

watersketch

Meeting in Lodz, Poland

15-17. juni 2005

Limfjorden case study

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County of North Jutland



Limfjorden - case study

- Introduction/Presentation
- What are the problems?
- What have we done?
- What are the scopes of the present study ?
- What are the main problems just now ?



Limfjorden - case study

- **Introduction/Presentation**



County of North Jutland

- **Area: 6,173 sq.km.**
(14.3% of the total area of Denmark)
- **Population: 495,548**
(2002 - 9.2% of the total Danish population)
- **Population increase: 8.7%** (1970 - 2002)
- **Population density: 80** (inhabitants/sq.km.)



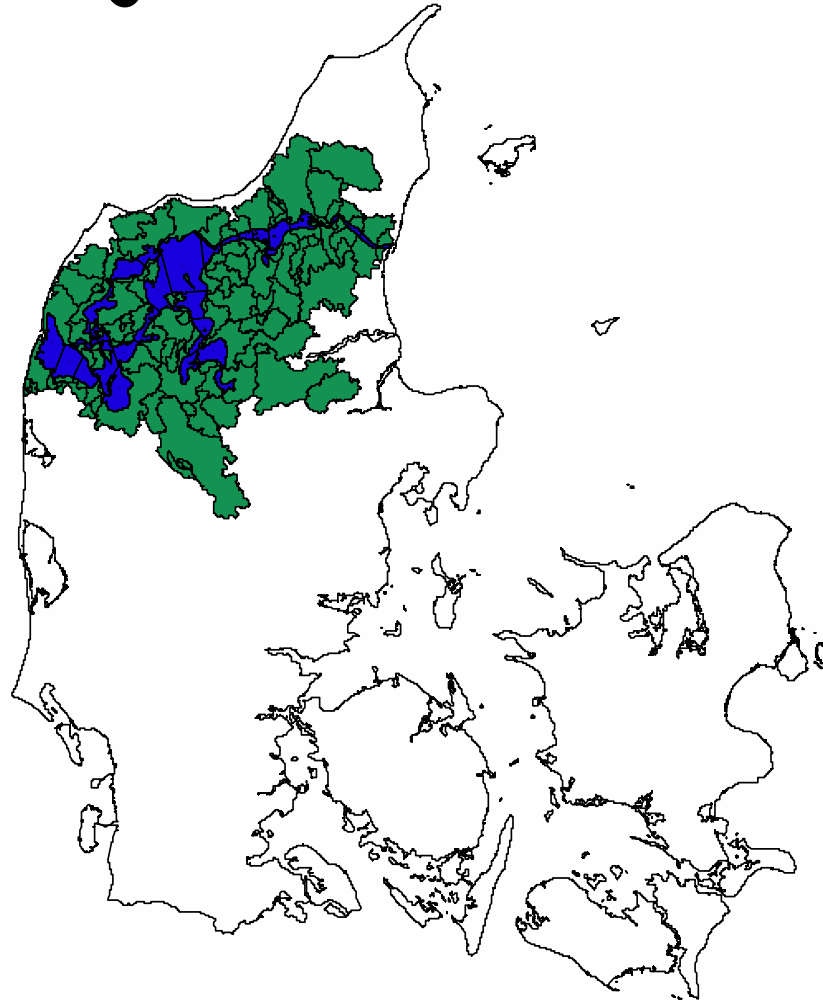
Limfjorden

Catchment area: 7500 km²

Water surface: 1500 km²

4 counties

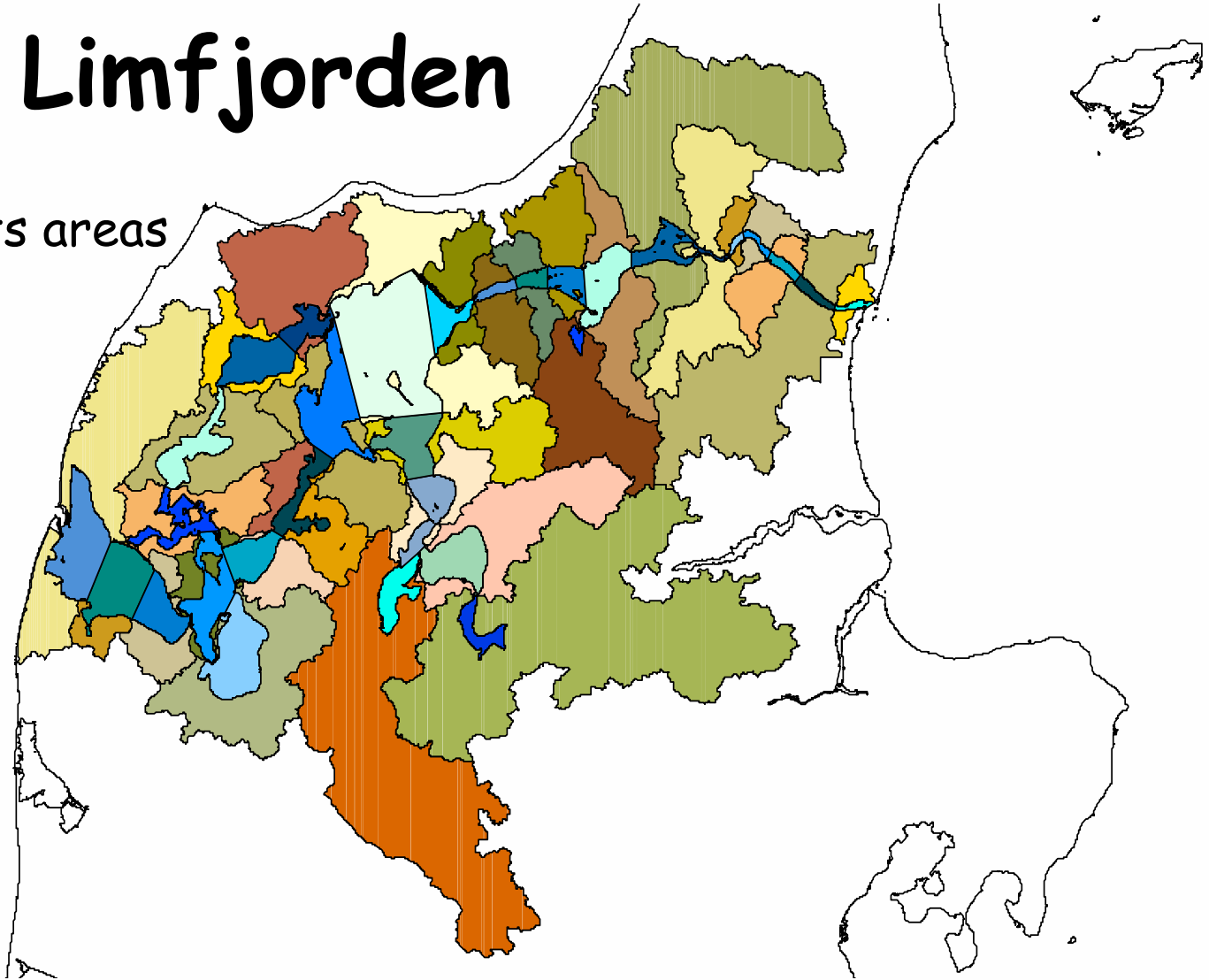
52 municipalities



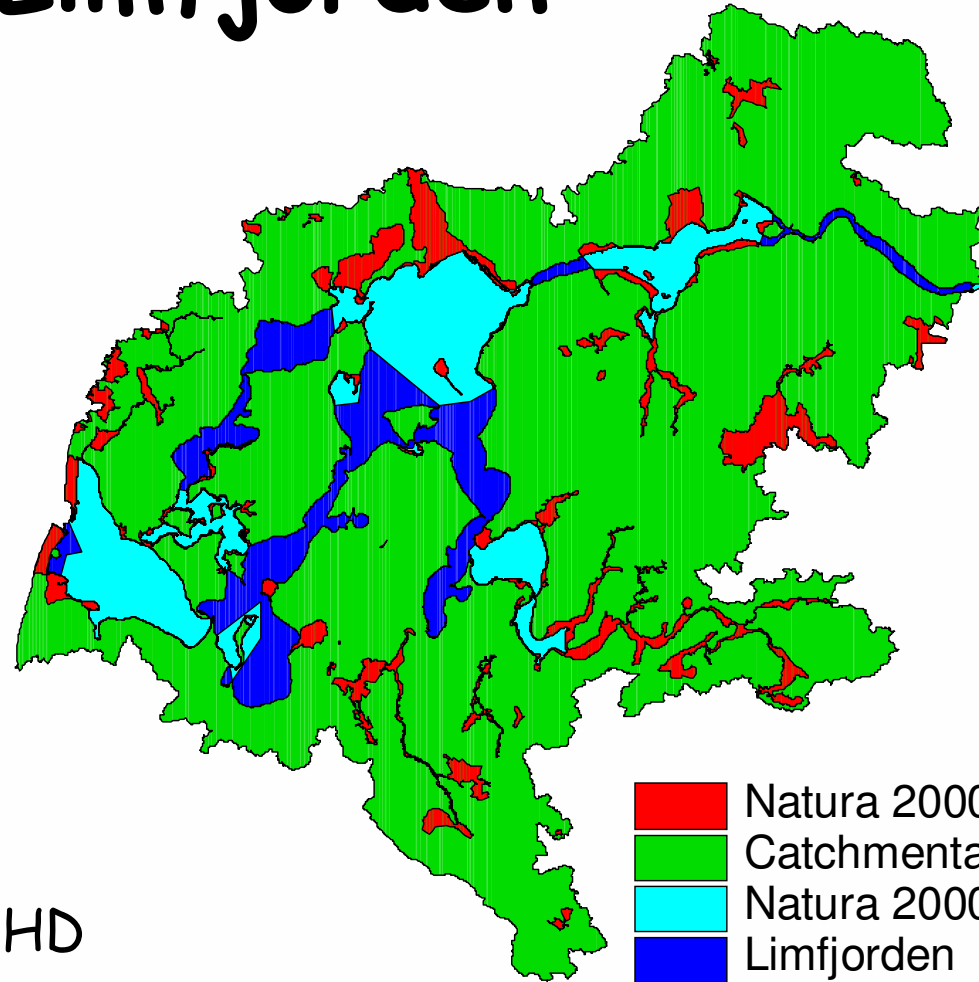
Limfjorden

31 sub-catchments areas

