Establishing "good ecological status" by reducing the nitrogen load of Norsminde Fjord

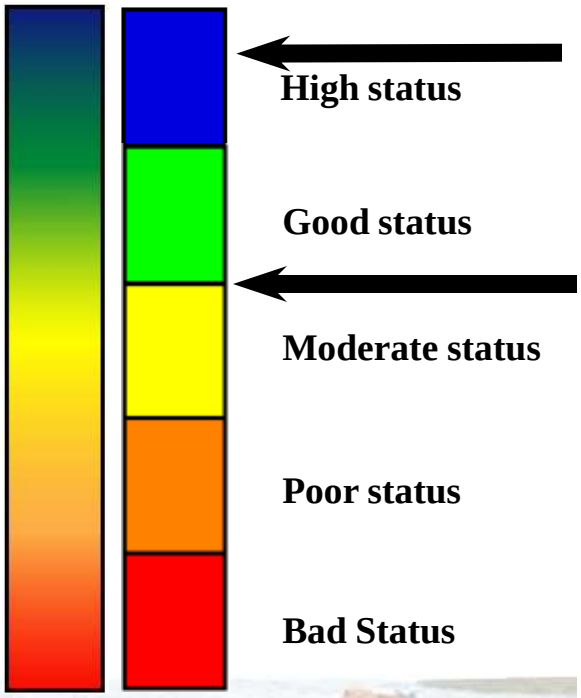
Henrik Skovgaard

Consultant to Environment Centre Aarhus
Ministry of the Environment
E-mail: hnsk@cowi.dk

Headlines

- The EU Water Frame Directive and environmental objectives
- Study area, Norsminde Fjord
- Data for a model set up
- Agwaplan definition of good ecological status
- Possible reduction targets for the nitrogen load

Reference conditions and ecological status



Reference condition
Undisturbed condition

At least good status in surface water

Environmental indicators in surface water (WFD)

Biological and chemical indicators (obligatory)

