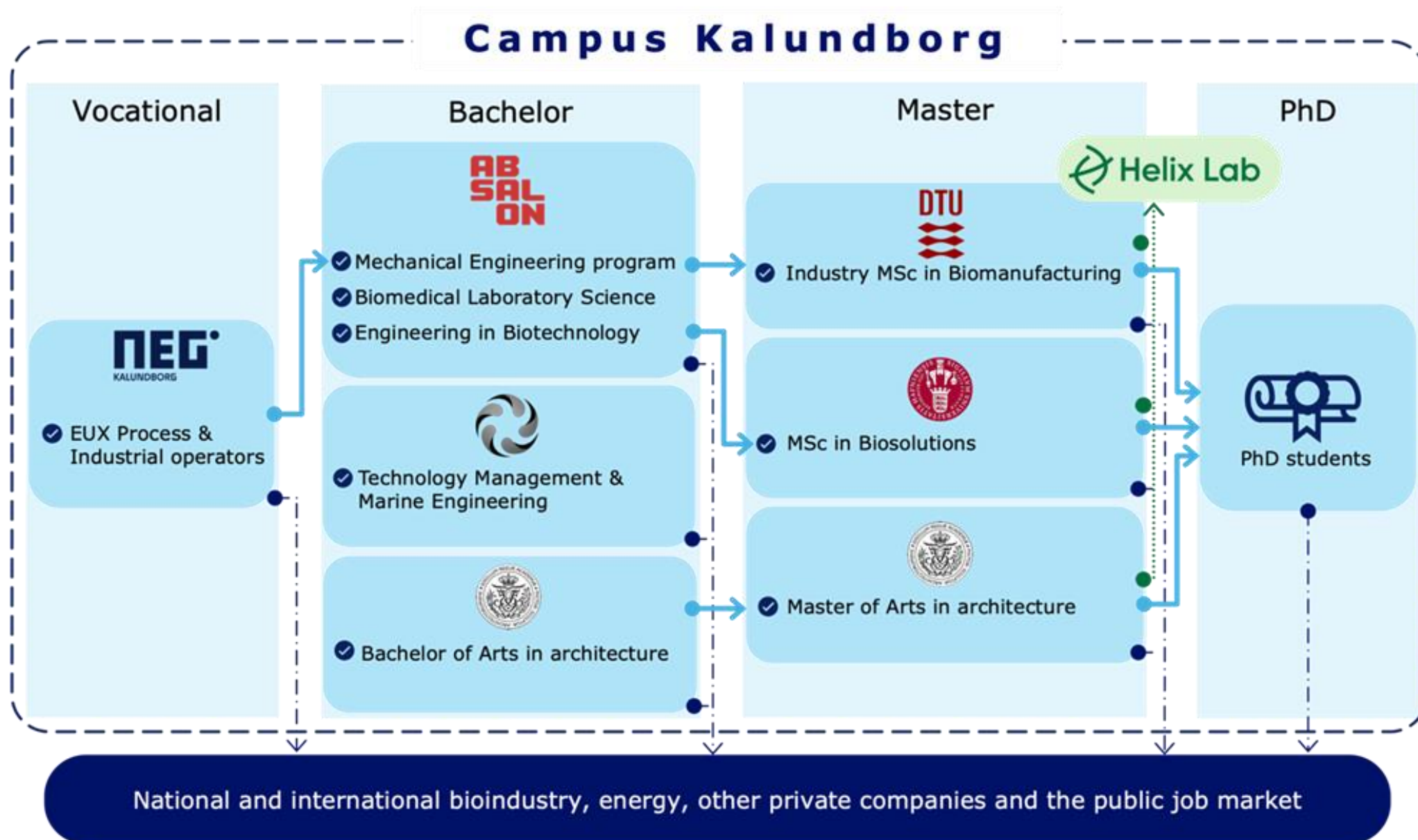


Examples of local growth



**12 new educational
programs
in Kalundborg**







New projects 2025

New production facilities & infrastructure

- District cooling and usage of excess heat
- Carbon Capture & Storage



Site visit for the Board of Directors, April 2024

International collaboration



Green Industrial Areas (GIA)