8 areas in VFD



Limfjorden



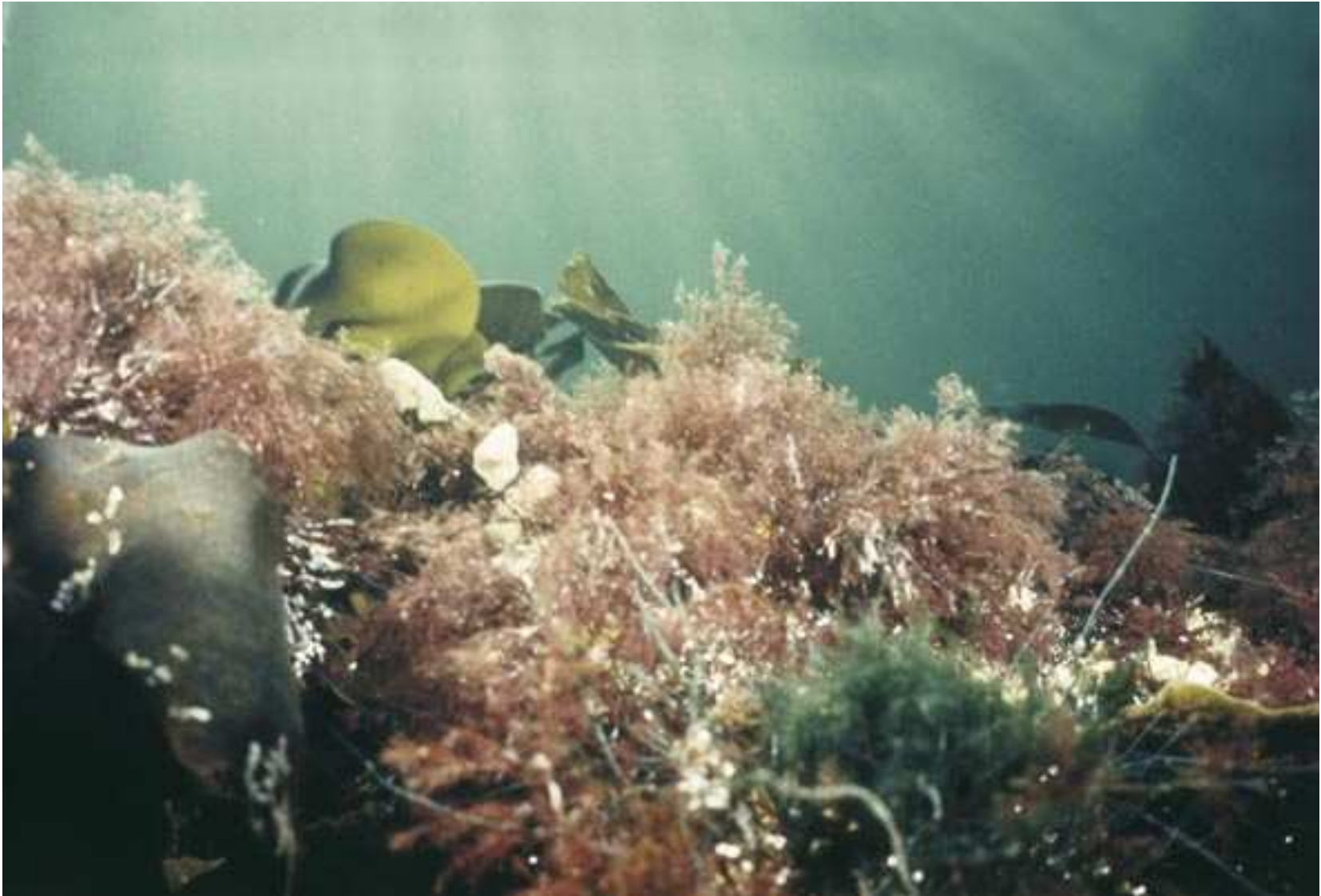
More than 60%
protected areas in HD

















Limfjorden - case study

- Introduction/Presentation
- **What are the problems?**



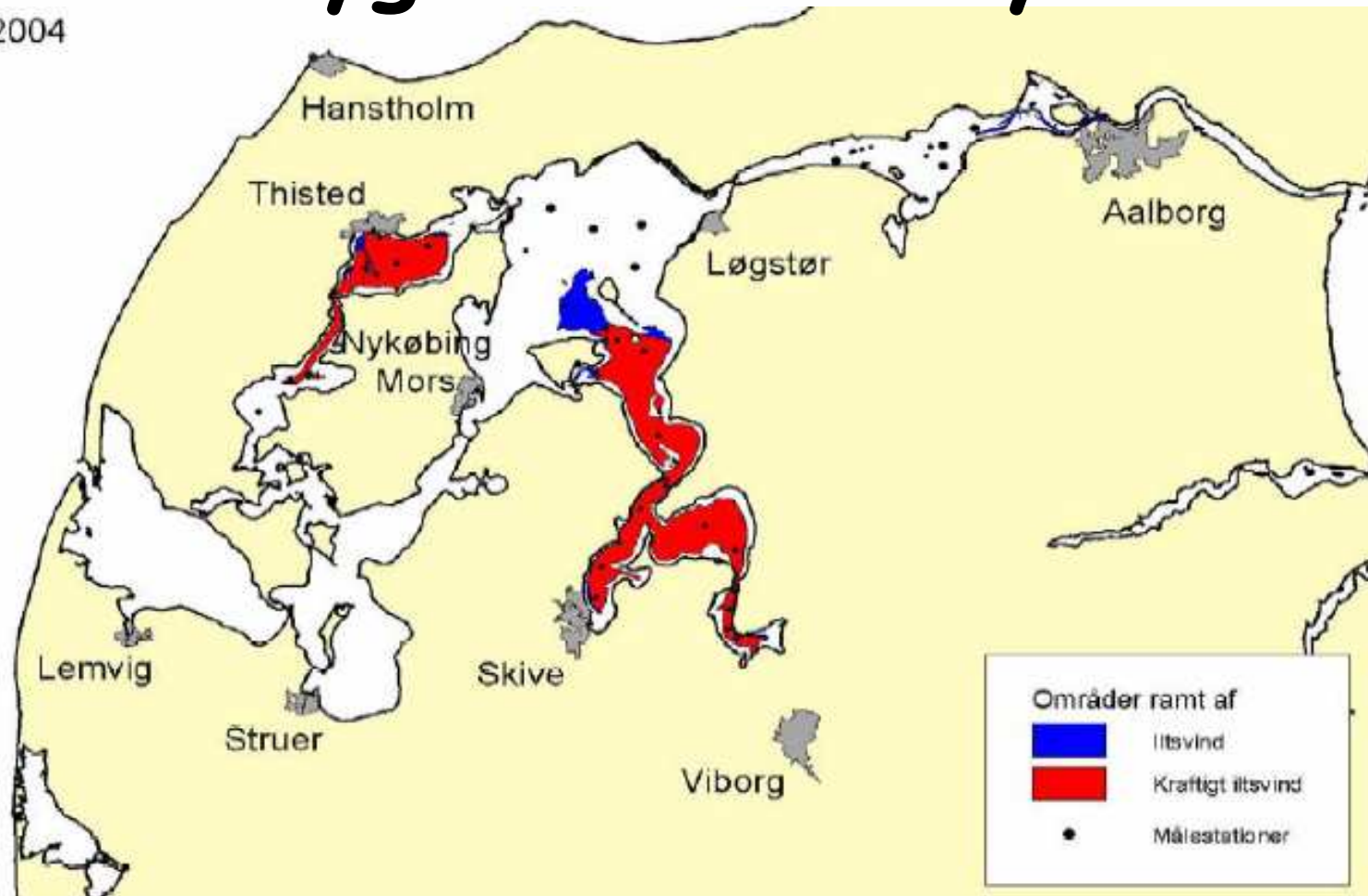
Ecological status	Objectives	Present status
Distribution of eelgrass	Widespread at depths exceeding 3-4 m	
Summer transparency	Minimum 3-4 meters	
Oxygen	More than 4 mg/l to 10 m of depth all year	



