

BLUE CARBON – CLIMATE ADAPTATION, CO₂ UPTAKE AND SEQUESTRATION OF CARBON IN NORDIC BLUE FORESTS

WP1 - Distribution and biomass of kelp, eelgrass and rockweed in Nordic marine waters

WP2 - Fieldwork – kelp carbon export and sequestration

WP3 - Carbon cycle of blue forests

WP4 - Blue forests now and in the future – pressures and management measures

WP5 - Communication and outreach

By Kasper Hancke, Helene Frigstad, Hege Gundersen, Guri Sogn Andersen (NIVA)

16-17 November at Miljødirektoratet, Helsefyr, Oslo



Photos: NIVA (J Gitmark, K Hancke)

Work package overview



WP2 - Fieldwork – kelp carbon export and sequestration

Responsible: *Kasper Hancke (NIVA)*

Personal: NIVA (*Helene Frigstad, Guri Sogn Andersen, Hege Gundersen, Hartvig Christie*)

Additional personal (fagansvarlig): *Gunhild Borgersen (NIVA)*

Collaborators: Aarhus Universitet: *Dorte Krause-Jensen*, Åbo Akademi University: *Christoffer Boström*, Göteborg Universitet: *Susanne Baden*

«**Dedicated fieldwork to quantify missing key values in the Nordic carbon cycle, with significance for carbon storage in the Nordic kelp forest**»

2.1 - Quantification of kelp detritus that sediment on the seafloor

2.2 - Degradation rates and long-term storage of kelp organic matter in sediments

2.3 - Production of Dissolved Organic Matter (DOC) in kelp forests

WP2 - Fieldwork – kelp carbon export and sequestration

2.1 Quantification of kelp detritus that sediment on the seafloor

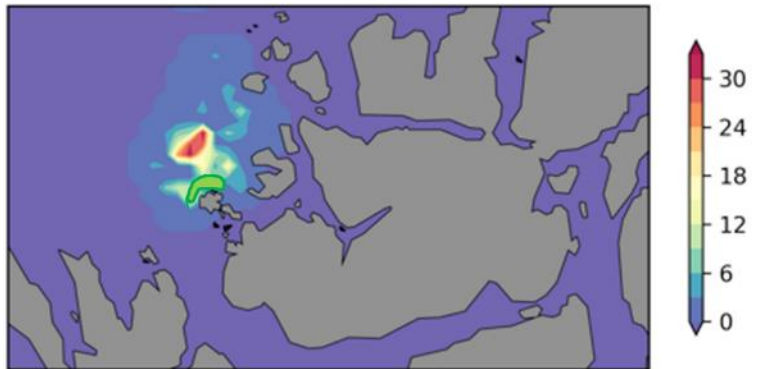


Figure 1. Modelled sedimentation of kelp organic matter (ABOVE), and a sedimentation 'trap' for quantifying kelp detritus transport to the seafloor (RIGHT)

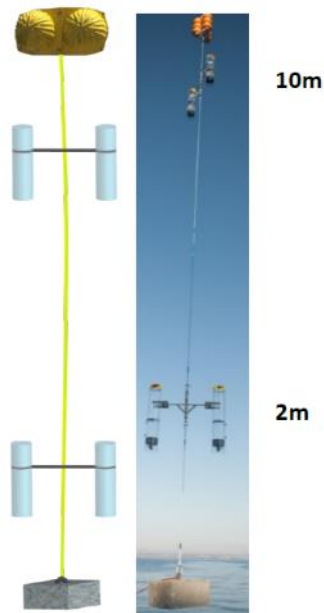


photo by K Filbee-Dexter

- **Fieldwork** is planned completed in the Trondheimsfjord region, with its highly productive kelp forests and know deposit areas
- **Spring-summer-fall 2018**
- **Delivering** rates to WP3
- Closely collaborating with ongoing projects of high relevance, i.e. **KELP-Fate, Kelp-float, KELP-EX, and KELPPRO**

