

# Towards Versatility of Aquatic Production Platforms: Unlocking the Value of Nordic Bioresources

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Nordic Centre of Excellence (2017-2022) in NordForsk Bioeconomy Programme



NordAqua is a consortium of 10 Nordic universities & research institutes along with several industrial partners & societal stakeholders

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# Academic Partners & Team Leaders





UTU, Academician  
EM Aro (chair)



UTU,  
Assoc. Prof.  
Y. Allahverdiyeva  
(co-chair)



UMU,  
Prof. C. Funk



NIVA,  
Prof. van Bavel



UB,  
Prof. L. Herfindal



NIBIO,  
Dr. H. Skomedal



UU  
Prof. P. Lindblad



VTT  
Prof. M. Penttilä



Luke  
Dr. S. Mäkinen



SINTEF Ocean  
Dr. J. Skjermo  
WP2 leader

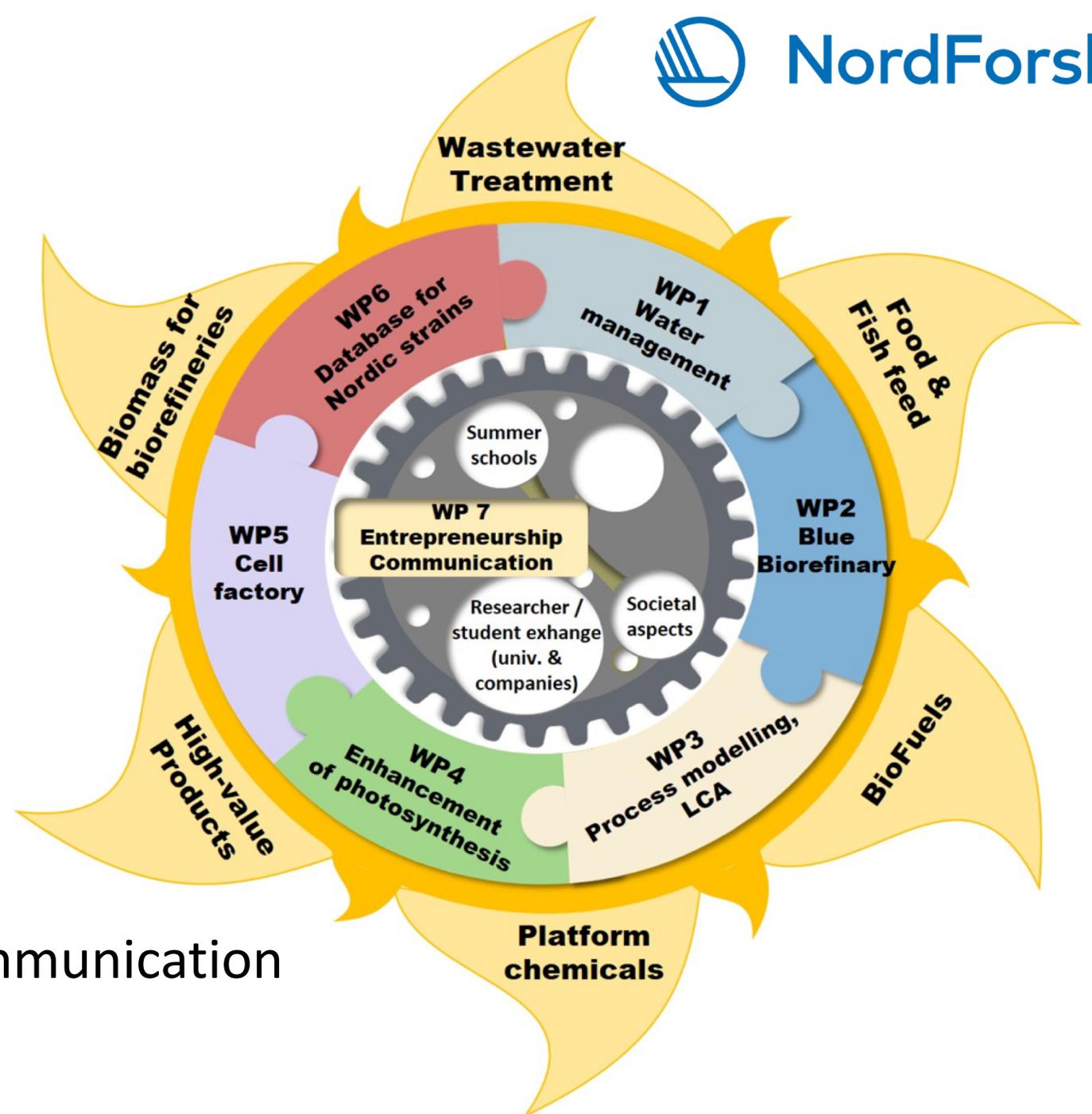


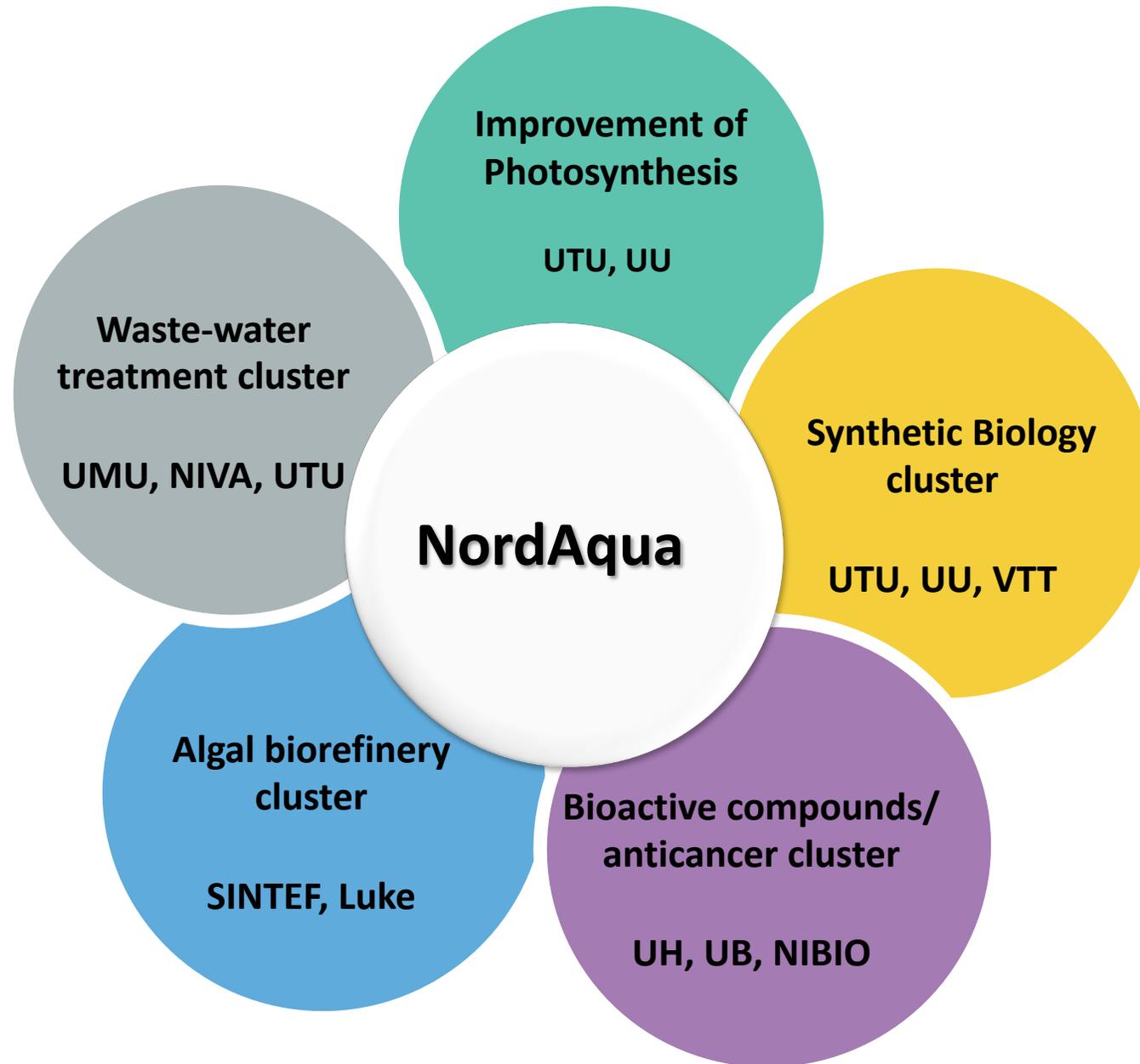
UH  
Prof. K. Sivonen

**NordAqua** aims to develop sustainable aquatic **photoautotrophic** production platform operating:

- i. via the production of **biomass** (near-term applications);
  
- ii. as **synthetic cell factories** for production of desired end-chemicals (longer-term applications)

Water management;  
 Blue biorefinery;  
 Process modelling, LCA;  
 Enhancement of photosynthesis;  
 Cell factories;  
 Database for Nordic algal strains;  
 Entrepreneurship, training and communication