Interreg
Baltic Sea Region

Co-funded by
the European Union

Washington State



Clayton



Rio de Janeiro



Danish Energy
Agency

Kenya



Ministry of Environment
of Denmark
Environmental
Protection Agency



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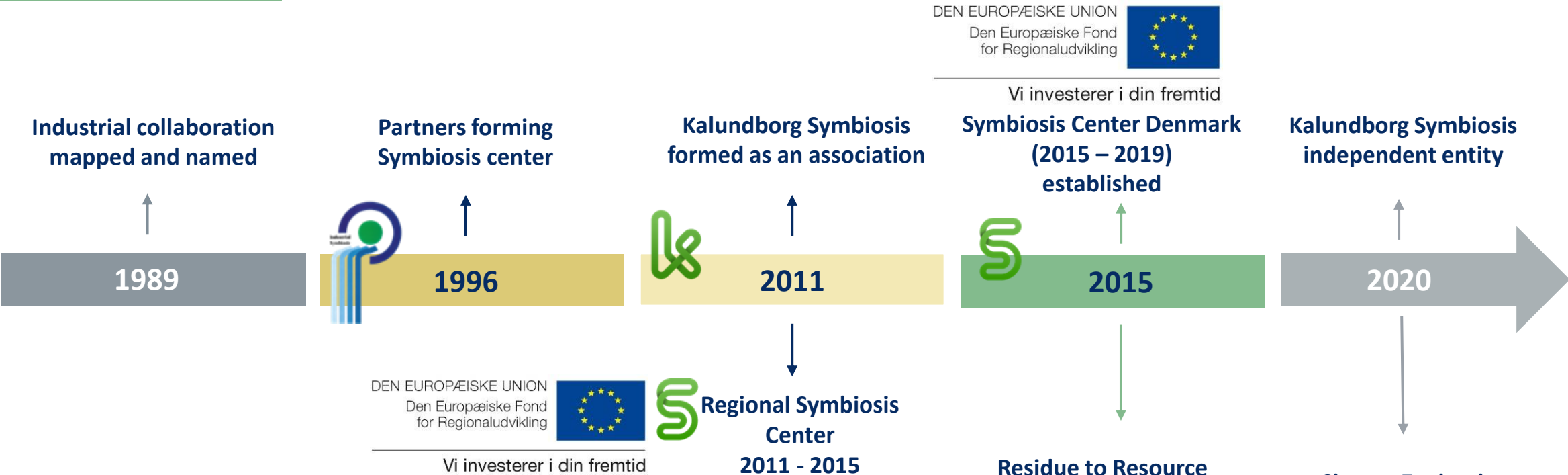
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EU Regional Development Fund projects



Organizational evolution



Projects

DEN EUROPÆISKE UNION
Den Europæiske Fond
for Regionaludvikling

Vi investerer i din fremtid

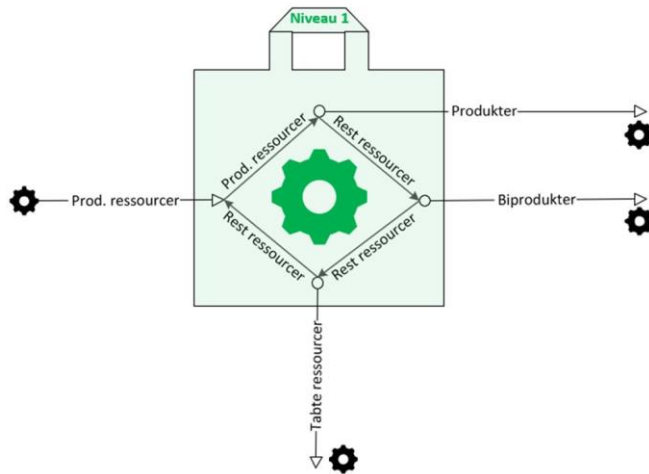
Biosolutions Zealand I & II
2021 - 2026

PtX Cluster Zealand
2022 - 2023

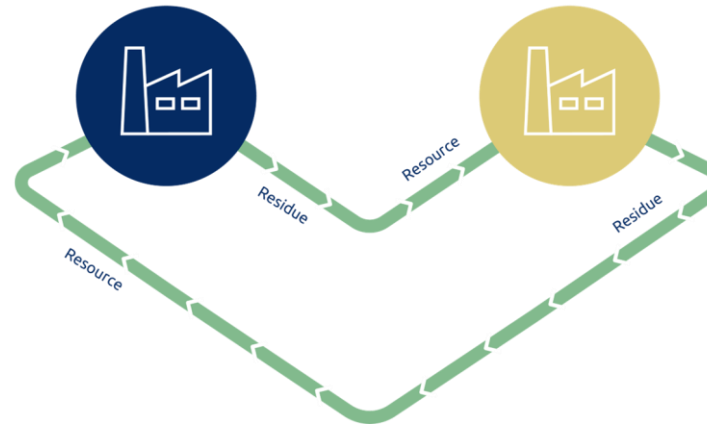
Biosolutions Zealand II, Flere SMV'er i værdikæden