WP2 - Fieldwork – kelp carbon export and sequestration

2.2 Degradation rates and long-term storage of kelp organic matter in sediments

- **Fieldwork** will be in the Trondheimsfjord region, and will collect **sediment cores** to track kelp organic matter and its degradation
- **Spring-summer-fall 2018**
- **Delivering** rates to WP3
- Closely collaborating with ongoing projects of high relevance, i.e. **KELP-Fate, Kelp-float, KELP-EX, and KELPPRO**



photo by T Bakken

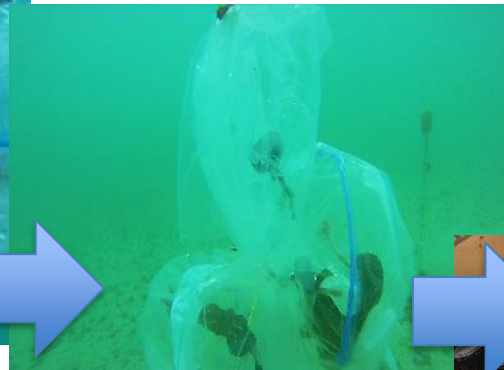
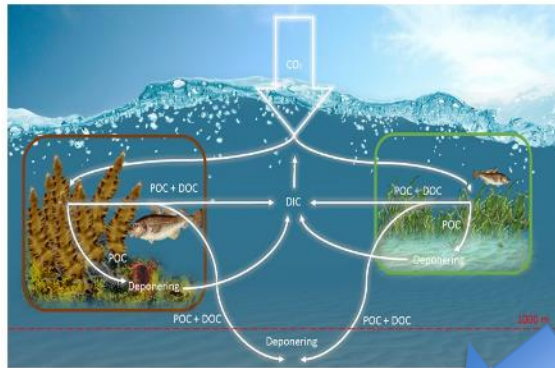


Figur 2. Kjerneprøvetaker og sedimentkjerne (Foto: NIVA)

WP2 - Fieldwork – kelp carbon export and sequestration

2.3 Production of Dissolved Organic Matter (DOC) in kelp forests

Work in progress..... (samples in the lab from fieldwork Aug 2017)



Production, respiration and exudation of dissolved organic matter by the kelp *Laminaria hyperborea* along the west coast of Norway 2004

Mohammed I. Abdullah* and Stein Fredriksen
University of Oslo, Department of Biology, PO Box 1047 Blindern, 0316 Oslo, Norway
*Corresponding author, e-mail: abdullah@bio.uio.no

WP2 - Fieldwork – kelp carbon export and sequestration

Deliverables:

- Quantitative estimates of carbon sedimentation on the seafloor
- Quantitative estimates of the carbon decomposition and sequestration
- Empirical data for an updated carbon budget, input to WP3
- Contribution to reports, final workshop, and popular science publications
- Data for scientific publications



Photos: J Gitmark, K. Filbee-Dexter and T Bakken

WP3 - Carbon cycle of blue forests

Responsible: *Kasper Hancke* (NIVA)

Personal : NIVA (Helene Frigstad, Guri Sogn Andersen, Hege Gundersen, Cecilie Mauritzen), Aarhus Universitet (Dorte Krause-Jensen), Åbo Akademi University (Christoffer Boström), Göteborg Universitet (Susanne Baden), GRID-Arendal (Maria Potouroglou), and IMR (Frithjof Moy).

Additional personal (fagansvarlig): Helene Frigstad (NIVA)