- Plankton algae
- Rooted plants
- Bottom fauna
- Fish
- Hazardous substances

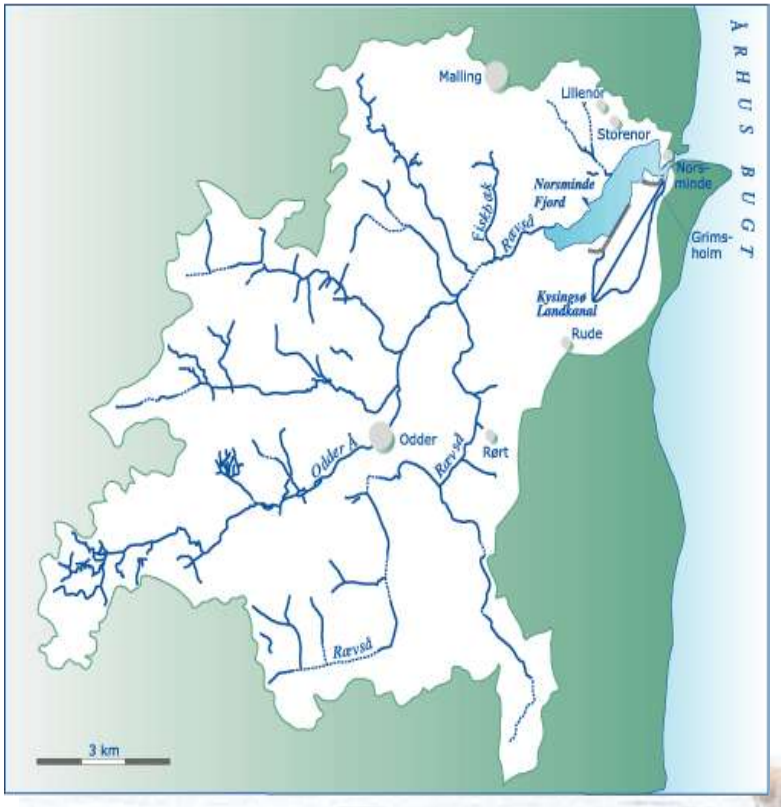
Supportive indicators

- Nitrogen and phosphorus
- Salinity
- Oxygen
- Visability

Norsminde Fjord and catchment area

Area: 1,90 km^2
Catchment area: 101 km^2

Land use: 80% agriculture



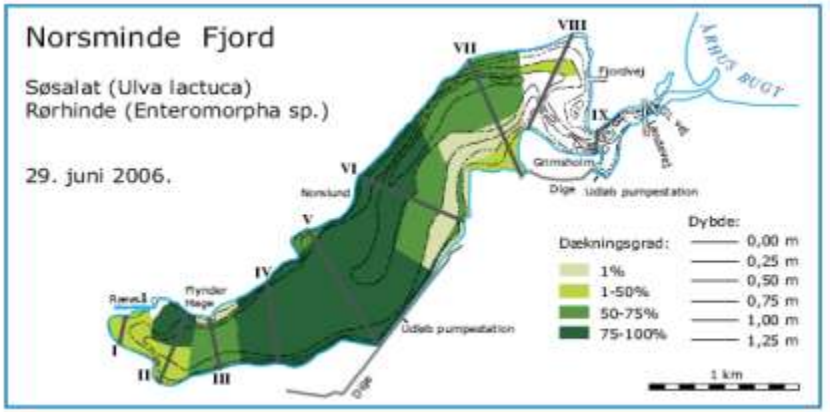
Environmental problems in Norsminde Fjord