Screening af virksomheder



Matchmaking



Medfinansieret af Den Europæiske Union, Danmarks Erhvervsfremmebestyrelse, Food & Bio Cluster, BIOSOLUTIONS ZEALAND

Handlingsplan

Tilpasning af forretningsmodel Biosolutions Zealand II

Titel på tilpasningen	[Kort titel, max 1 linje]
Forventet tidsperiode	Fra [dato] til [dato]
Samlet budget:	
Støtte fra BZ II	
Støttemodtager: Virksomhedens navn, CVR-nummer, kontaktoplysninger:	
Kontaktperson i Biosolutions-partnerskabet:	

Beskrivelse af forventet nyt produkt/forretningsben/teknologi/løsning: [Beskriv her i korte træk det nye tiltag, virksomheden forventes at kunne lancere som følge af denne tilpasning] [Max 1000 tegn]

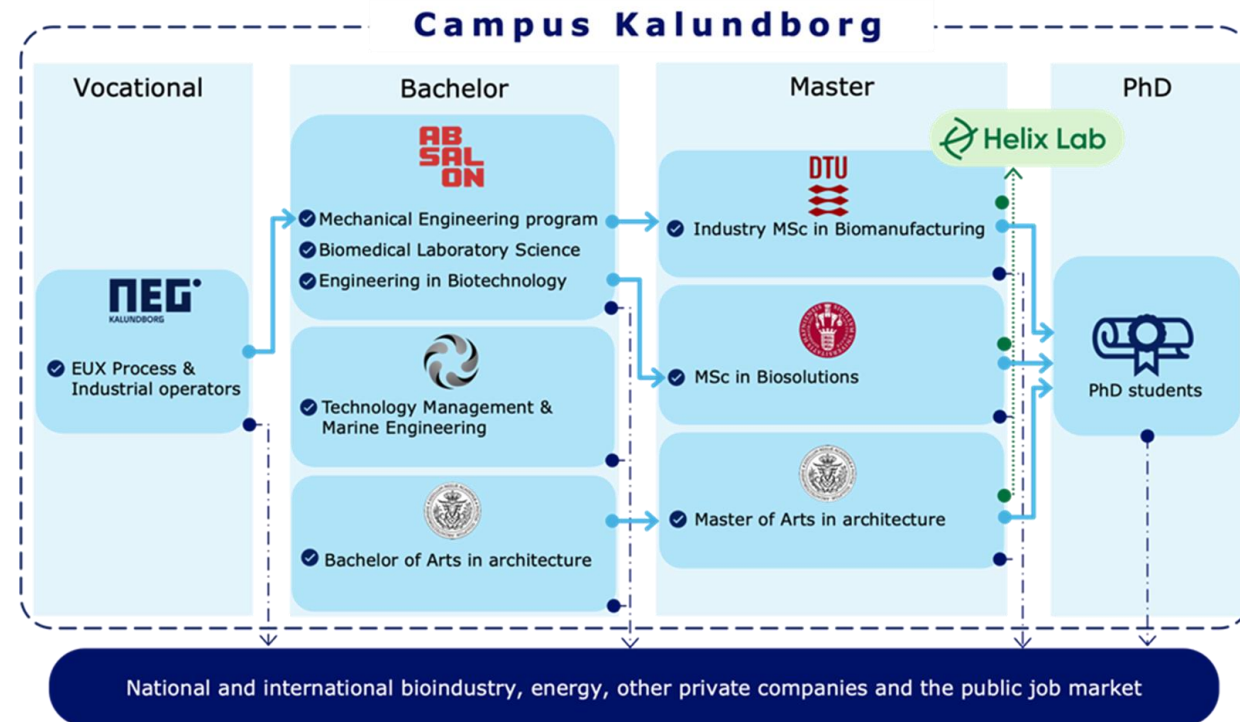
Beskrivelse af tilpasning: [Beskriv her det overordnede formål med- og indhold i tilpasningen. Specificer behovet for inddragelse af eksterne rådgiver(e) og/eller tilkøb af udstyr, hvad skal rådgiveren/udstyret bidrage med? Begrund valget af den/de konkrete rådgivere eller udstyr, hvis de kendes ved ansøgningens indsendelse] [Max 4500 tegn]

Forventede resultater: [Beskriv her de forventede resultater af tilpasningen indenfor tidsperioden] [Max 1500 tegn]