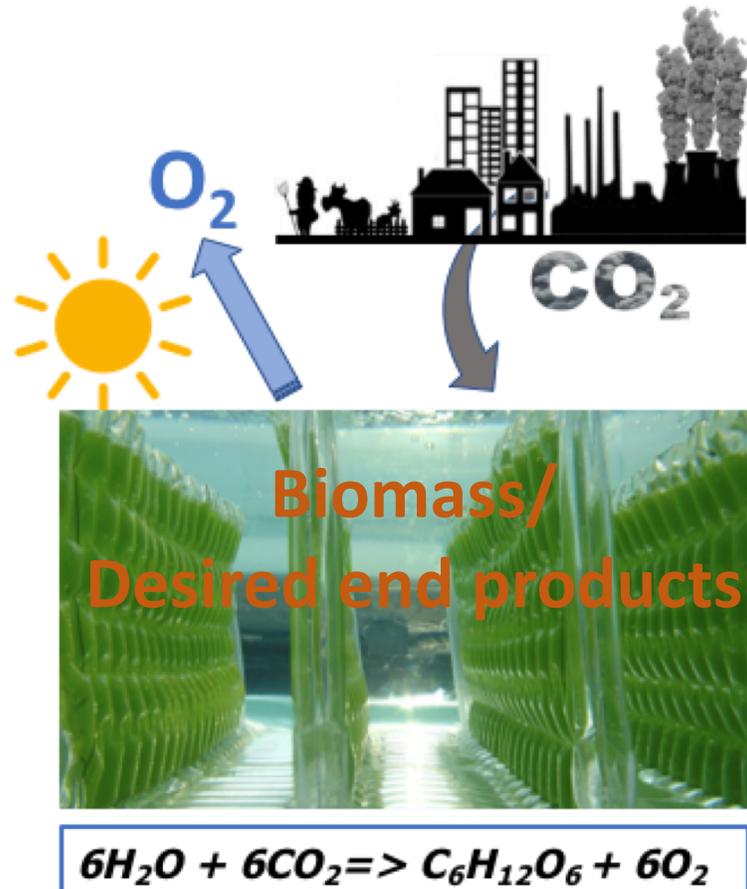




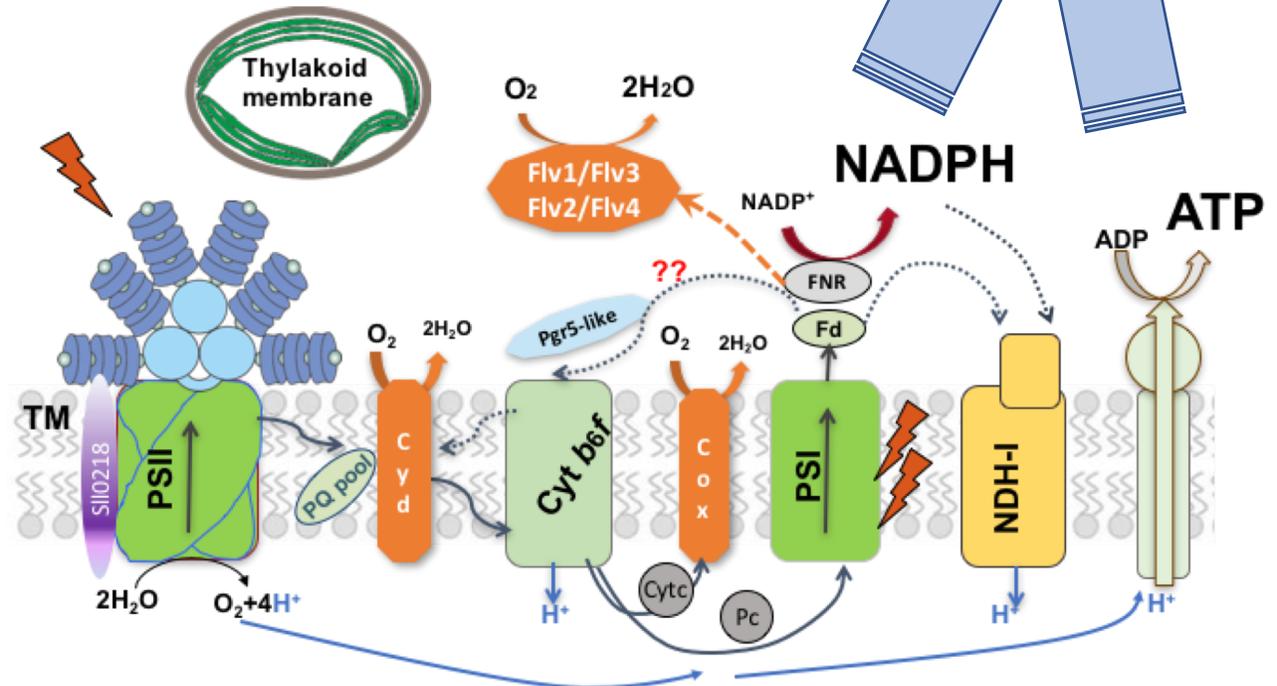
# Starting point is Photosynthesis – Biological conversion of light energy and CO<sub>2</sub> into chemical energy