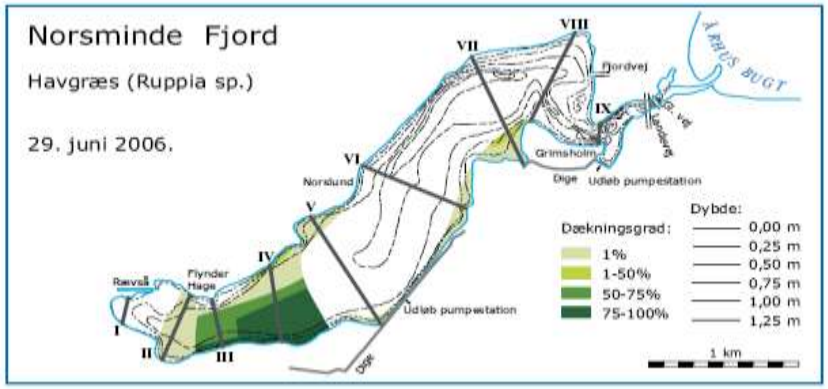
Too many nutrients

Macroalgae drive out the natural rooted vegetation

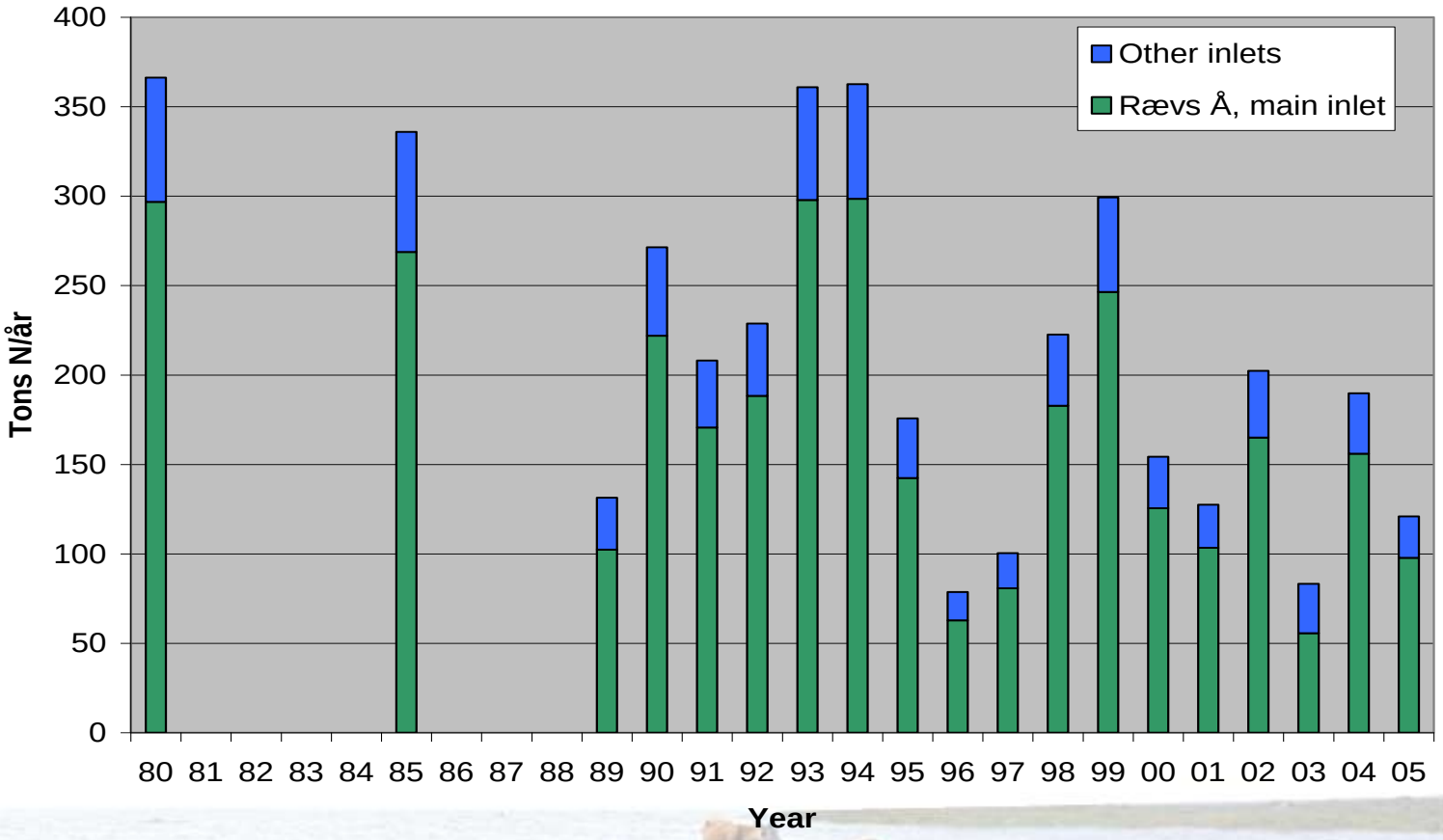