1

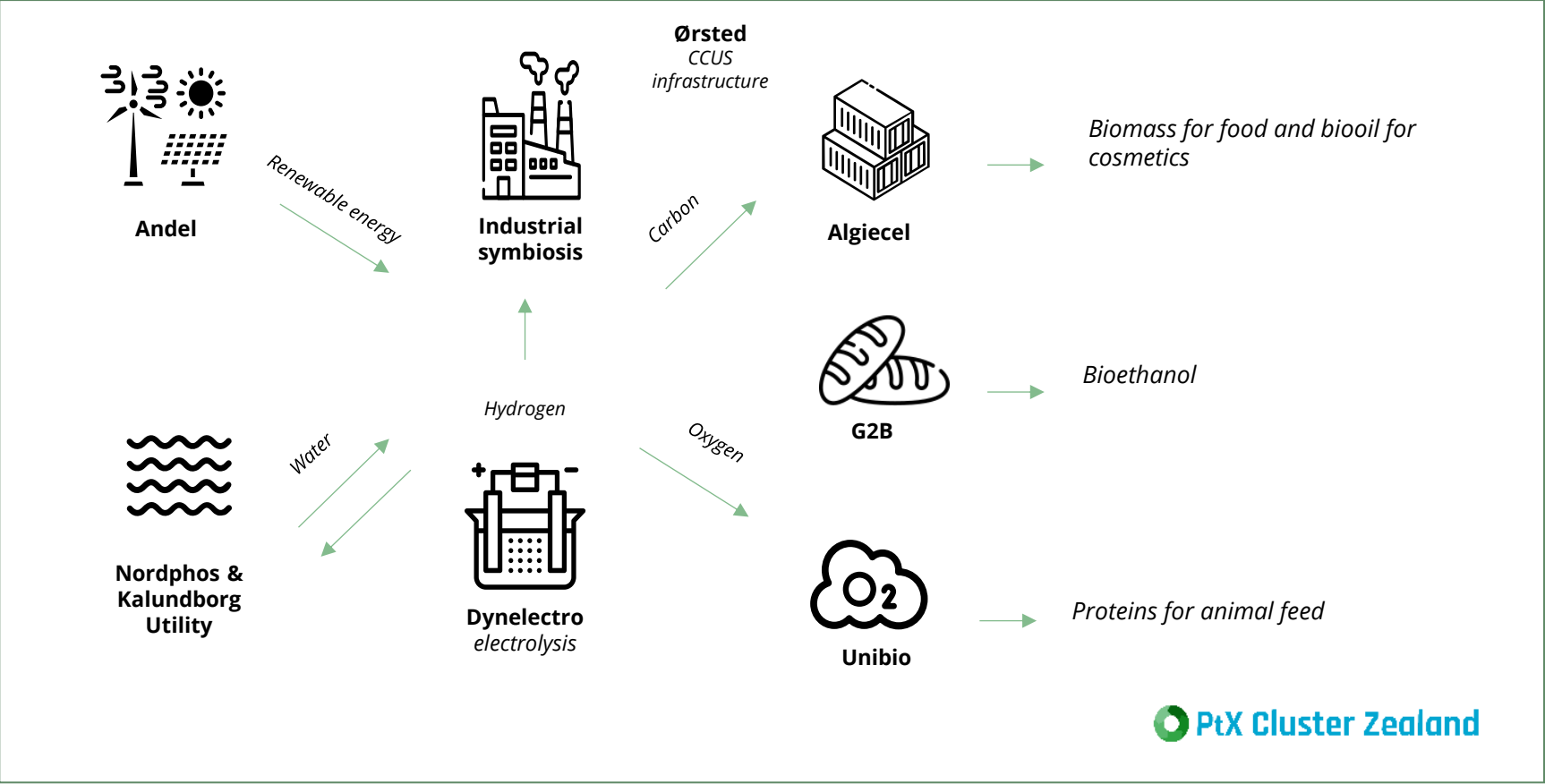
Erhvervsforum, SYMBIOSIS, www.knowledge@zealand.dk, zealand@zealand.dk

Biosolutions Zealand, effekter for det lokale økosystem



BIOSOLUTIONS ZEALAND Innovationsprojekter

PtX Cluster Zealand



PtX Cluster Zealand



Biosolutions and Power-to-X

Sector Coupling in a World Leading Industrial Symbiosis in Greater Copenhagen

IRISgroup

THE EUROPEAN UNION
The European Regional Development Fund
Funded as part of the Union's response to the COVID-19 pandemic
Investing in your future

Danish Board of Business Development

IST (For Development Use Only) - [Entity List]