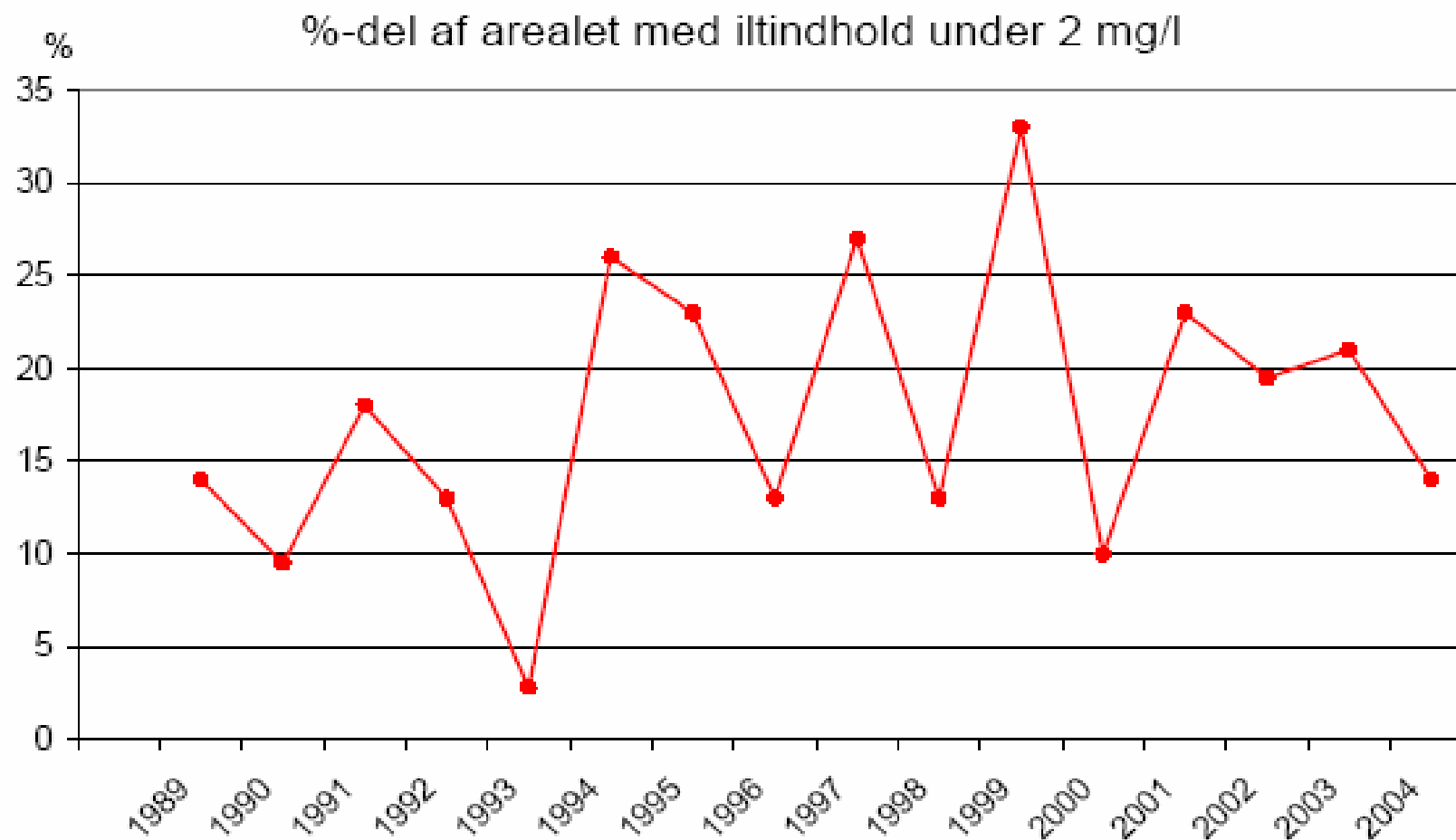


Oxygen deficiency

Total 2004



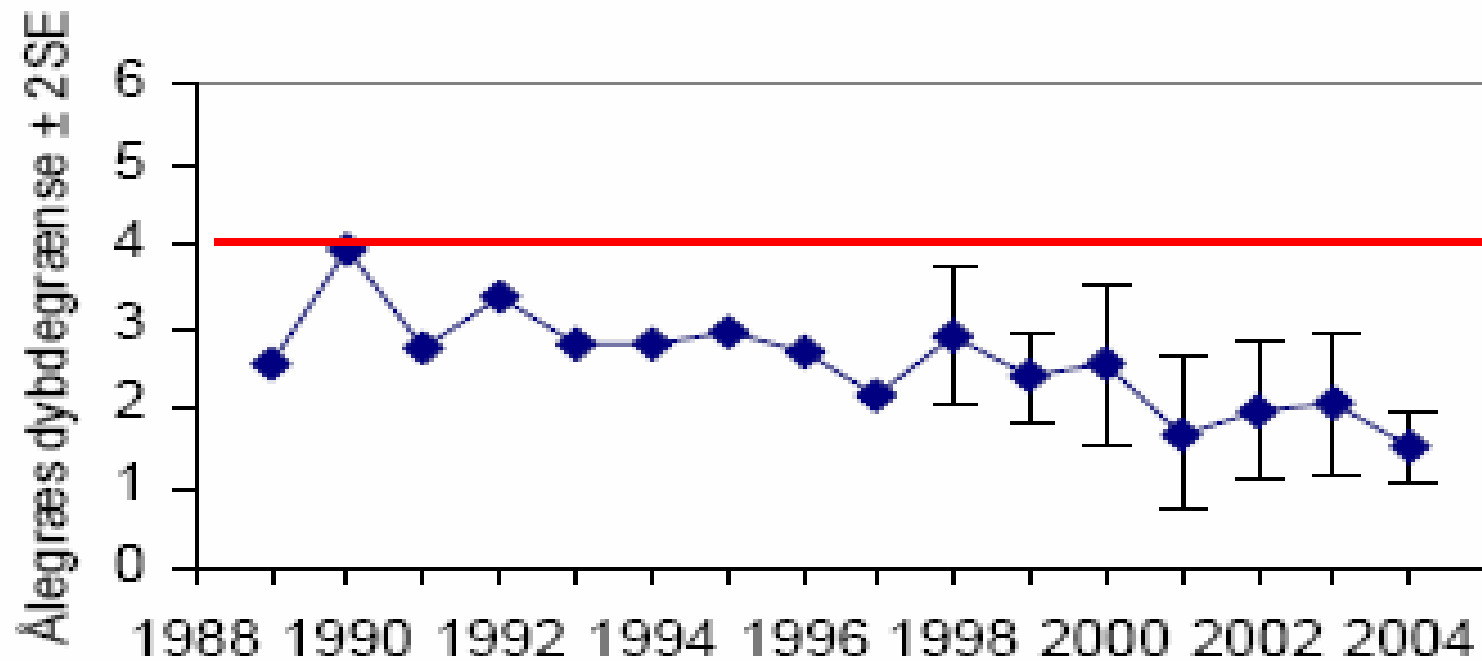
Areas with severe oxygen deficiency





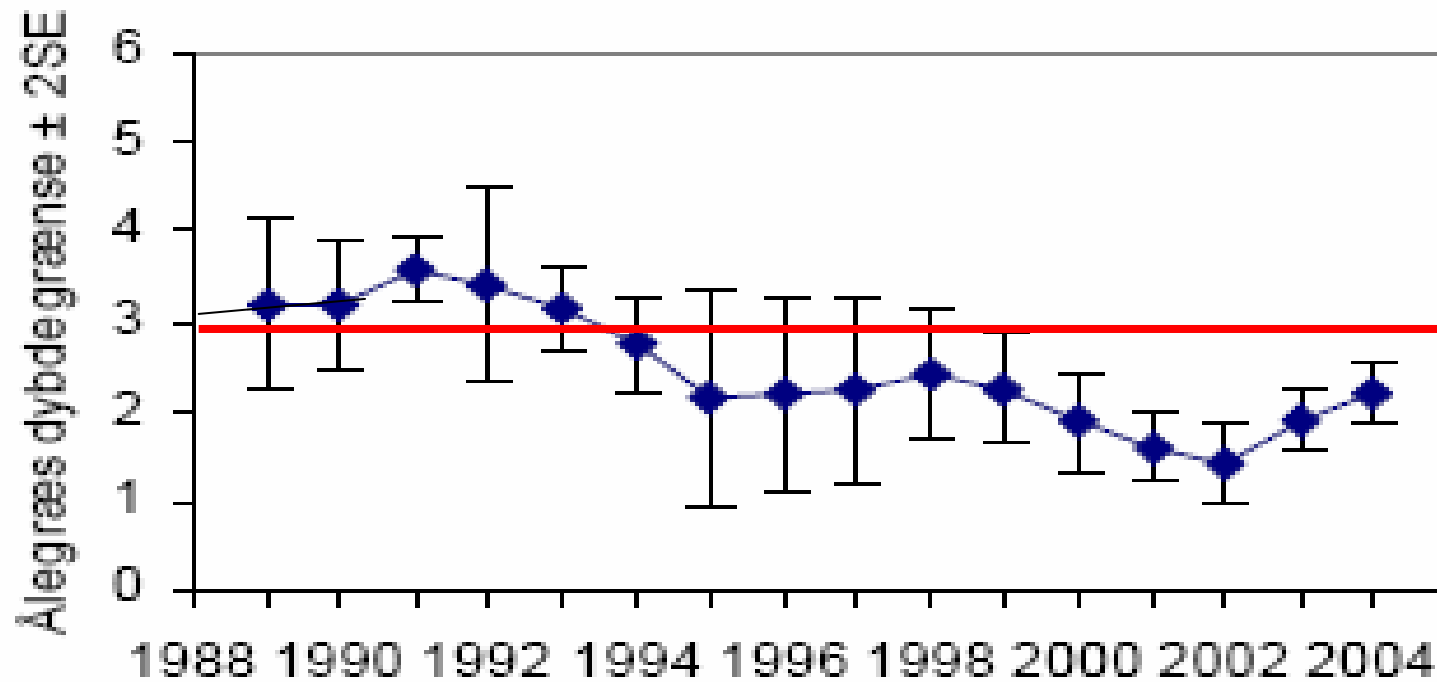
Maksimum depth of eelgrass

Løgstør Bredning