Toxic plankton algae

Sludge

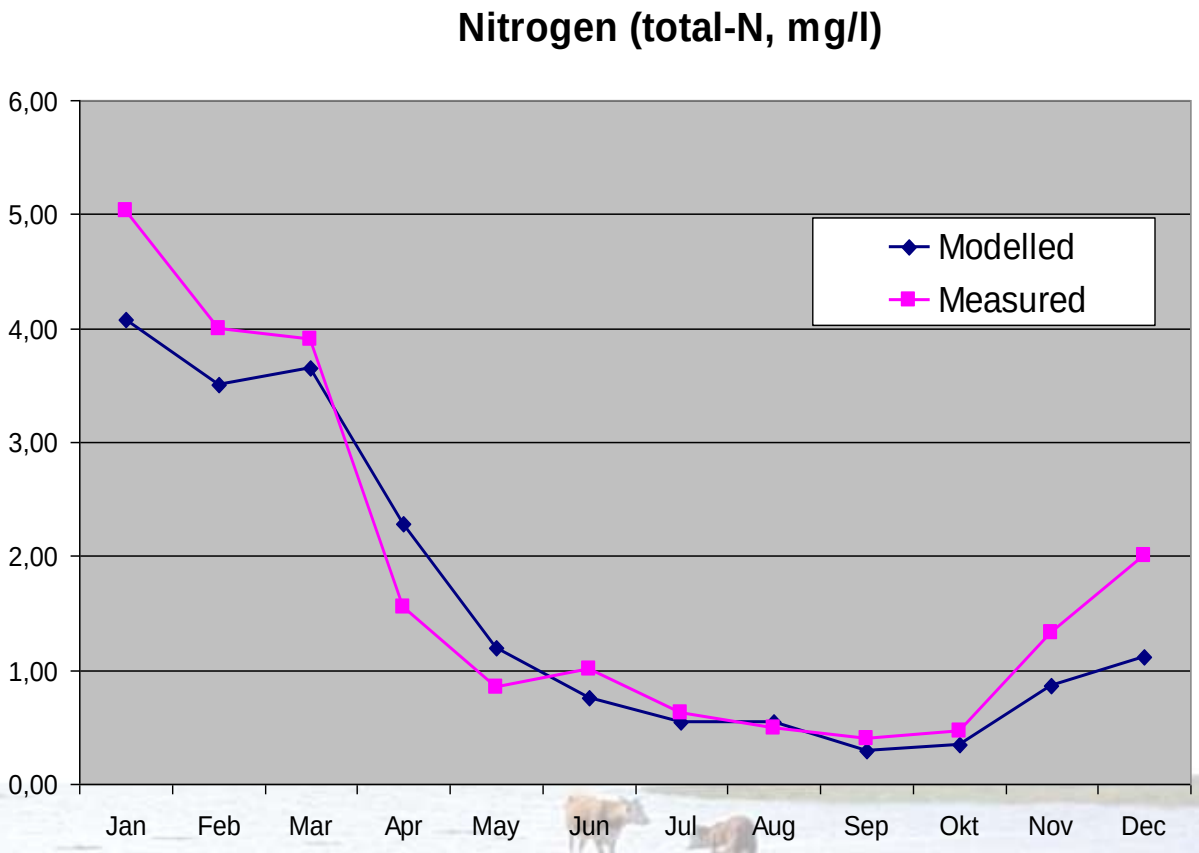




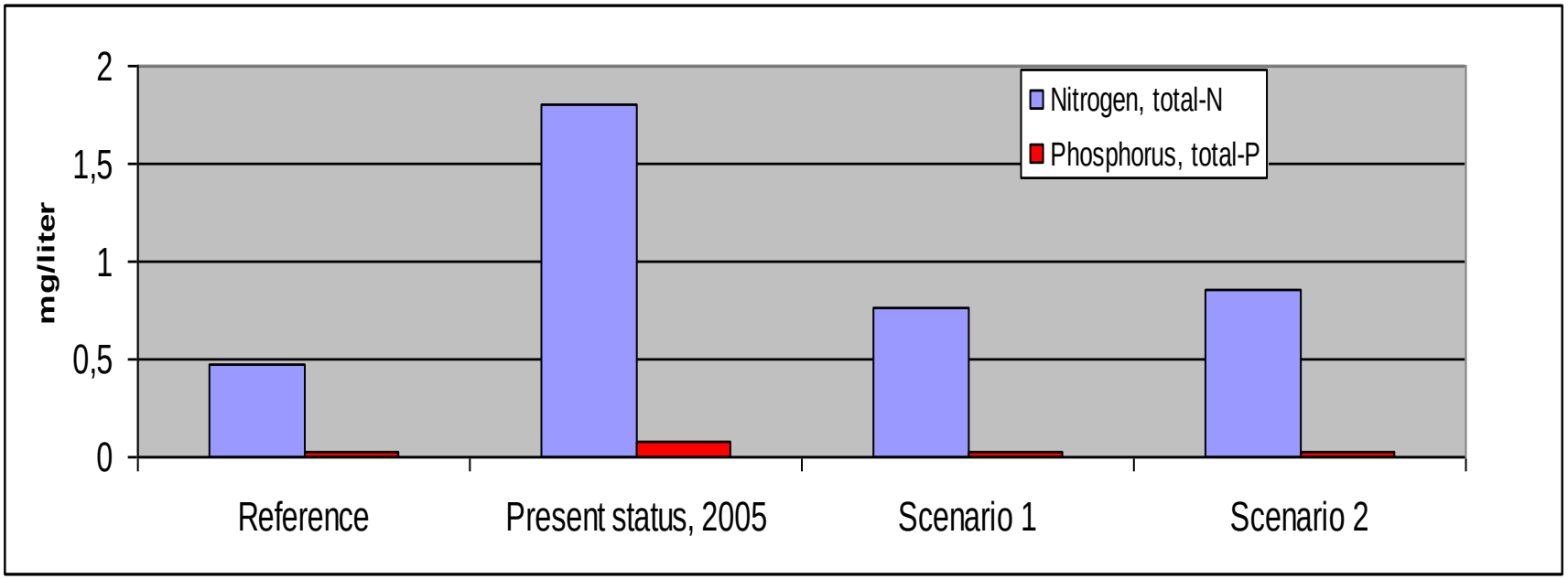