Theoretical light energy conversion efficiency 10-13 %

0.1- 1%, 2-3 %

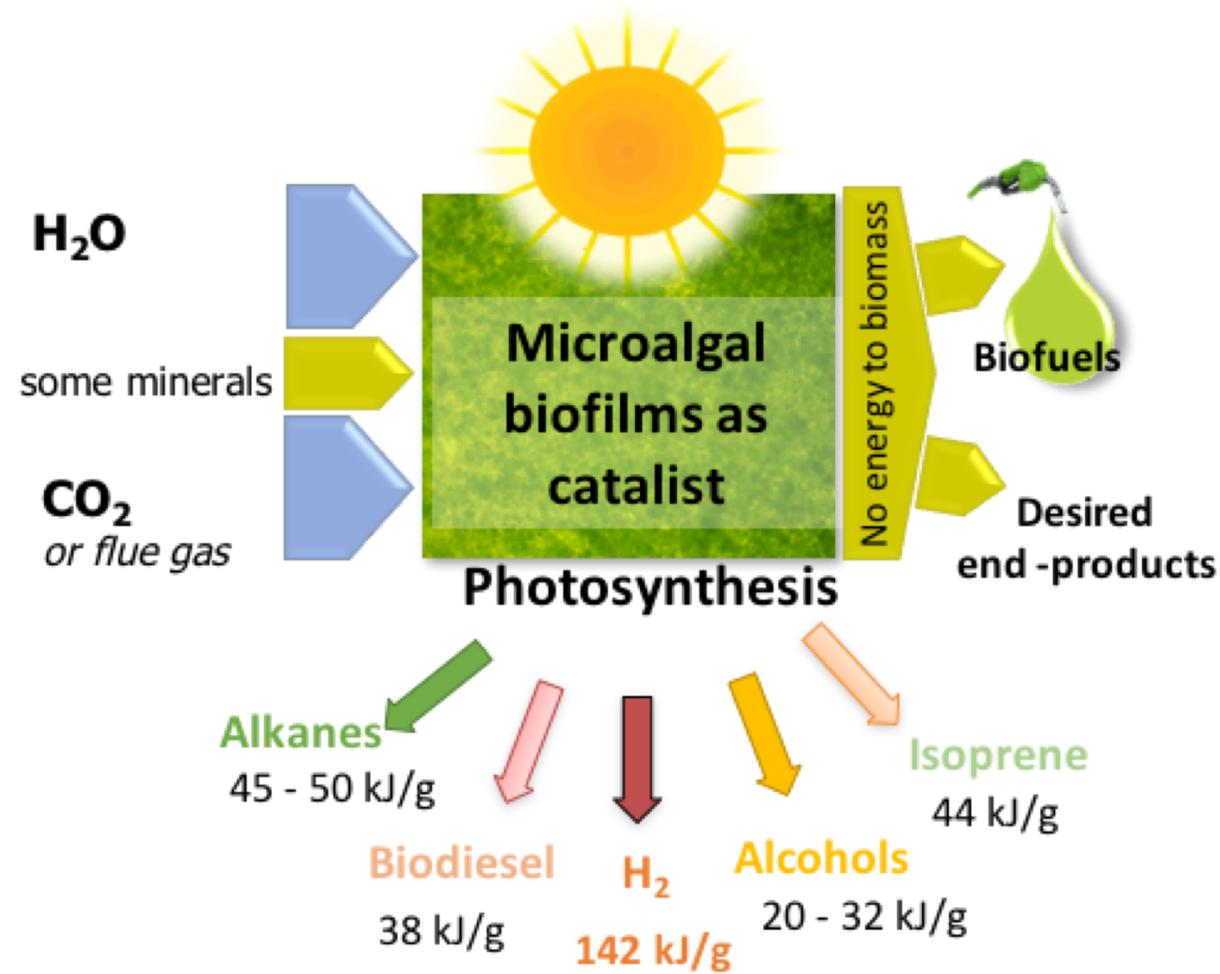


Improvement of photosynthesis  
Funnelling more energy  
to the desired end-  
products