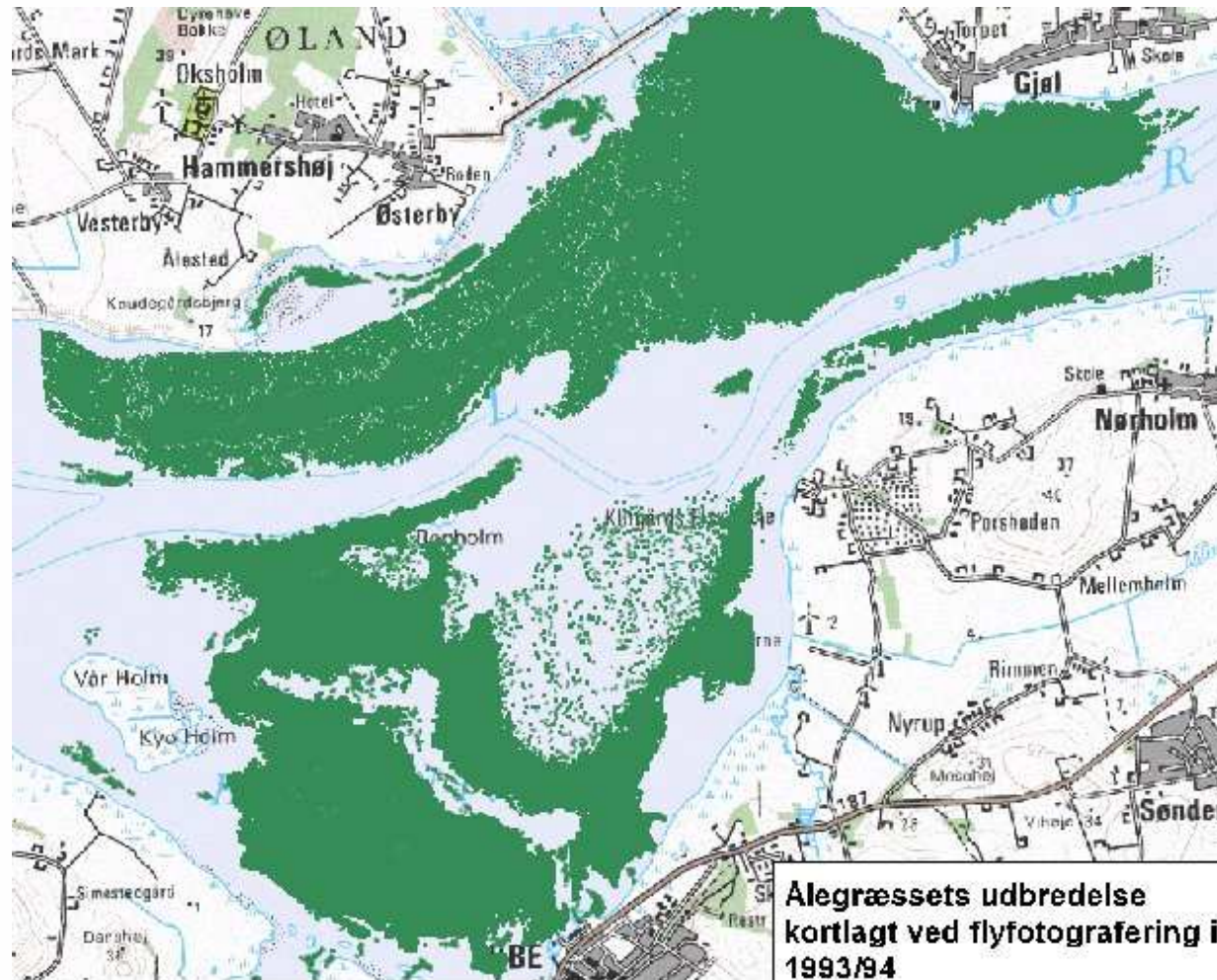


Maksimum depth of eelgrass

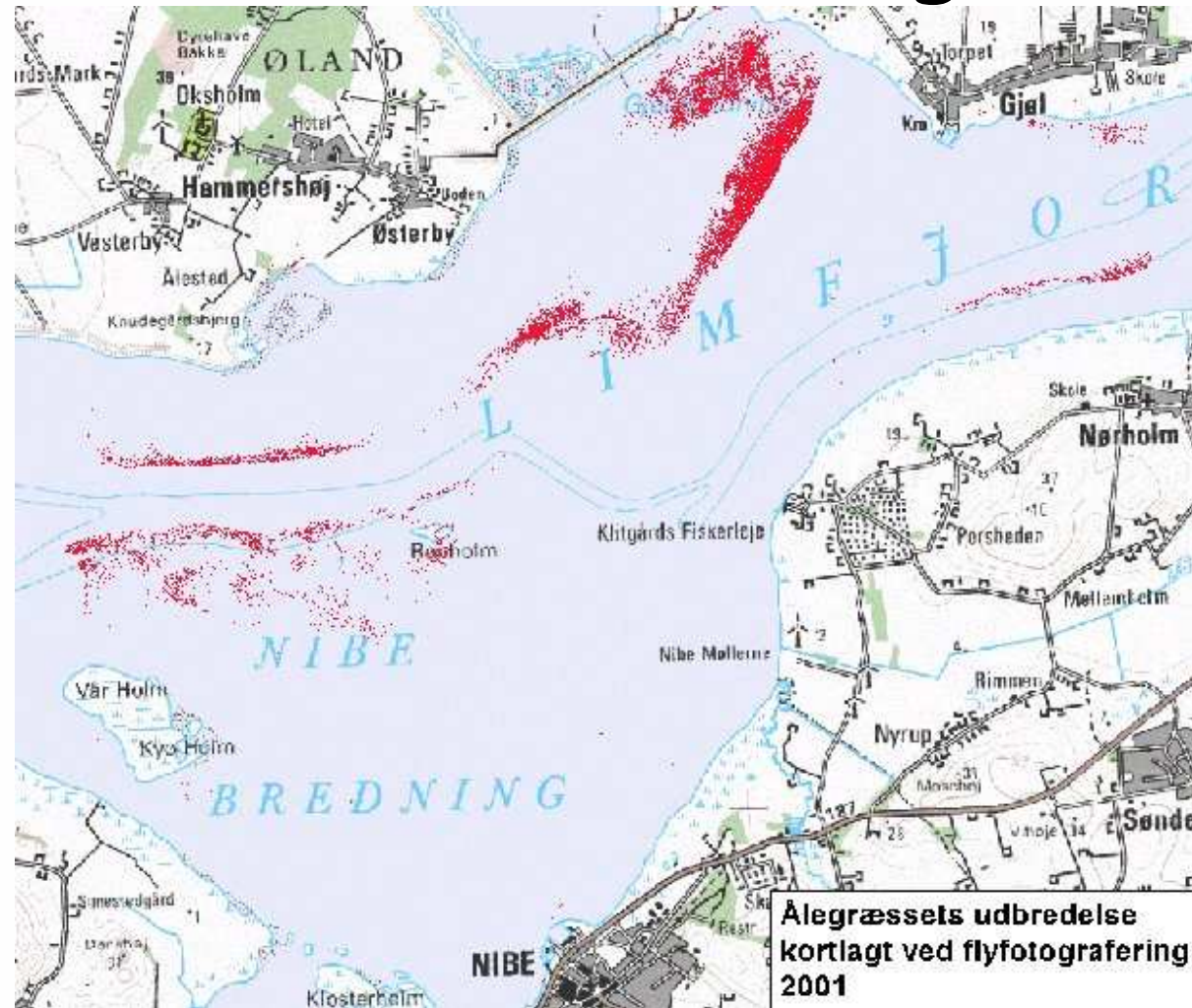
Område Nibe/Gjøl Bredning



Distribution of eelgrass



Distribution of eelgrass



Sea lettuce

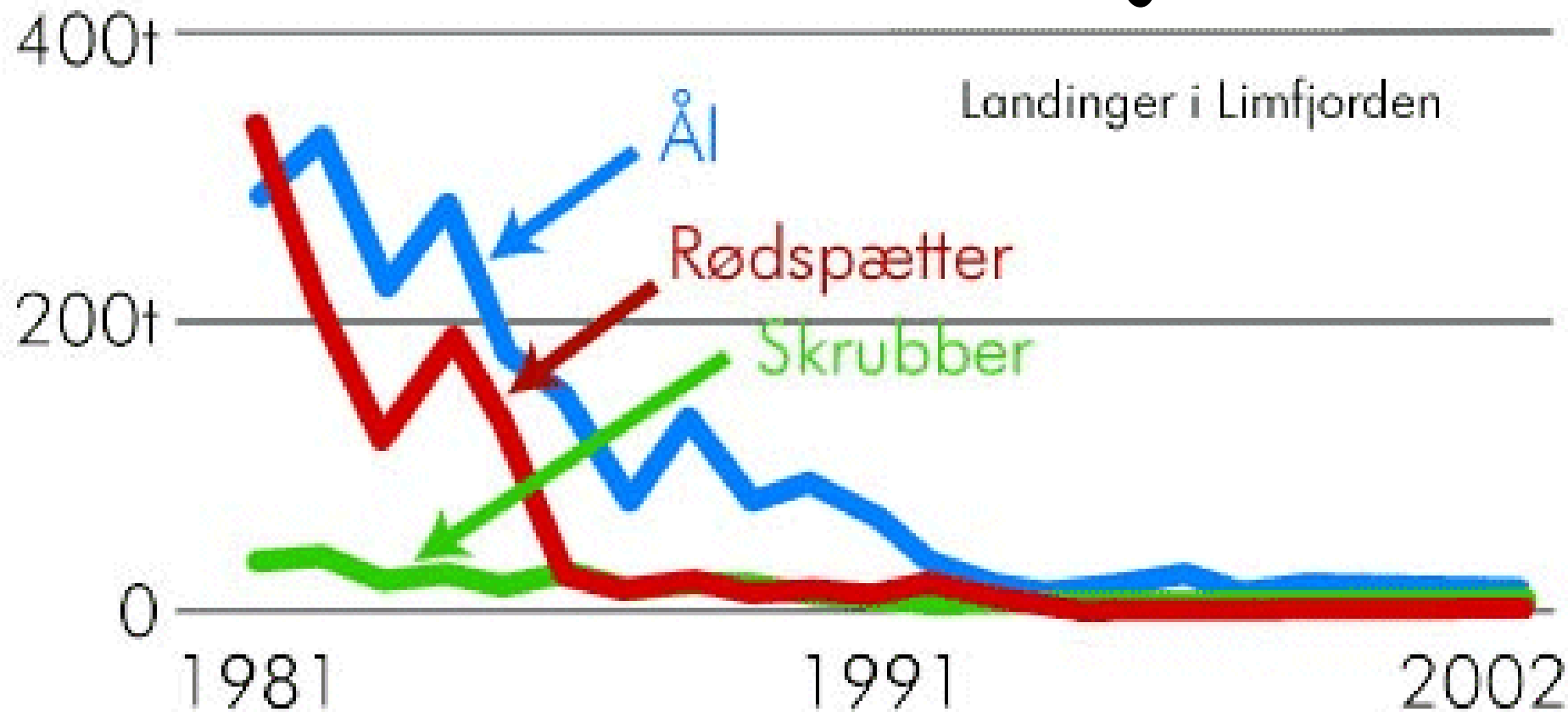


Jellyfish



