

New Licenses: why and why not?

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Ecological and social sustainability

- Ecological sustainability includes everything that is connected with the Earth's ecosystems. Amongst other things, this includes the stability of climate systems, the quality of air, land and water, land use and soil erosion, biodiversity (diversity of both species and habitats), and ecosystem services (KTH).
- The social sustainability dimension largely concerns well-being, justice, power, rights and the needs of the individual.

Different forms for mussel farming in Denmark-
annual production 10.000 t – approximately 45 farms
(250X750 m)



Smartfarm



Bottom culture



Longlines

Many forms of mussel farming - food

- Production of mussels for food - this requires a high-quality mussel. Important to be ready with product in April-May - when there is a great demand. The production at a plant is normally 300-600 t. The mussels can be produced on traditional longlines or on nets, where the mussels are thinned out in late summer.
- Production of mussels for stocking. Here, the mussels are harvested in the autumn, sorted by size and used as stocking material.
- Production of mussels for culture banks. This will typically take place on nets that are harvested in the autumn, and the mussels are laid out on banks and harvested after a few years.

Many forms of mussel farming – Ingredients and other functions

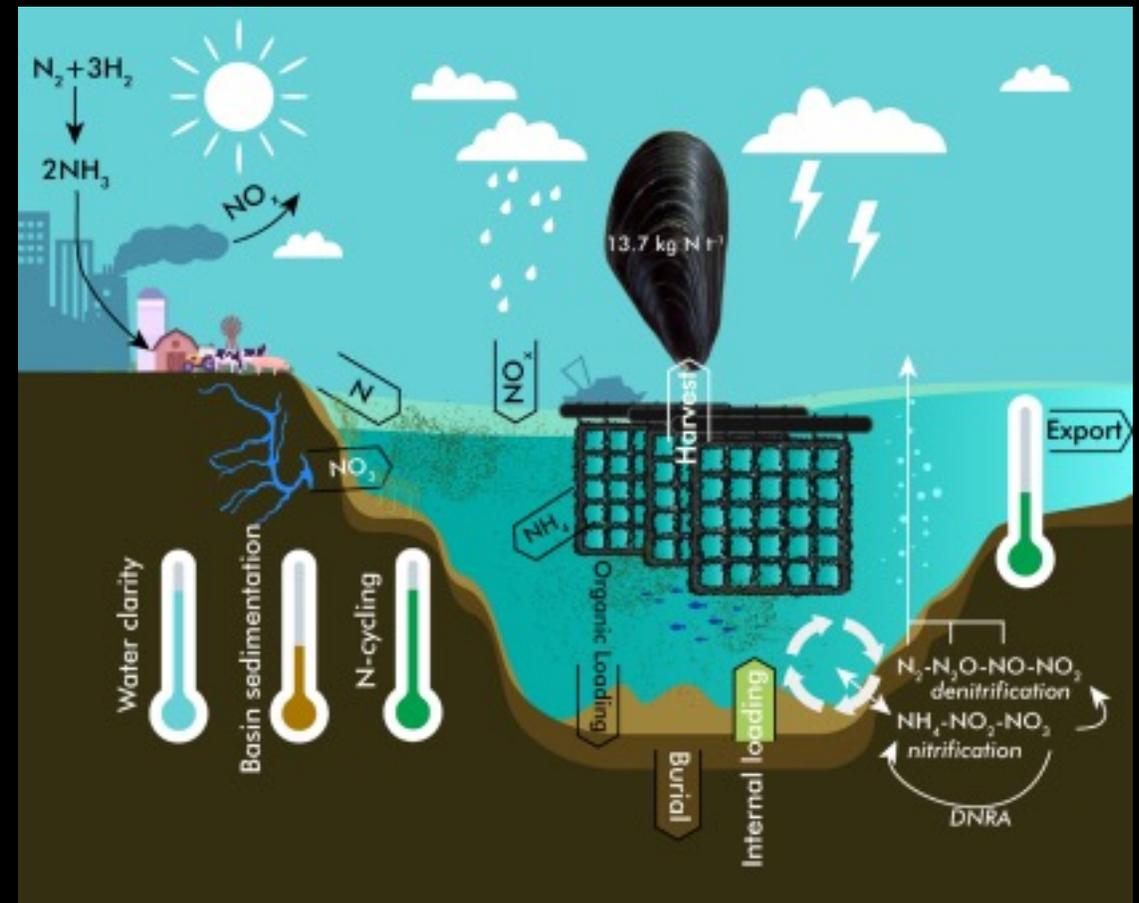
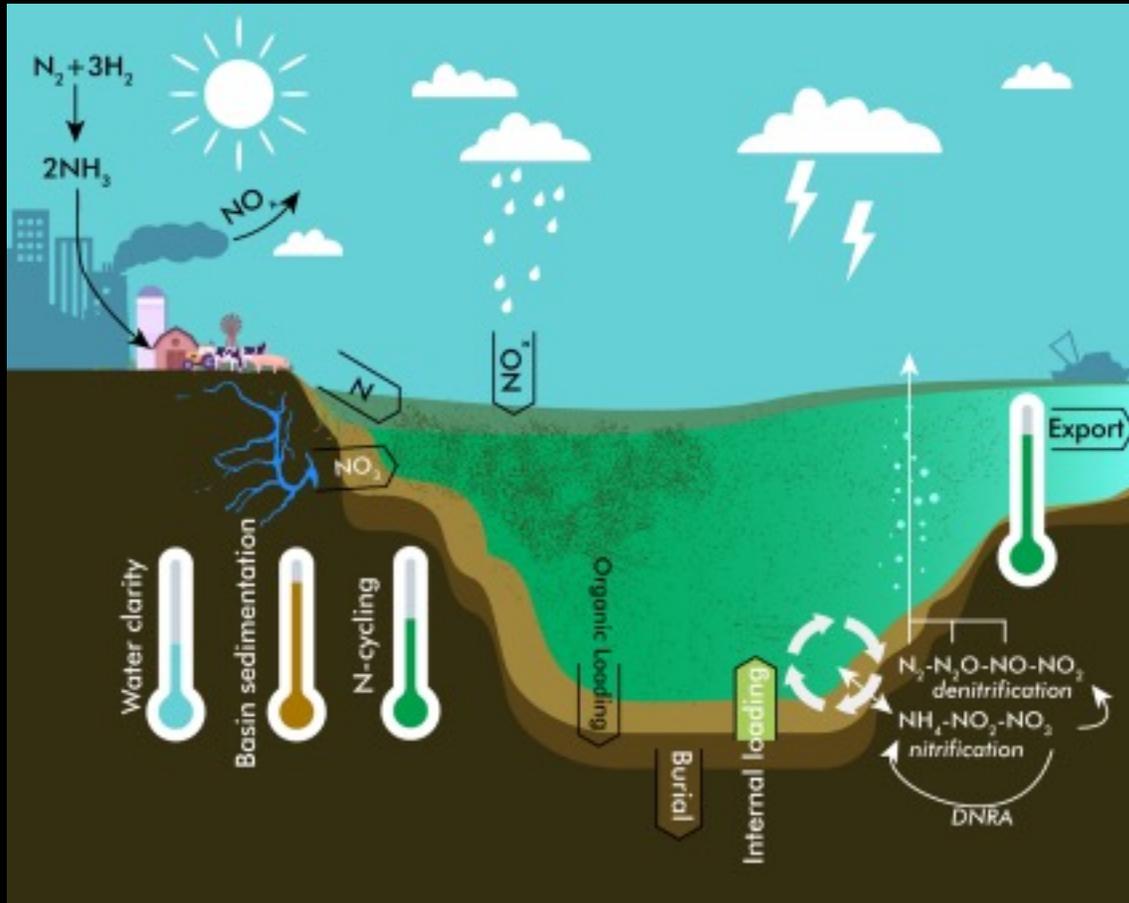
- Production of mussels as ingredient for food or feed. This production has not been established.
- Production of mussels for nature restoration. See Healthy Vejle Fjord. The establishment of biogenic reefs can promote the recovery of eelgrass
- Compensation farming where the mussels are used to remove N from the aquatic environment. This form has not been established in Denmark, and there is a lack of clarification on how it can be managed.