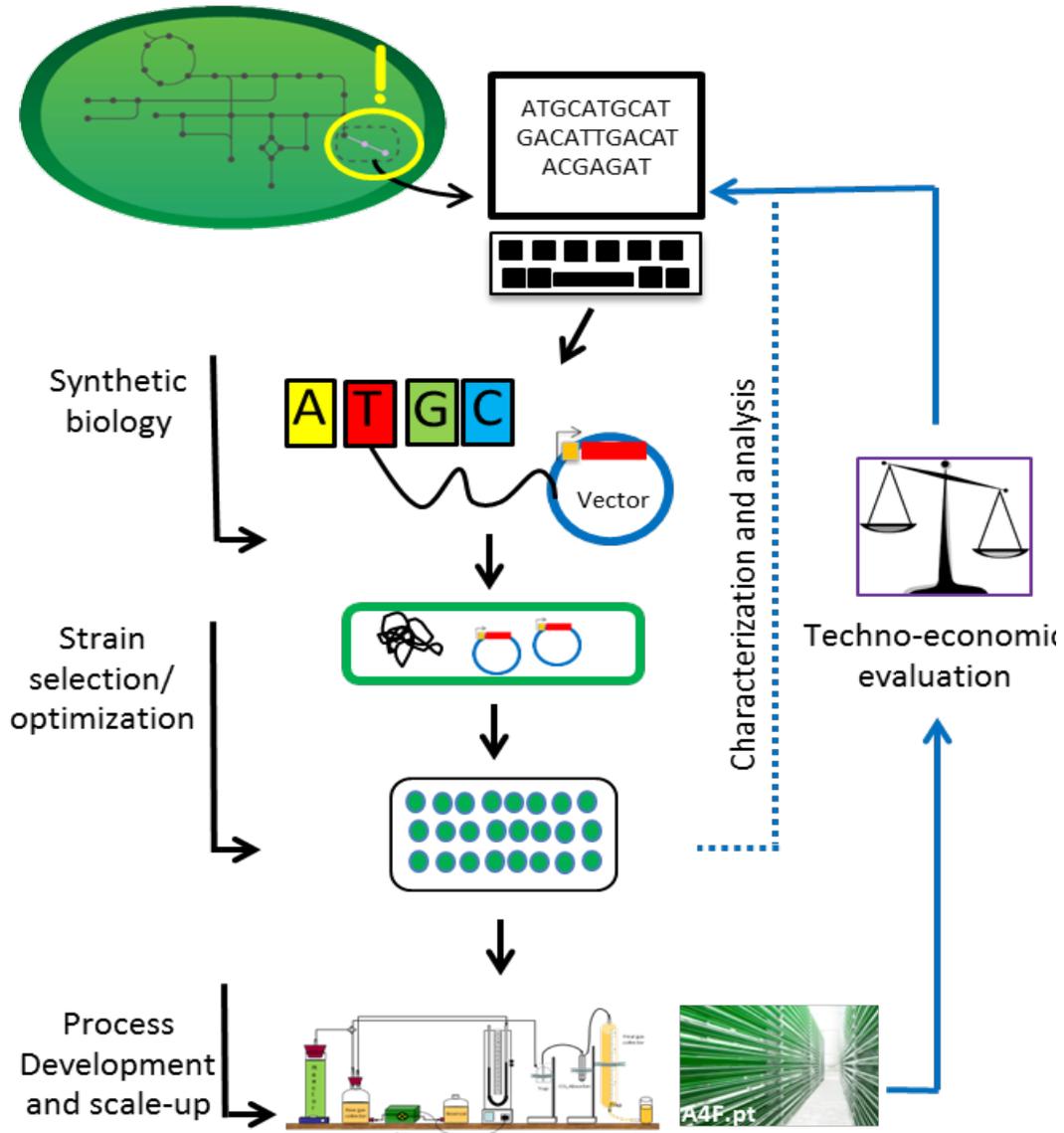


# Microalgae as biocatalysts for production platform (2 stage process)

Immobilization of algal cells  
in polymeric matrix



# Design, engineering and construction of photosynthetic microbial cell factories for direct biofuel and chemical production



