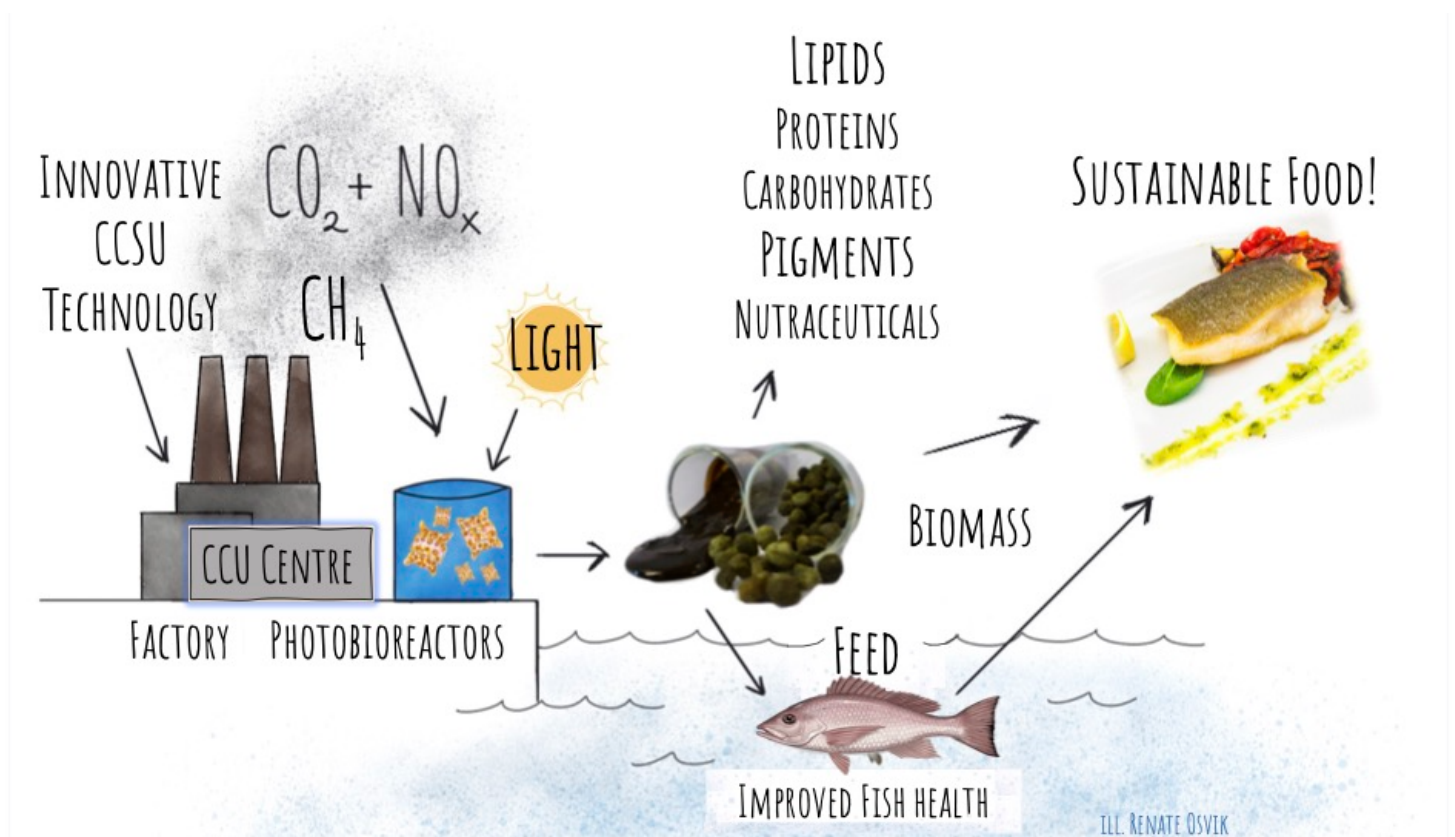


# Algal-based carbon capture and utilization for sustainable food, feed, and marine bioproducts



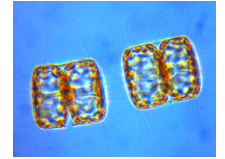
Rising atmospheric carbon concentrations are forcing global warming and triggering irreversible changes to the oceans, the sea ice coverage, the Greenland and Antarctic icecaps, the tundra, taiga, and permafrost. We are rapidly approaching tipping points that will completely change the Arctic and severely impact livelihoods and nature globally.