Entity List | Resources List | Stream List | Processflow

Entity List

Search

Filters

+ Create Entity

Show Map

Name	Type	Address	Area	Sector
Anden industri	C	-		
APM Terminals	C	Asnæsvej 42	Zealand	
Argo i/S	C	Genvej 5	Zealand	
Avista Green ApS	C	Juelsmindevej 6	Zealand	
Boehringer Ingelheim Animal Health Denmark A/S	C	Sydavnsvej 15	Zealand	
Elinett	C	-		
Fjernvarmenettet	C	-		
Gyproc	C	Hareskovvej 12	Zealand	
Intertek Denmark A/S	C	Dokhavnsvej 3, Postboks 67	Zealand	
Kalundborg Bioenergi ApS	C	Asnæsvej 14A	Zealand	
Kalundborg Forsyning A/S	C	Dokhavnsvej 15	Zealand	
Kalundborg Forsyning Holding A/S	H	Dokhavnsvej 15	Zealand	
Kalundborg Kommune	C	Holbækvej 141B	Zealand	
Kalundborg Køleforsyning A/S	C	Dokhavnsvej 15	Zealand	

Feasibility Study of CO2 Infrastructure in Northwest Zealand

PtX Cluster Zealand

28 September 2023

WHEN TRUST MATTERS

PtX potentials and scenarios in Kalundborg

August 2023

Danish Board of Business Development

THE EUROPEAN UNION
The European Regional Development Fund
Funded as part of the Union's response to the COVID-19 pandemic
Investing in your future

NIRAS



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Udarbejdelse af en concept note for integration af industriel symbiose i erhvervsuddannelsernes pensum i Norden

Projektmål

- Udarbejde en concept note, der beskriver integrationen af industriel symbiose i erhvervsuddannelser.
- Fremme samarbejde mellem uddannelsesinstitutioner og erhvervsliv for at sikre, at pensum opfylder virkelighedens behov.
- Øge bevidstheden og forståelsen for bæredygtige praksisser blandt elever og undervisere.

Projektpartnere:

teknika[™]



li.u LINKÖPINGS
UNIVERSITET

Kalundborg
SYMBIOSIS

Eksterne partnere:

NEG
Kalundborg



Kalmar län
Industriellt utvecklingscentrum



**Funded by
the European Union**

Erasmus+

WP1: Analyse

Kortlægning af erhvervsuddannelsernes struktur og funktion.

Analyse af samarbejdet mellem industrielle virksomheder og erhvervsskoler.

Gennemgang af eksisterende læseplaner med henblik på integration af emner inden for Industrial Symbiose og Cirkulær Økonomi.

Vurdering af behovet for at inkludere IS-undervisning i uddannelsen af fremtidige medarbejdere.

WP2: Udarbejdelse af en concept note for integration af industriel symbiose i erhvervsuddannelsernes pensum i Norden

WP3: Inddragelse af interessenter, herunder undervisere og repræsentanter fra industrien, for at indsamle input og feedback på concept noten (slutleverance)

Afholdelse workshops og fokusgrupper for at forfine concept noten baseret på interessenterne inputs.

WP4: Evaluering og formidling:

Vurdering af concept notens gennemførlighed og effekt gennem interessentvurderinger og feedback fra pilotprojekter.

Formidling af concept noten og resultaterne via workshops og online platforme for at fremme anvendelsen hos andre uddannelsesinstitutioner.

Symbiosis guided tour



Kalundborg Symbiosis

Surplus from circular production



For more information please contact:

symbiosecenter@kalundborg.dk



From Funding to Impact: Unibio's Development and Contribution to Biosolutions in Denmark

Eleni Ntokou, PhD

NPD, Sustainability & Regulatory Affairs Director

Rising population and growing demand for food and protein



Humanity is expected to consume more food in the coming decades



By 2050, food production will rise, but conventional proteins won't meet global demand due to resource constraints and sustainability concerns



The Good Food Institute estimates that the alternative proteins industry could reach a global value of \$1.1 trillion by 2050¹, from \$29 billion in 2023²

¹ 2022-05-20 - Sustainable Path Fact Sheet – FINAL, The Good Food Institute

² State of the Industry Report: Plant-based meat, seafood, eggs, and dairy, The Good Food Institute, Euromonitor data



Leading a global transformation in protein production

We have a clear vision: to lead a global transformation in protein production, harnessing nature's alchemy to brew resilient, planet-friendly proteins.