UPPSALA  
UNIVERSITET

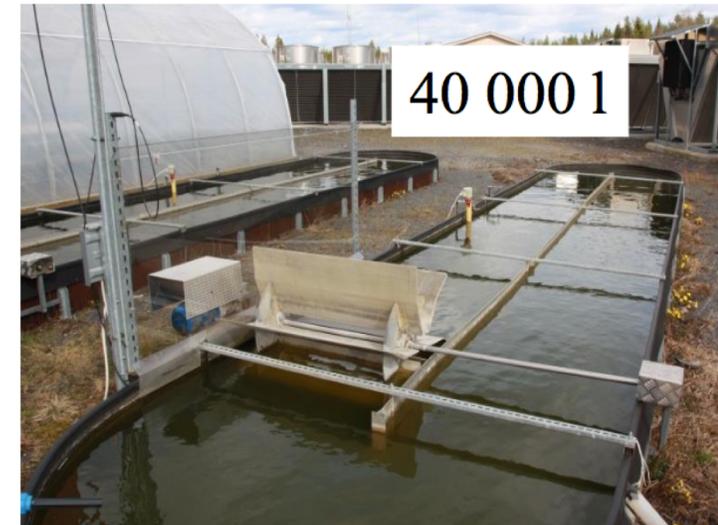


Turun yliopisto  
University of Turku



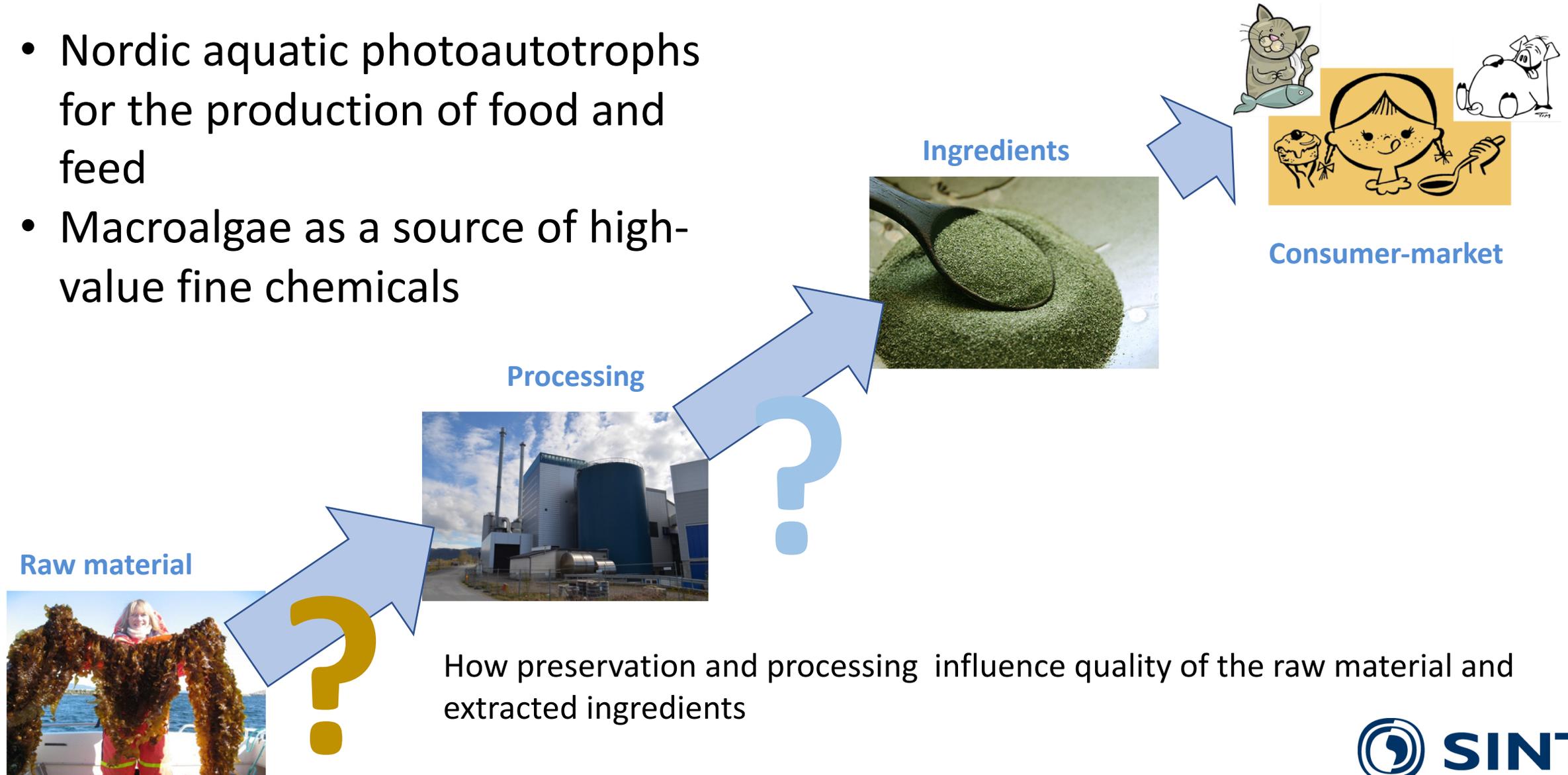
Technical Research  
Centre of Finland

- Screening of the Nordic strains (adapted to low light and temperature) based on their ability to
  - (i) remove **nutrients** (phosphorous, ammonium and nitrate)
  - (ii) remove **contaminants of emerging concern, CECs** (pharmaceutical compounds, including analgesics, antibiotics etc)
  - (iii) remove **heavy metals**.
- Up-scaling cultures
- Metagenomics, harvesting mechanisms, biomass quality