Why mussels?

High area-efficiency

	blåmuslinger		makroalger (sukkertang)	
	effekt	index	effekt	index
Biomasse (100 tons/ha)	1,76	100	0,052	2,9
Kvælstof (tons/ha)	2,30	100	0,030	1,3
Fosfor (tons/ha)	0,14	100	0,001	0,5
CO2 (tons/ha)	17,55	100		
Protein (tons/ha)	18,43	100	0,041	0,2
Fedt (tons/ha)	2,46	100	0,030	1,2
Kulhydrat (tons/ha)	6,00	100	0,215	3,6

Ecological sustainability



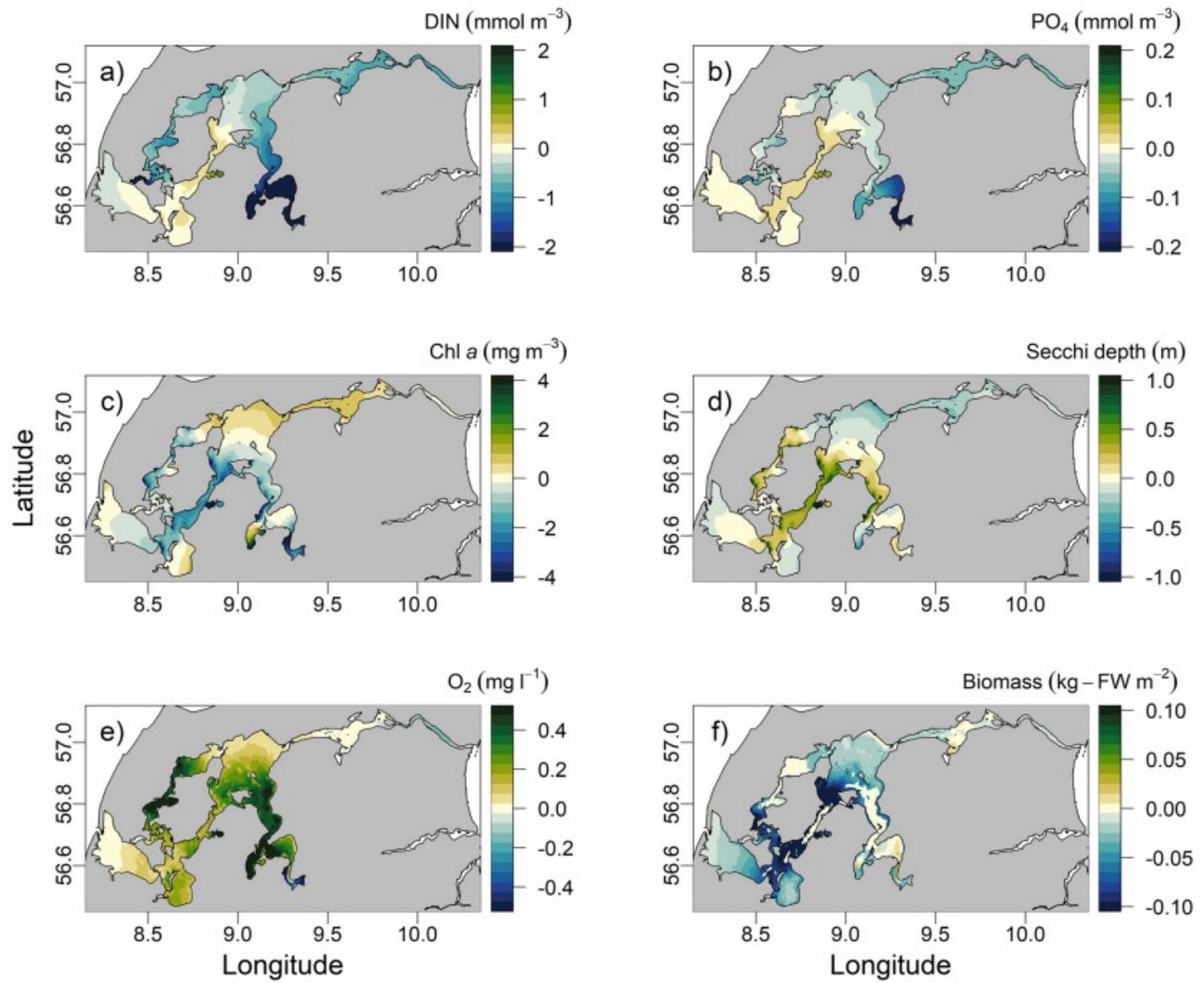
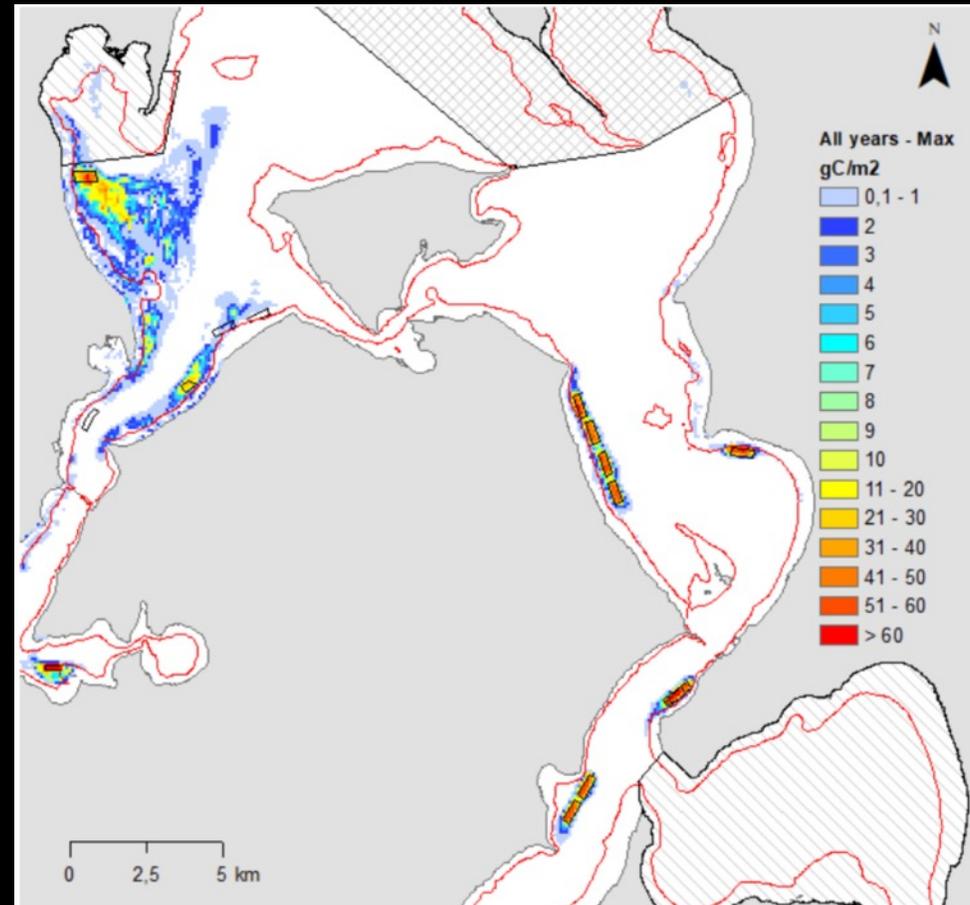
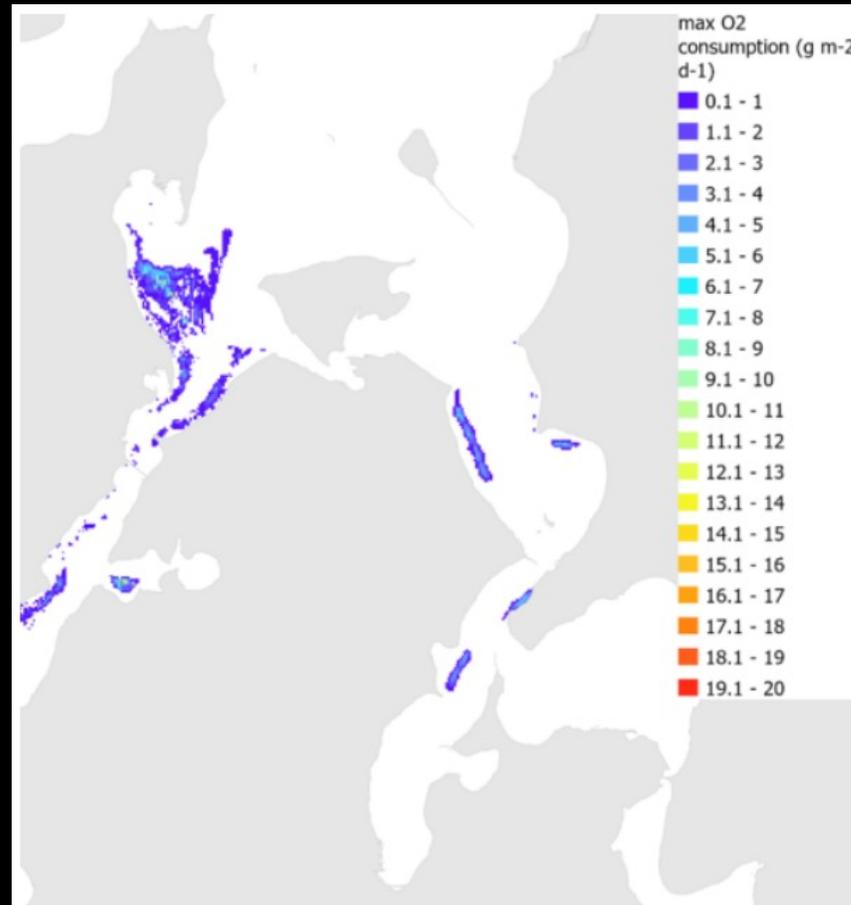
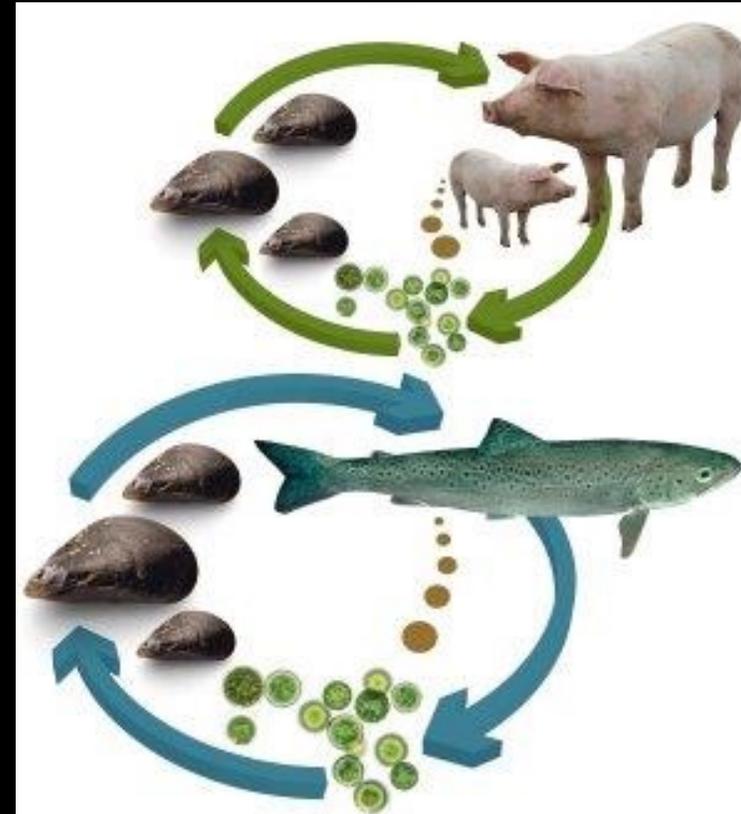
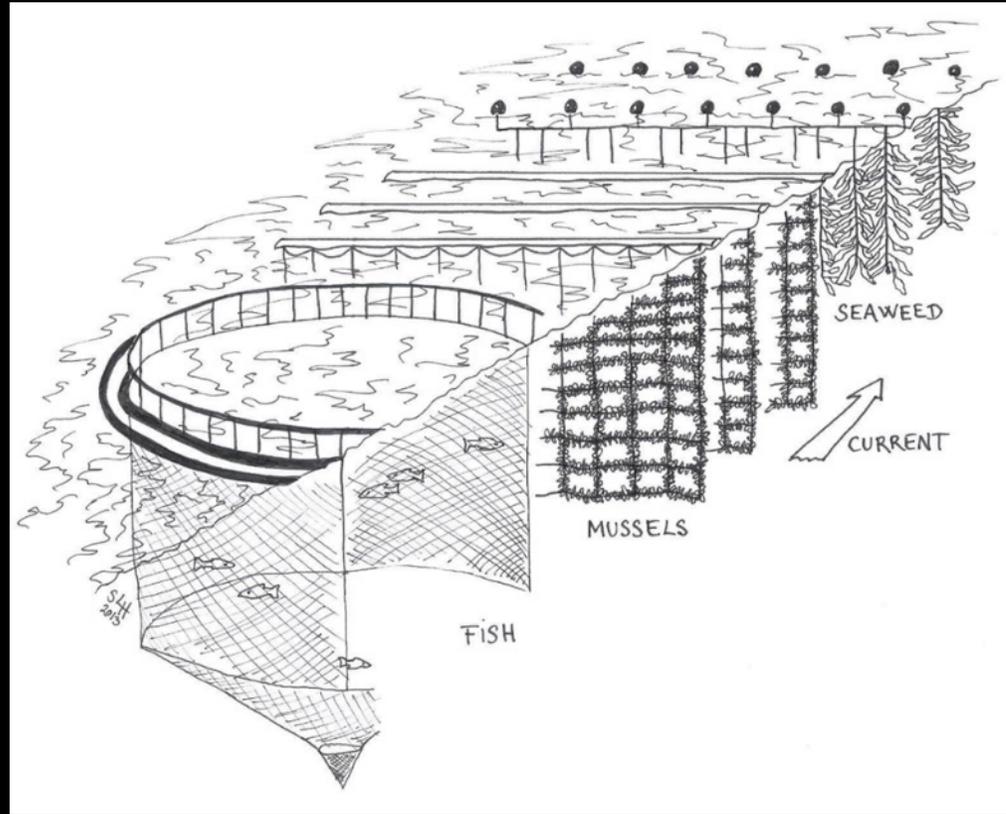