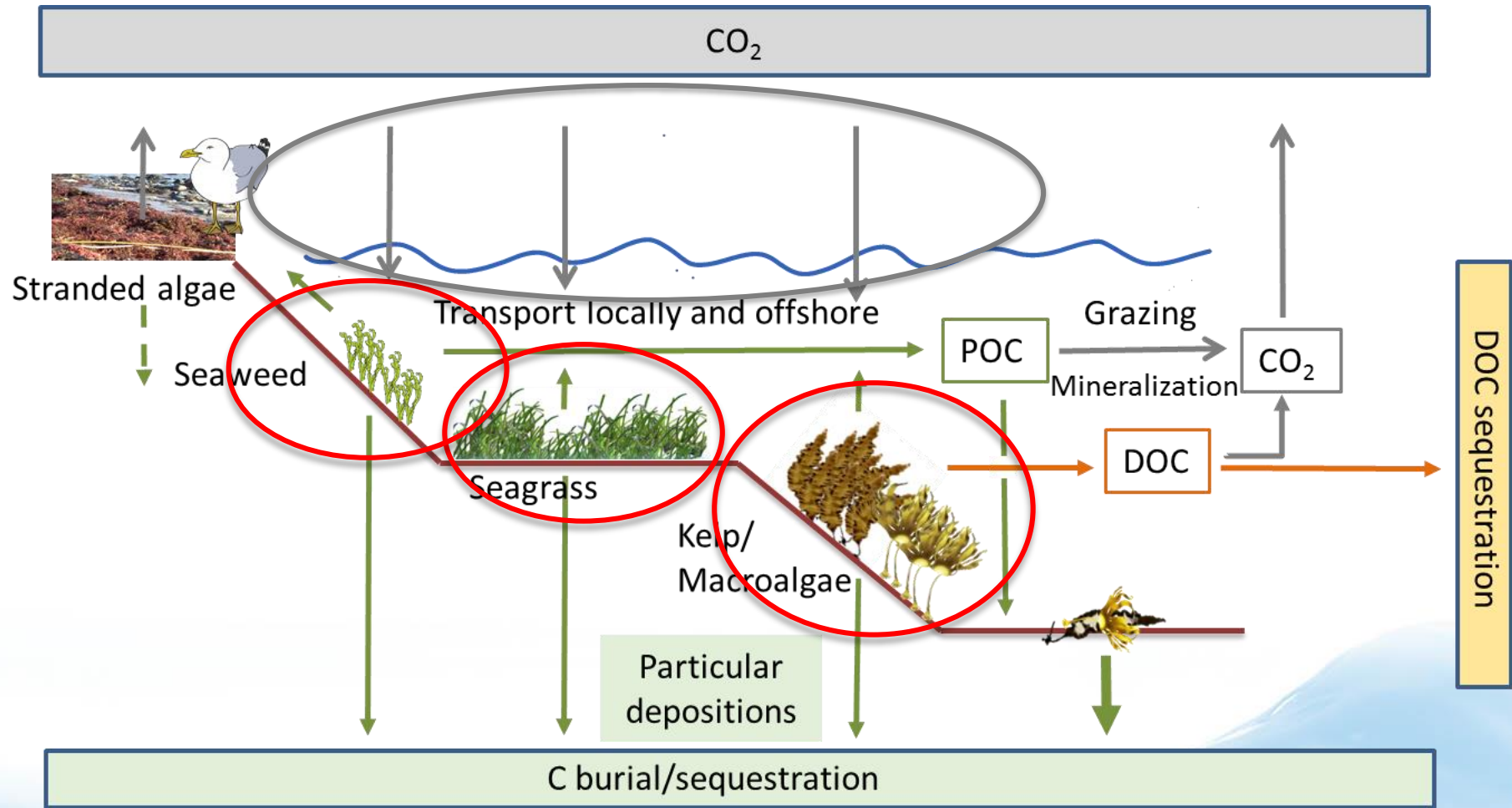
«Updating the marine carbon pathways, including a budget of the uptake, export, and sequestration of marine carbon in Norwegian Blue Forests»

- 3.1 Net primary production of kelp, seaweed and seagrasses
- 3.2 Export of kelp forest carbon
- 3.3 Carbon sequestration in coastal and deep sea regions
- 3.4 An update of the carbon budget for the Norwegian Blue Forest