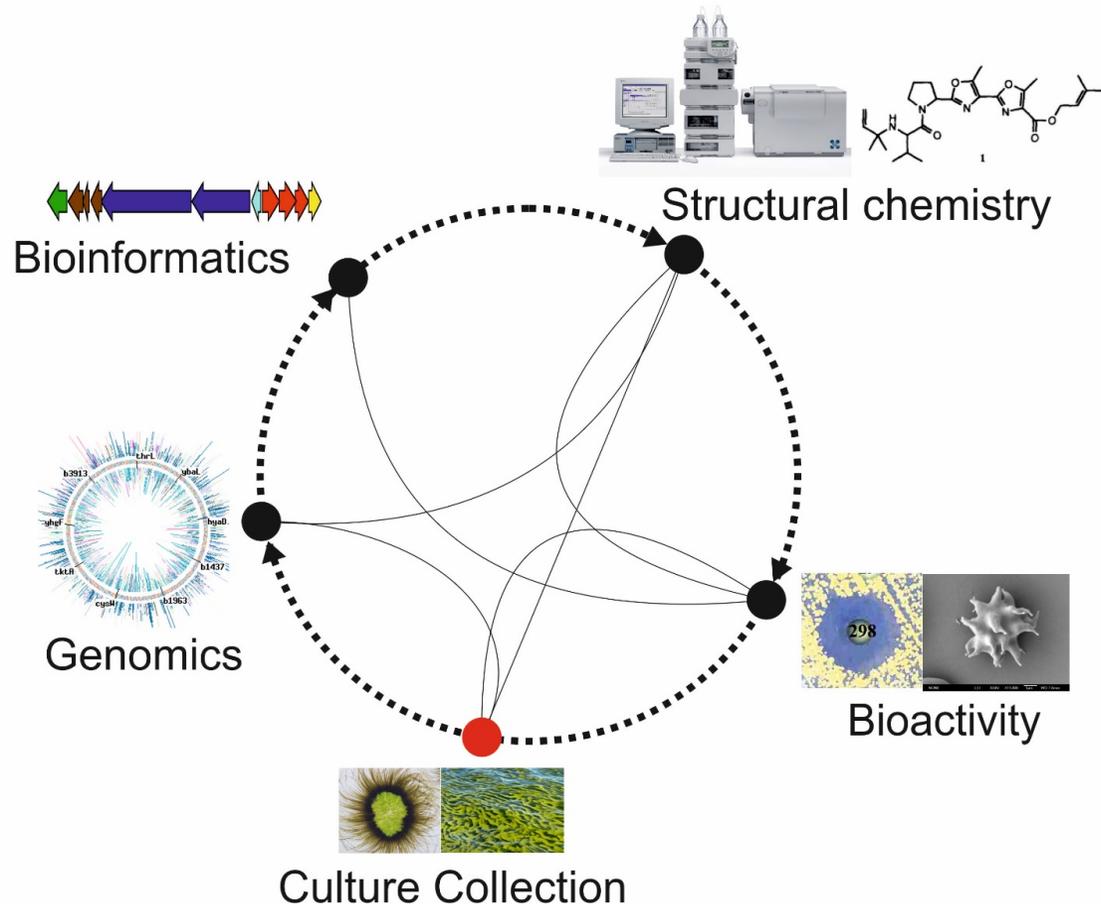


# Industrial cultivation and application of seaweed and microalgae

- Nordic aquatic photoautotrophs for the production of food and feed
- Macroalgae as a source of high-value fine chemicals



# Novel bioactive compounds



- Natural products from cyanobacteria and green algae
- **Anticancer**, antifungal, antiviral and antibacterial activities
- Use a combination of microbiology, genomics, bioinformatics, biochemistry and structural chemistry to study how cyanobacteria make natural products.
- **University of Helsinki and NIVA Culture collection**