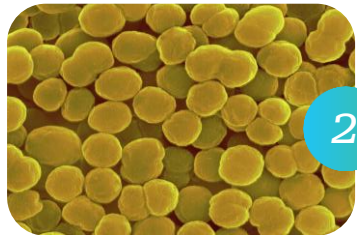


Conversion of methane to protein occurs in nature

FROM NATURE



In lakes, methane is released from decomposition of organic matter



The microbes that live in these lakes have adapted to convert carbon from methane into protein



These high-protein microbes are then taken up in the lake's food chain and accumulate in fish bodies, converting carbon from methane into protein



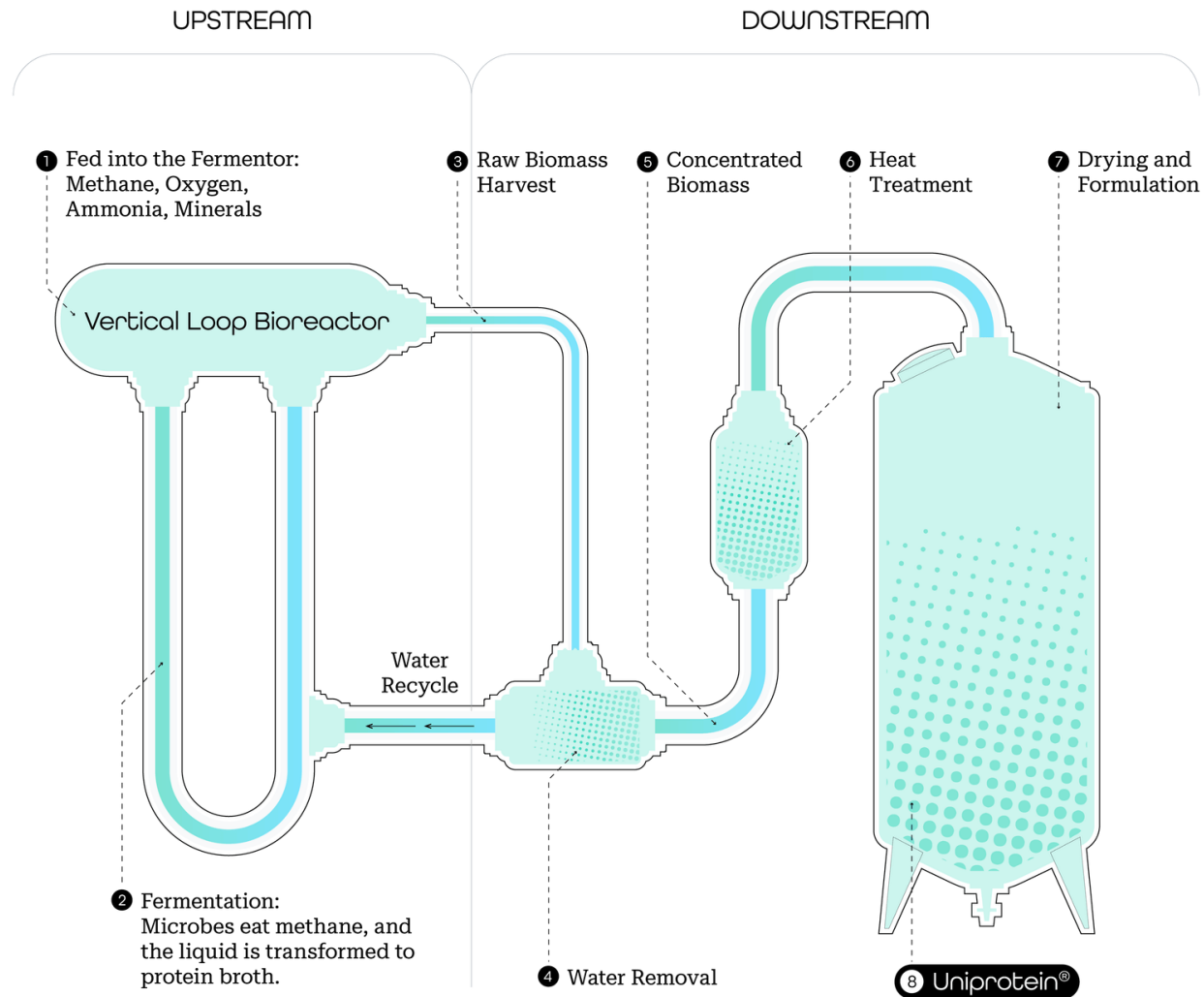
TO INDUSTRIAL SCALE





Our technology

A highly efficient **gas-to-microbe-to-protein** conversion technology



Our technology greatly improves mass transfer rate and protein productivity



Technology validated at industrial scale
– and ready for global roll-out



Protected by 17 patent families and
extensive know-how



National and EU funding
Centralized and Regional

EFPro2 – Environmentally Friendly Protein Production (2016–2019)

Funding Source

- Innovation Fund Denmark

Partners

- Unibio, DTU, Aarhus University, SDU, Vestjyllands Andel

Objective

- Develop and assess the environmental and socio-economic implications of producing microbial protein from non-crop-based substrates (e.g., nitrogen, methane, biogas).