Annual nitrogen load of Norsminde Fjord



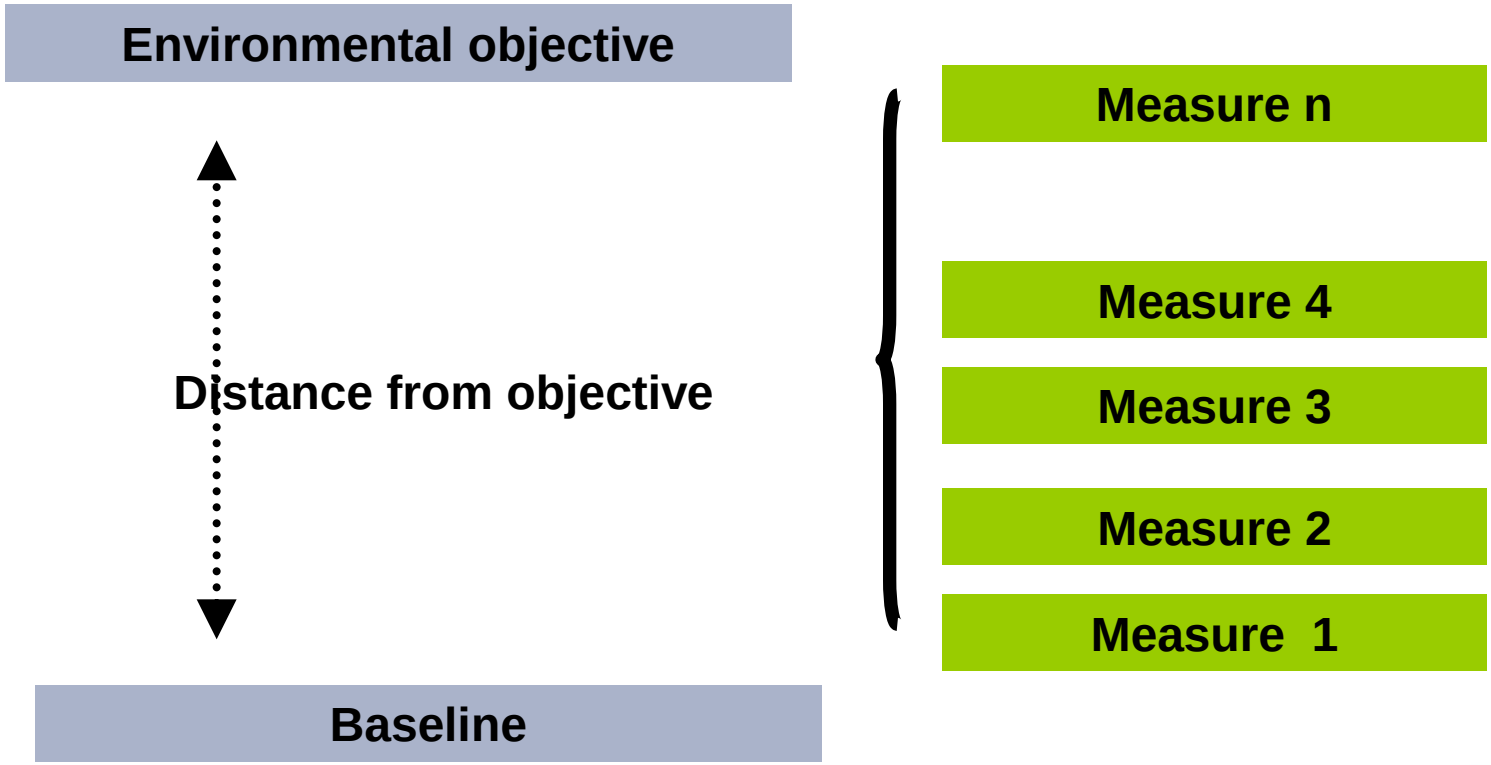
Measured and modelled nitrogen concentration in Norsminde Fjord in 2005