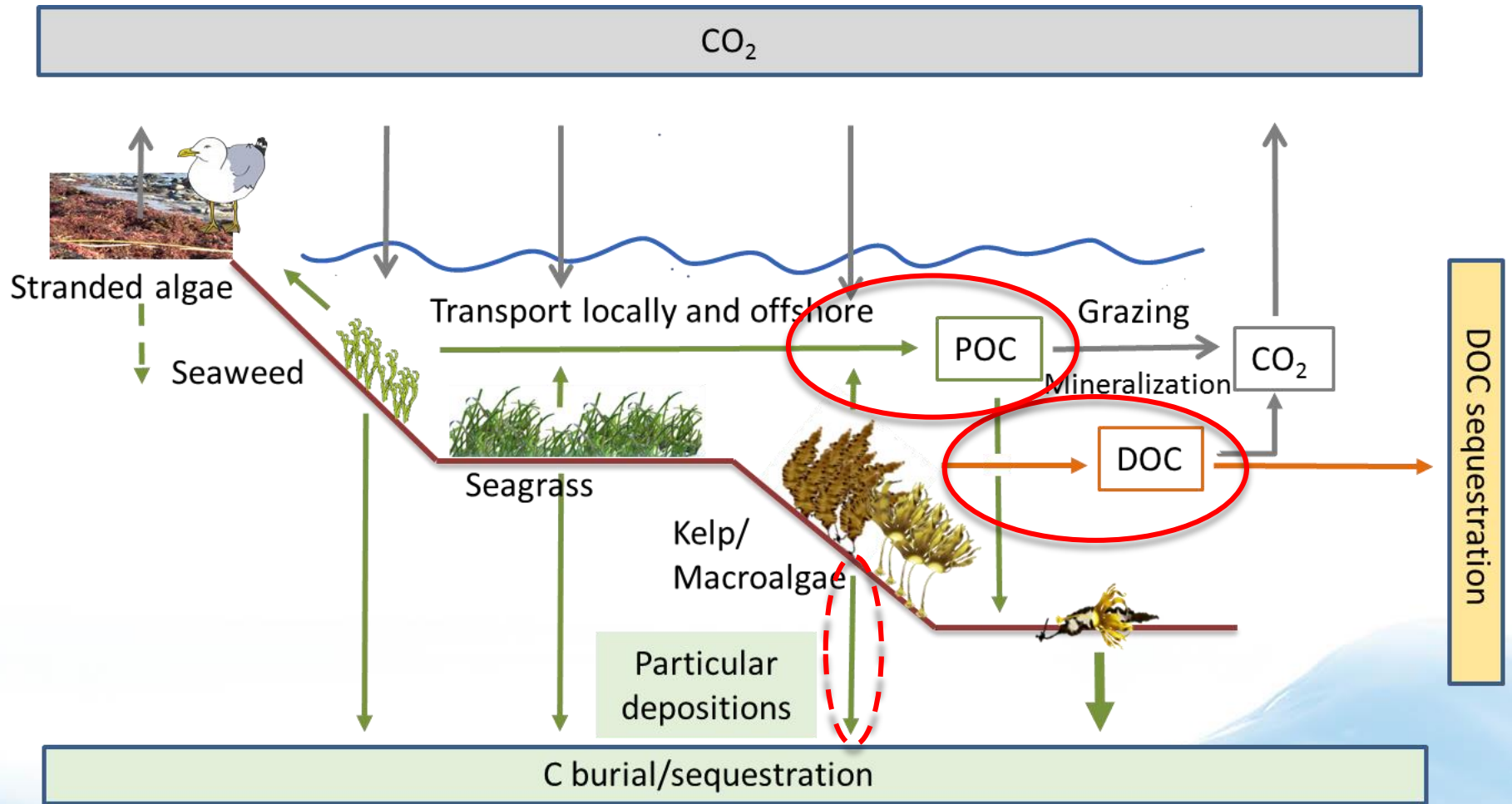
The major Blue Forest Carbon pathways

3.1 Net primary production of kelp, seaweed and seagrasses



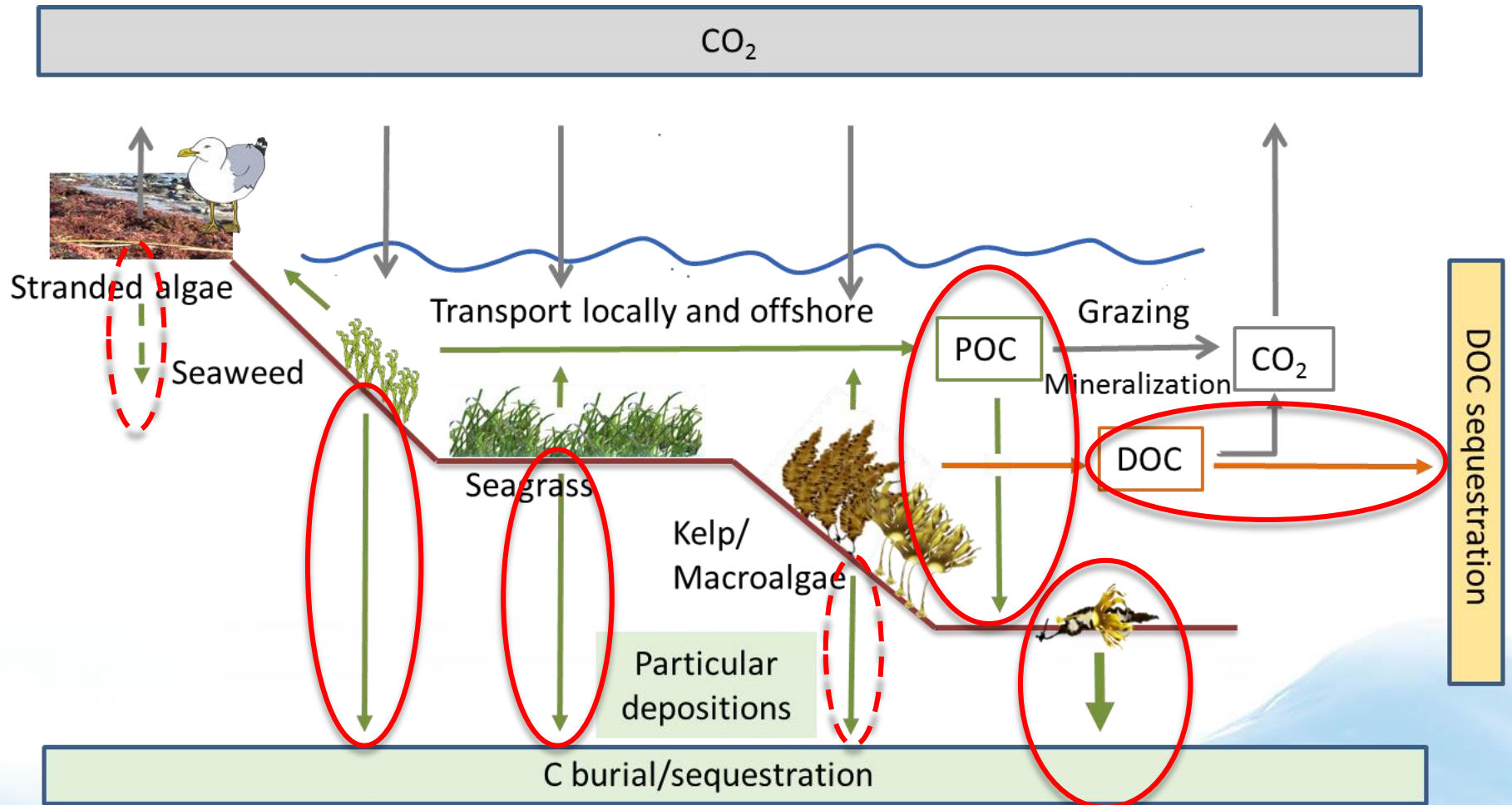
The major Blue Forest Carbon pathways

3.2 Export of kelp forest carbon



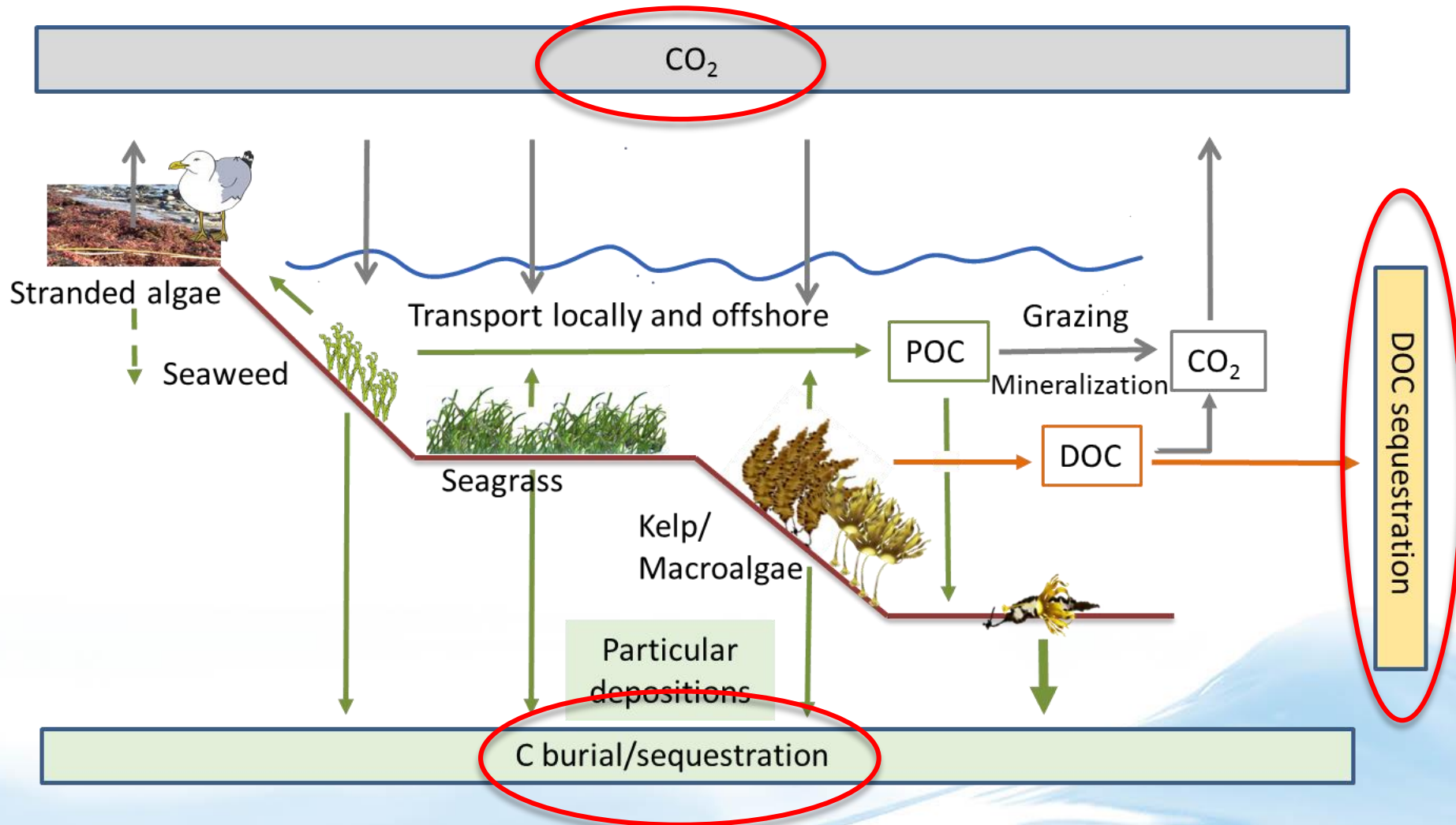