Impact

- Advanced life cycle assessment (LCA) tools developed
- Supported Unibio's sustainable protein innovation and helped in establishing the first pilot scale U-Loop®

PROVIDE Project (2017–2022)

Funding Source

- Innovation Fund Denmark

Grant Amount

- DKK 14,780,000

Partners

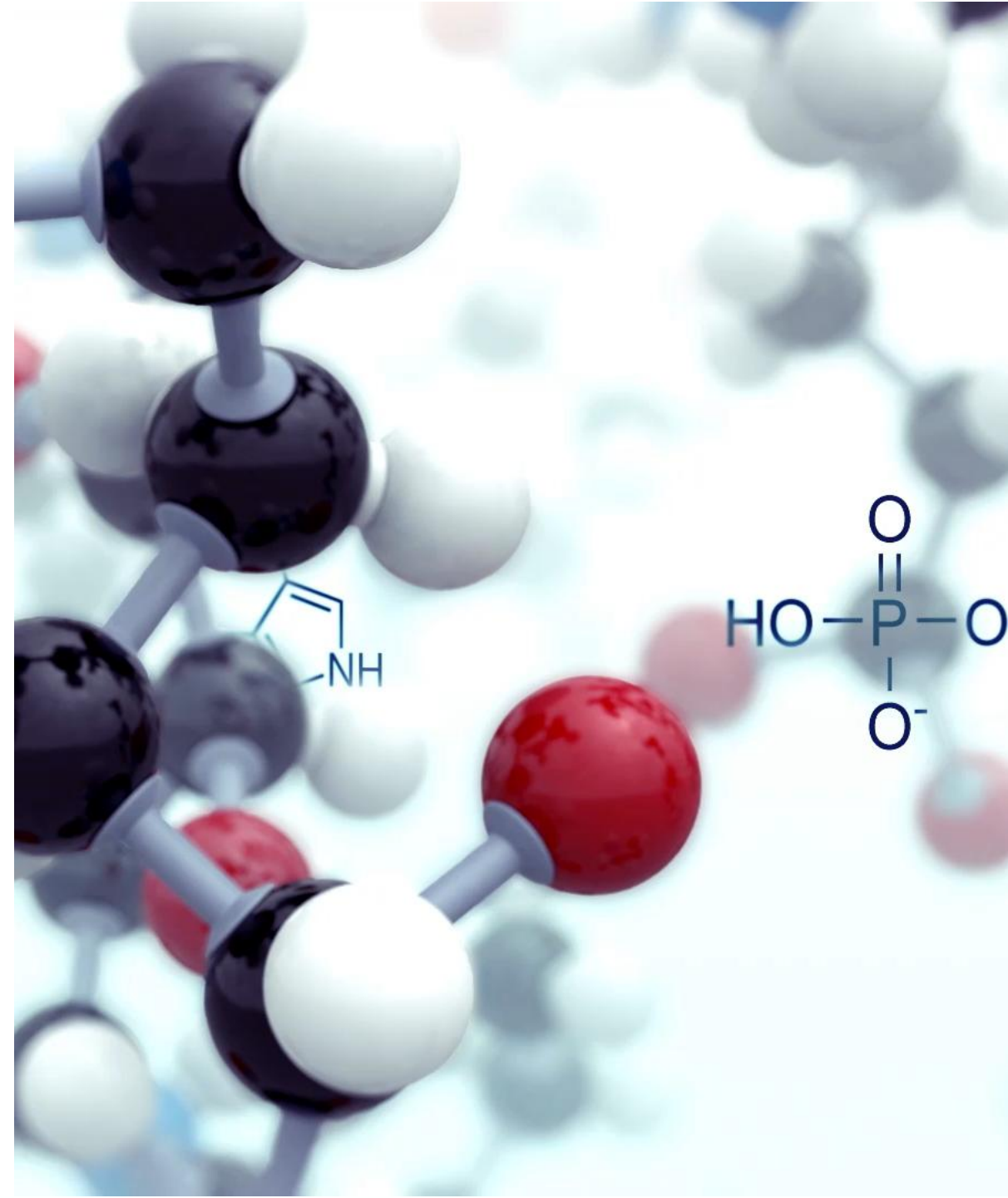
- Unibio, DTU, Aalborg University, KMC, AKV Langholt, Lihme Protein Solutions, CPKelco ApS

Objective

- Use bioinformatics to identify valuable peptides in proteins
- Apply hydrolysis, fermentation, and separation for ingredient extraction

Impact

- Created new high-value ingredients from under-used protein sources
- Promoted circular resource use in food/feed production



VALUEWASTE Project (2018-2022)

Funding Source

- Supported by EU Horizon 2020 with €8.38M in funding.