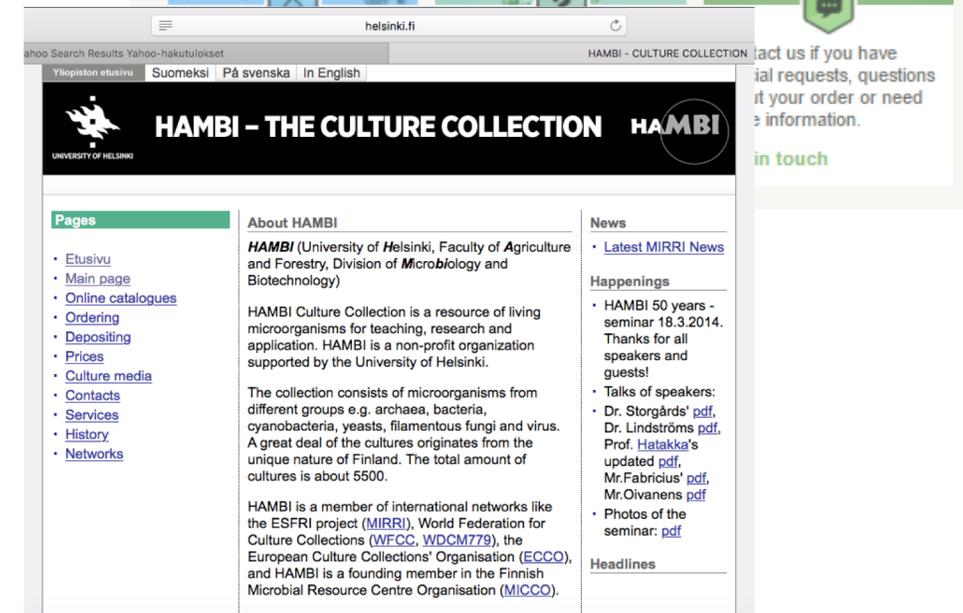
NIVA has currently a broad know-how on management of a huge volume of strains of photosynthetic microorganism (about 1700) as well as website-supported marketing ([www.niva-cca.no](http://www.niva-cca.no)).

The UH maintains one of the world-wide largest collections (around 1200 strains) of cyanobacteria (some green algae) isolated from fresh and brackish waters many of which are axenic ([www.helsinki.fi/hambi](http://www.helsinki.fi/hambi)).

UMU has recently isolated many strains, among them 59 strains which are able to grow on wastewater.



The screenshot shows the NIVA CCA website. At the top, there is a search bar with the text "Search for algae" and a shopping cart icon labeled "Cart (0)". Below the search bar, there are navigation links: "Home", "Shop", "About", "Questions", "Contact". The main heading reads "BROWSE OUR COLLECTION OF 1773 algae strains". Below this, a paragraph states: "The Norwegian Institute for Water Research (NIVA) offers access to its culture collection of algae. You can order strains and growth media directly on this site - we ship globally to educators, researchers and businesses." A green button labeled "Browse the shop" is visible. At the bottom, there are three small images showing different types of algae.



The screenshot shows the HAMBİ website. The header includes the text "HAMBİ - THE CULTURE COLLECTION" and "HAMBİ UNIVERSITY OF HELSINKI". Below the header, there is a navigation menu with links: "Etusivu", "Main page", "Online catalogues", "Ordering", "Depositing", "Prices", "Culture media", "Contacts", "Services", "History", "Networks". The main content area is divided into three columns. The left column is titled "Pages" and contains the same navigation menu. The middle column is titled "About HAMBİ" and contains text about the collection: "HAMBİ (University of Helsinki, Faculty of Agriculture and Forestry, Division of Microbiology and Biotechnology) HAMBİ Culture Collection is a resource of living microorganisms for teaching, research and application. HAMBİ is a non-profit organization supported by the University of Helsinki. The collection consists of microorganisms from different groups e.g. archaea, bacteria, cyanobacteria, yeasts, filamentous fungi and virus. A great deal of the cultures originates from the unique nature of Finland. The total amount of cultures is about 5500. HAMBİ is a member of international networks like the ESFRI project (MIRRI), World Federation for Culture Collections (WFCC, WDCM779), the European Culture Collections' Organisation (ECCO), and HAMBİ is a founding member in the Finnish Microbial Resource Centre Organisation (MICCO)." The right column is titled "News" and contains a list of news items: "Latest MIRRI News", "HAMBİ 50 years - seminar 18.3.2014. Thanks for all speakers and guests!", "Talks of speakers: Dr. Storgårds' pdf, Dr. Lindströms pdf, Prof. Hatakka's updated pdf, Mr. Fabricius' pdf, Mr. Oivanens pdf", "Photos of the seminar: pdf". At the bottom, there is a "Headlines" section.



BIOKRAFT



SEAWEED  
ENERGY  
SOLUTIONS AS

# The Second Nordic Algae Symposium 2019

## NAS19

A yellow sticky note with a red pushpin at the top left corner, containing the text "Save the Date" in a black, cursive font.

*Save  
the  
Date*

**Wednesday, 27<sup>th</sup> February 2019**

**Hotel Bristol, Oslo, Norway**

**Registration will be open soon!**

More details on [www.nordaquafi.fi](http://www.nordaquafi.fi)



@NordAqua