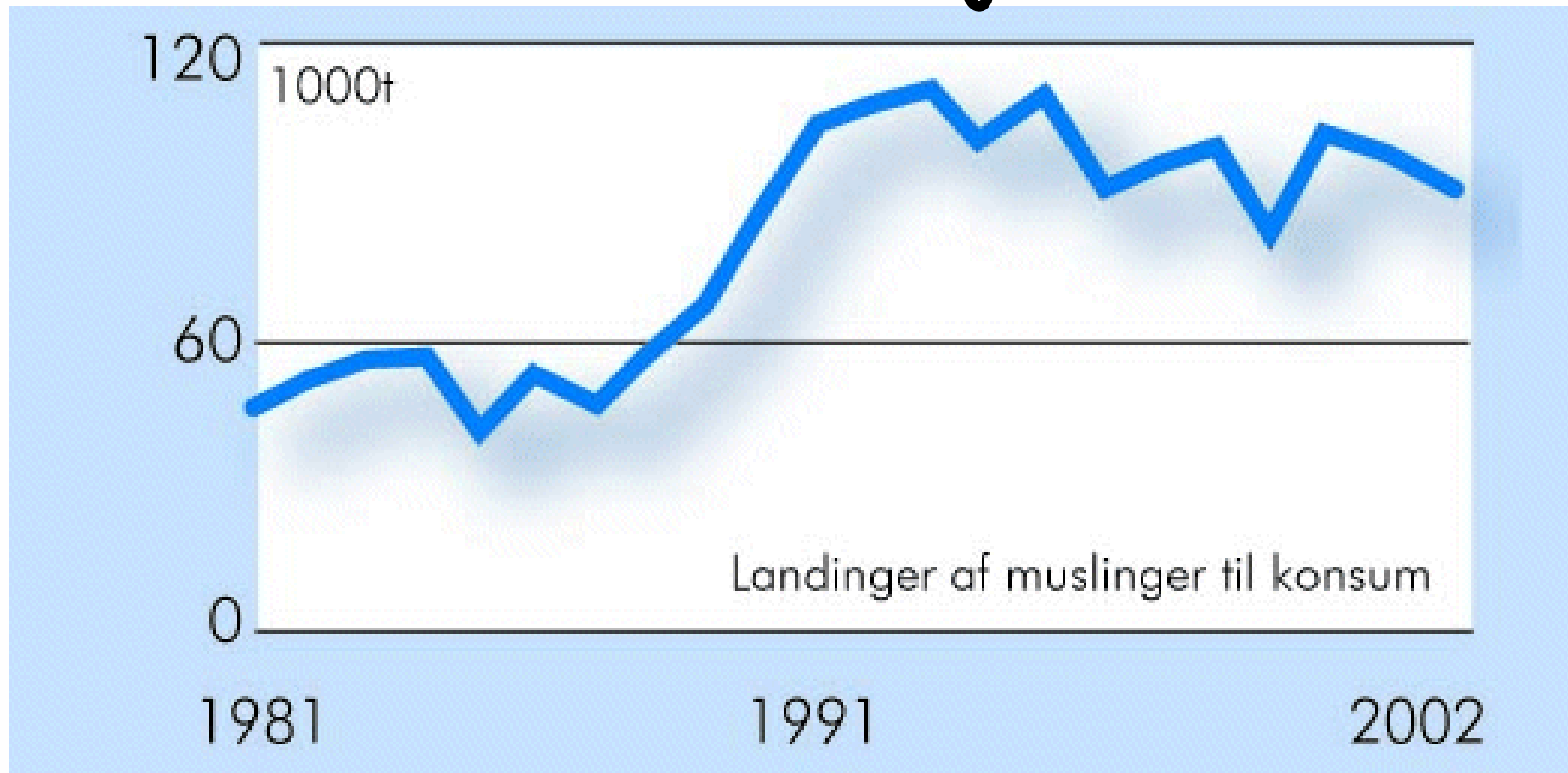


The catch of 3 common species of fish in the Limfjord





The catch of Blue mussels in the Limfjord







Ecological status	Objectives	Present status
Distribution of eelgrass	Widespread at depths exceeding 3-4 m	Not fulfilled
Summer transparency	Minimum 3-4 meters	Not fulfilled
Oxygen	More than 4 mg/l to 10 m of depth all year	Not fulfilled



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- Introduction/Presentation
- What are the problems?
- **What have we done?**
-