Figure 7. Spatial changes in scenario MF4 year 2017 relative to MF1. (a) Winter DIN, (b) winter PO_4 , (c) summer Chl *a*, (d) summer Secchi depth, (e) summer bottom oxygen, and (f) benthic bivalve biomass.

DTU/DHI model og oxygen consumption and sedimentation around new mussel farms



Conflict I: IMTA and Nutrient-catch culture



Mussels as nutrient-catch culture

- 2010 Appendix in national aquaculture strategy: fishfarming offshore-nutrient catch coastal improving water quality.
- 2014 permission to fishfarm and musselfarming as nutrient catch.
- 2015 Nature Appeal Board cancel permission
- 2017 Law open for using mussels as nutrient-catch from fish farming
- 2020 law close for using mussels as nutrient-catch from fish farming

Conflict II- Nutrient-catch from agriculture



Mussels as nutrient-catch from land

Mussels farming is demonstrated as a cost-efficient measure and is ready for implementation, BUT

- A reductions of nutrient-discharge is targeted directly on the source, so mussel farming is not relevant
 - No focus on delays in the systems (10-20-30 y) or internal loads
 - Mussels is not the solution due to the local impact of the farming
- July 2021 Moratorium for new applications- expected to ends in 2024.
- ✓ In projekt in Vejle (2020-2024) mussel farming is with succes used to improve waterquality and the growth of Zostera.

Take-home message

- If your goal is to produce healthy mussels with a low climate footprint for human consumption, be very careful about making noise on the narrative of your product by attaching yourself to heavy unpredictable agenda