The major Blue Forest Carbon pathways

3.3 Carbon sequestration in coastal and deep sea regions



The major Blue Forest Carbon pathways

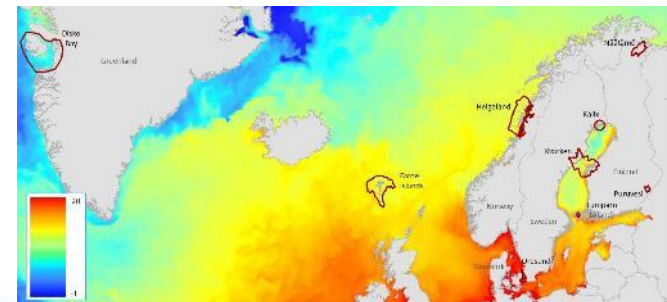
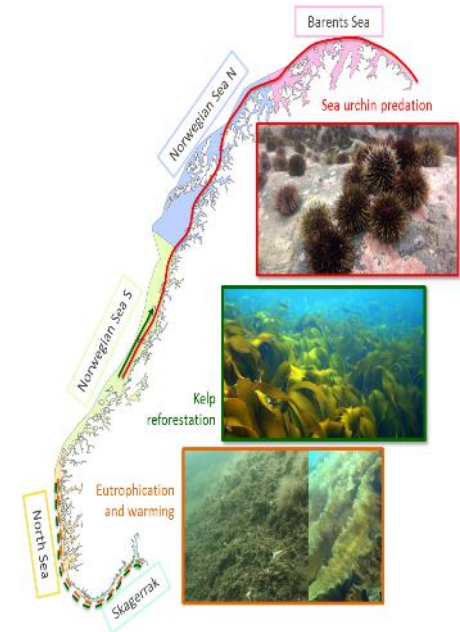
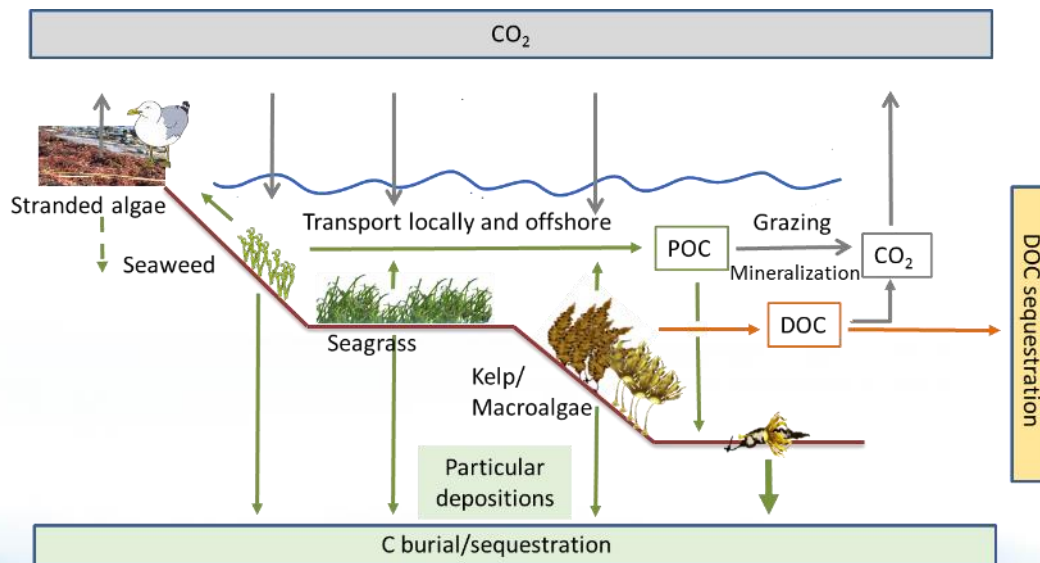
3.4 An update of the carbon budget for the Norwegian Blue Forest



WP3 - Carbon cycle of blue forests

Deliverables:

- Quantitative estimates of the carbon uptake and export from kelp forests
- Total carbon budget for the Norwegian kelp forest
- Total carbon budget for the Nordic Blue Forest
- Data for WP4
- Contributions to reports, final workshop and popular science publications
- Data for scientific publications



**Thanks for your attention:
Any questions?**

/.. or comments to the project plan?

DOC incubation *in situ* experiment.
Malangen fjord, August 2017.
Photo by Karen Filbee-Dexter