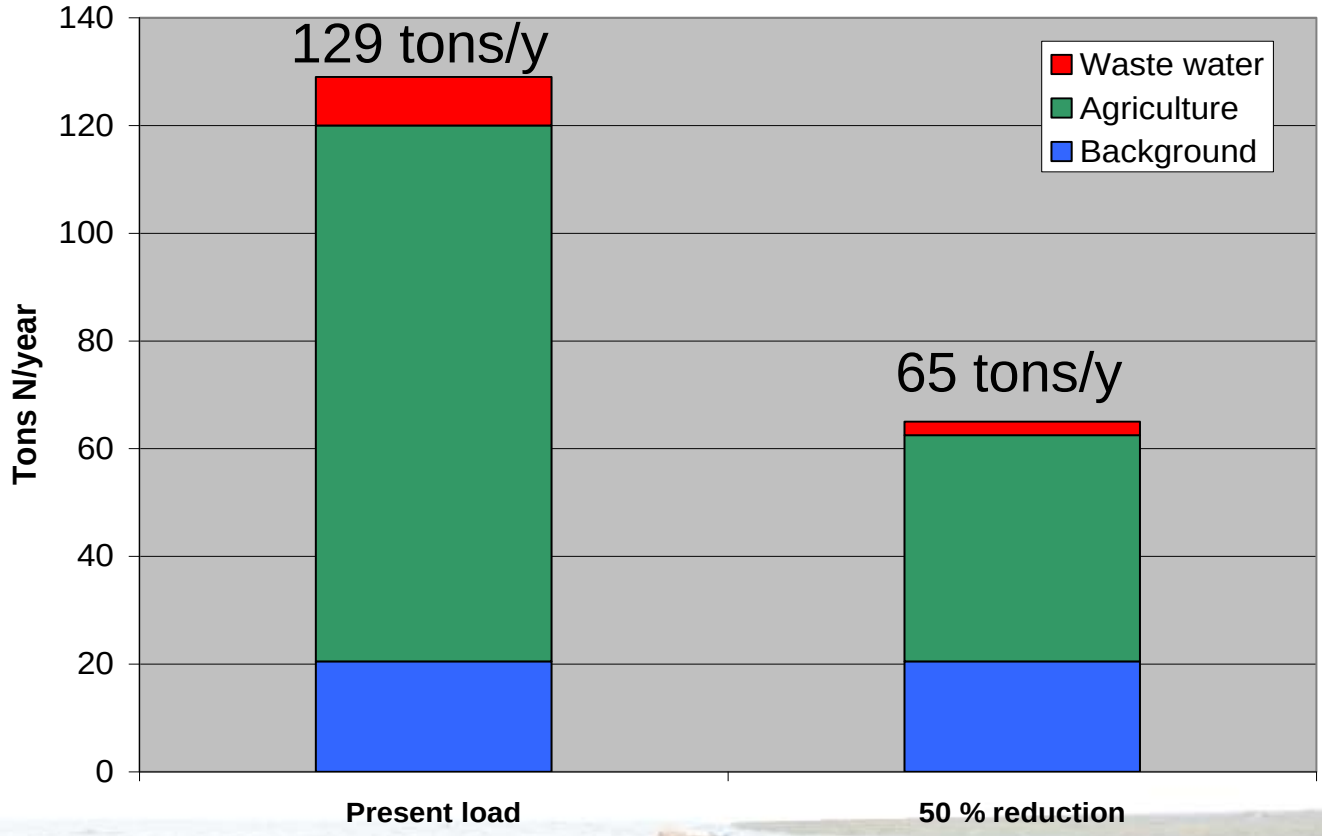
Reference condition, present status and two scenarios representing good ecological status in Norsminde Fjord.



Action plan


Environmental objective
Distance from objective
Baseline
Measure n
Measure 4
Measure 3
Measure 2
Measure 1

Present and scenario 2 load of nitrogen from the main inlet Rævs Å. Agwaplan target



Validation of the hydrodynamic and ecological model (MIKE 3)

- **Hydrodynamic model**
  - Water balance
  - Temperature
  - Salinity

- **Ecological model**
  - Oxygen
  - Nitrogen and phosphorus
  - Plankton algae (chlorophyll)
  - Macroalgae
  - Rooted vegetation (seagrass)

Scenario calculations in the water plan in order to obtain good ecological status (Mike 3 model)

1. 2005 situation with normalized water flow

2. Baseline 2015 with measures already implemented

3. Varying N and P loads (percentage reduction compared to 2005)
   - N30/P15
   - N50/P25
   - N60/P25
   - N80/P40

Biological indicator. Depth distribution of eelgrass.