Grant amount

- €8,375,472.25

Partners

- 17 partners from 6 EU countries (Including Food & Bio Cluster and Kalundborg Municipality).

Objective

- Develop integrated solutions for urban biowaste valorization into high-value products.



VALUEWASTE Project (2018-2022)

Impact: Downstream Processing Hall in Kalundborg

- The funding facilitated setup of downstream processing hall in Kalundborg for the fractionation of microbial biomass.
- Boosted capacity to refine Uniprotein® for various applications.

Impact: Advancements in Product Development

- Development of new food and feed products from microbial biomass.
- Safety and application trials for human consumption.
- Future: Uniprotein® positioned as a sustainable protein source for the human food market.

SUPIAF Project (2019–2022)

Funding Source

- Green Development and Demonstration Programme (GUDP)

Grant Amount

- DKK 9.5 million (~€1.3 million)

Partners

- Unibio, Danish Agro, AU Foulum, DTU Aqua, BioMar

Objective

- Validate Uniprotein® as a sustainable feed ingredient for piglets and salmonids

Impact

- Proven efficacy in replacing fishmeal and potato protein
- Maintained animal growth and feed efficiency



Power-to-X Project (2022-2023)

Funding Source

- Supported by the European Regional Development Fund financed as part of the EU's response to the COVID-19 pandemic

Grant Amount

- DKK 24,510,762

Partners

- Ervervshus Zealand, Knowledge Hub Zealand, Energy Cluster Denmark, DTU KemiTeknik, Kalundborg Symbiosis, Ørsted, Dynelectro, Nordphos, Algiecel, Unibio, G2B Biosolution

Project Overview

- PtX Zealand: Green energy project converting renewable electricity into fuels & biosolutions.
- Focus: Power-to-X (e.g., methanol, ammonia, green protein).

Objective

- Convert renewable energy (electricity) into methane for microbial protein production

Impact

- Supports decarbonization of protein production and promotes renewable energy integration



PROFIT Project (2023–2027)

Funding Source

- Innovation Fund Denmark (Grand Solutions Programme)

Grant Amount

- DKK 10.7 million (~€1.44 million)

Partners

- Unibio, DTU, Roskilde University, Knowledge Hub Zealand, Amager Resource Center, City of Copenhagen

Objective

- Develop tech to convert organic waste into protein-rich animal feed via microbial fermentation

Impact

- Reduced reliance on imported soy
- Promoted circular economy and lowered CO₂ emissions



Biosolutions Zealand I & II - Sustainable Innovation For a Greener Future

Program Overview

- Danish national initiative supporting biosolutions—biotech alternatives for agriculture, food, and industry.
- Focus: green transition, circular economy, and biotech scale-up.

Funding Mechanisms

- Grants up to DKK 500,000 for SMEs/startups.
- Scale-up vouchers for testing/demo in shared facilities.
- Funded under EU De Minimis rules (max €300k over 3 years).

Key Stakeholders

- Helix Lab & UC Absalon: Actively involved—support R&D and education in Kalundborg Biotech City. Novo Nordisk Foundation funded Helix Lab PhD program (DKK 22M).



Impact on Unibio and Denmark's Biosolutions Ecosystem

Infrastructure Development: Funding supported the creation of Unibio's R&D and pilot facilities in Greater Copenhagen, and a semi-industrial production plant in Kalundborg.

Technological Advancements: Enabled the development and scaling of Unibio's proprietary U-Loop® fermentation technology, converting methane into Uniprotein®.

Collaborative Research: Partnerships with several Danish Universities provided access to cutting-edge research, driving innovation.

Integration into Kalundborg Symbiosis: Participation in this industrial ecosystem allows Unibio to share resources and by-products with other companies, enhancing sustainability and efficiency.

Contribution to Biosolutions Evolution: Unibio's growth aligns with Denmark's biosolutions strategy and initiatives like Campus Kalundborg, aiming to establish the region as a hub for education, research, and innovation in biomanufacturing.





Questions