Addressing the climate crisis by only reducing industrial CO<sub>2</sub> emissions is impractical. This is because some elements of heavy industry are necessary to sustain global economies and even drive the green shift. Hence, active carbon capture, and utilization (CCU) is rapidly becoming a mandate to prevent, mitigate, adapt to the climate crisis.

**Capturing CO<sub>2</sub> directly from heavy industry and converting it into marine algal biomass is a viable and scalable technology and a part of the near future's portfolio of solutions to avoid irreversible tipping points.** This biotechnology has already been developed and tested by UiT – The Arctic University of Norway, together with industrial collaborator Finnfjord AS and other UArctic member institutions. Together, we are pioneering a new biotechnology landscape, new value chains and new socio-economic drivers in the Arctic to meet multiple United Nations Sustainability goals, including: Zero Hunger, Clean Water and Climate Action.

## How can UArctic help us become more “Carbon Capture Ready”?

**Track 1:** We are currently operating pre-industrial CCU at 300 000 L using an Arctic marine diatom native to the Norwegian coast. We have established robust, production of marine biomass that has value as aquaculture feed, but this is a preliminary product that has not been optimized maximize economic viability or carbon capture efficiency.



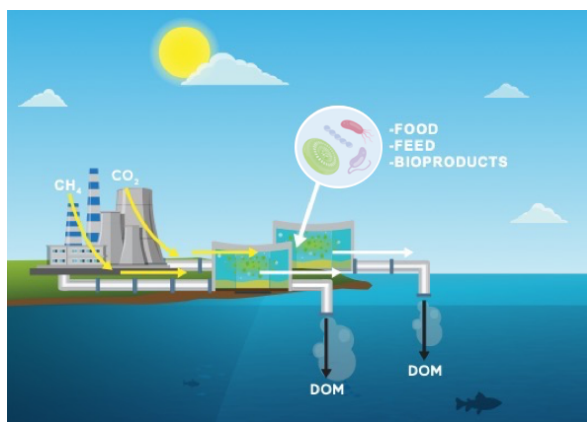
The immediate next step requires 350 K EUR to test our new collection of Arctic marine algae as a portfolio of “carbon capture ready” algae-crops that can be used across different northern regions and industry models. This step will test up to five new algae crops for carbon capture efficiency, nutritional quality for aquaculture, unique genetic attributes, and scalability.

**Year 1 (EUR)**  
Personnel: 100 K  
Operations: 70K

**Year 2 (EUR)**  
Personnel: 100 K  
Operations: 80 K

**Deliverables**

- New species
- Test at scale
- Knowledge exchange in UArctic



**Parallel Track 2:** Our current project portfolio aims to standardize and modularize the algae CCU platform at industrial scale while also including remediation of methane. The next step will be to move beyond the “test demonstration” at the Finnjord facility to demonstrate that this concept can be used in other northern industry locations and even globally.

An investment of 2 M EUR would support the formation of a broader collaboration from UArctic member to establish twin pilot facilities and expand the biotechnology platform to consider communities of algae plus bacteria that are

flexible and adaptive to different streams of greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub> and NO<sub>x</sub>). This step will test up to three distinct industrial gas streams with up to three new “algae community platforms” to establish a plug and play portfolio for different carbon capture efficiencies, bioproduct capacities (including food and feed), unique genetic attributes and scalability.

**Year 1**  
Cost: 400 K EUR  
**Deliverables:**  
Stablish Uarctic team and test sites

**Year 2**  
Cost: 600 K EUR  
**Deliverables:**  
Build twin pilot plants and biotech platform

**Year 3**  
Cost: 600 K EUR  
**Deliverables:**  
optimize process, technology and products

**Year 4**  
Cost: 400 K EUR  
**Deliverables:**  
Knowledge sharing in Uarctic, and education

**Parallel Track 3:** UiT, Finnjord AS, Nord University and other UArctic member institutes are currently in the early stages of developing a Center for Carbon Capture and Utilization. The aim is to capitalize on flexible and customizable gas streams provided by Finnjord AS by establishing several laboratories and expert personnel to integrate different technologies related to carbon capture and sequestration. This will include algal and microbial community biomass models, eMethanol production but be flexible for other actors in the field to test and innovate new concepts and technologies for carbon capture. However, we require investment to help initiate this effort by establishing infrastructure for the new laboratory facilities, and personnel – full time experts, visiting researchers and PhD students – over six years for ca. 5 M EUR

This CCU center will be game changing initiative. It will support an interdisciplinary and international culture of experts and give them access to state-of-the-art infrastructure. UArctic members physically work alongside each other to share ideas that can immediately be tested and implemented at scale in a real industry setting.