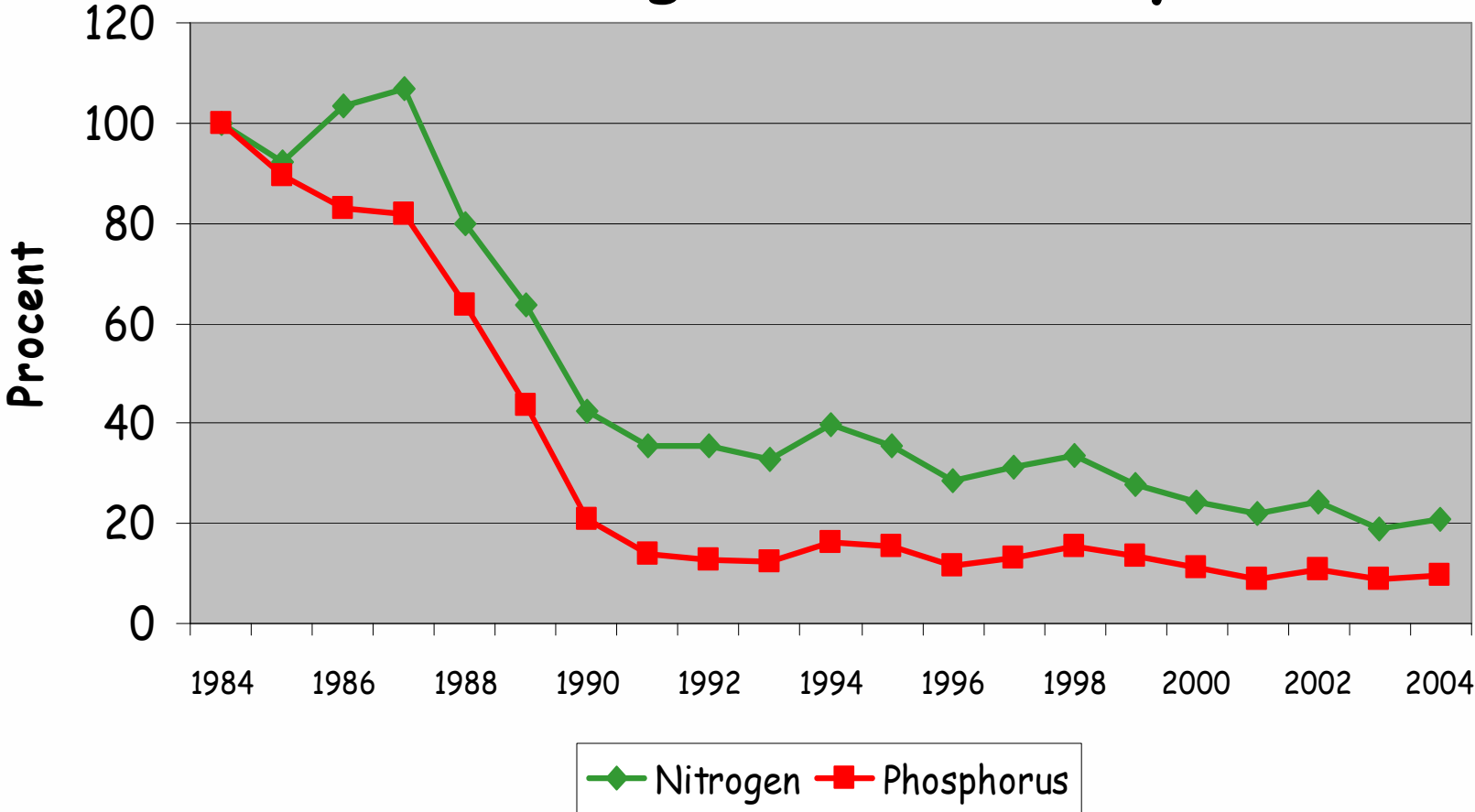
What have we done?

Regional management plans for 30 years especially targeting point sources.

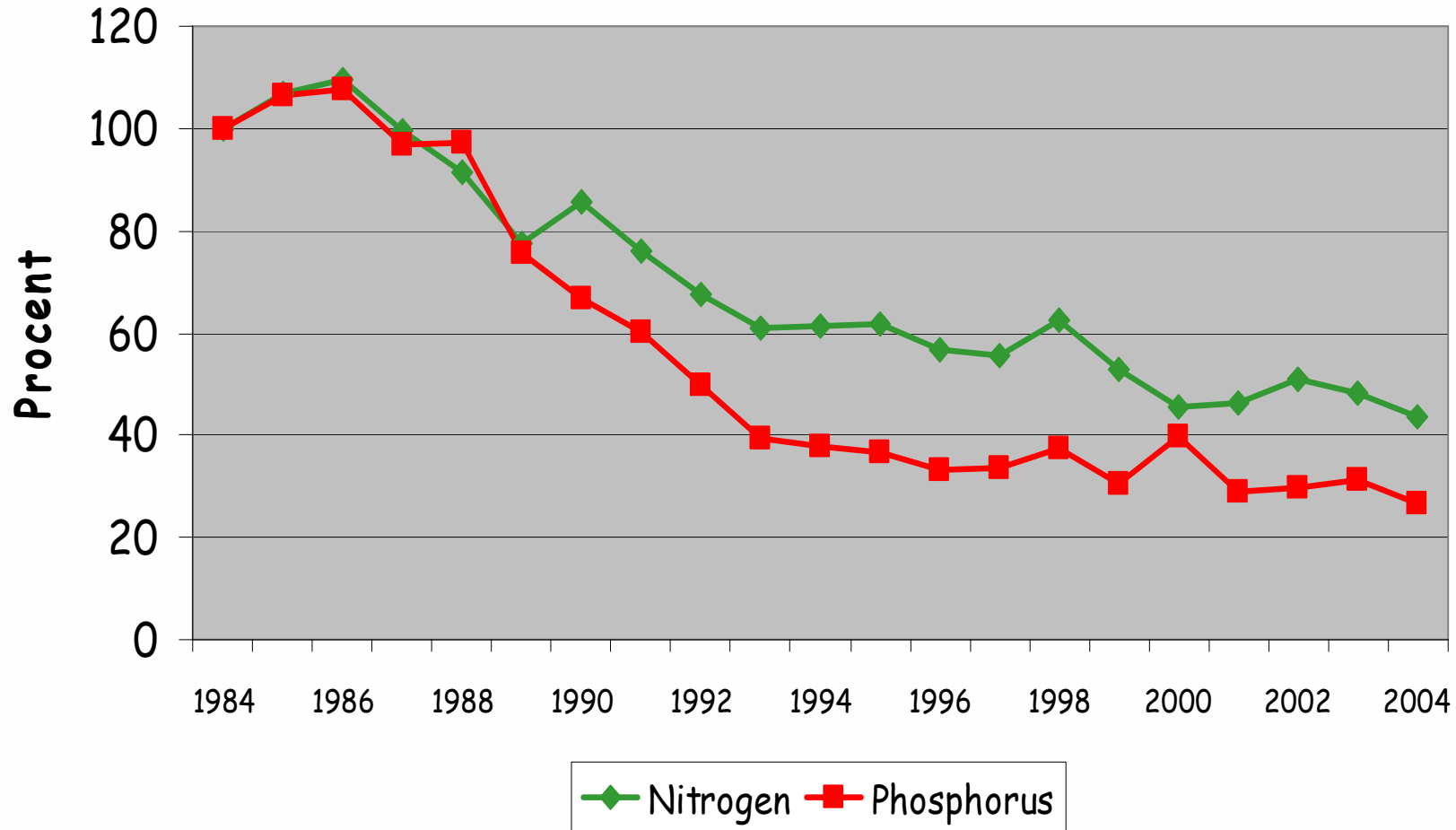
National legislation for 15 years targeting agricultural losses of nitrogen



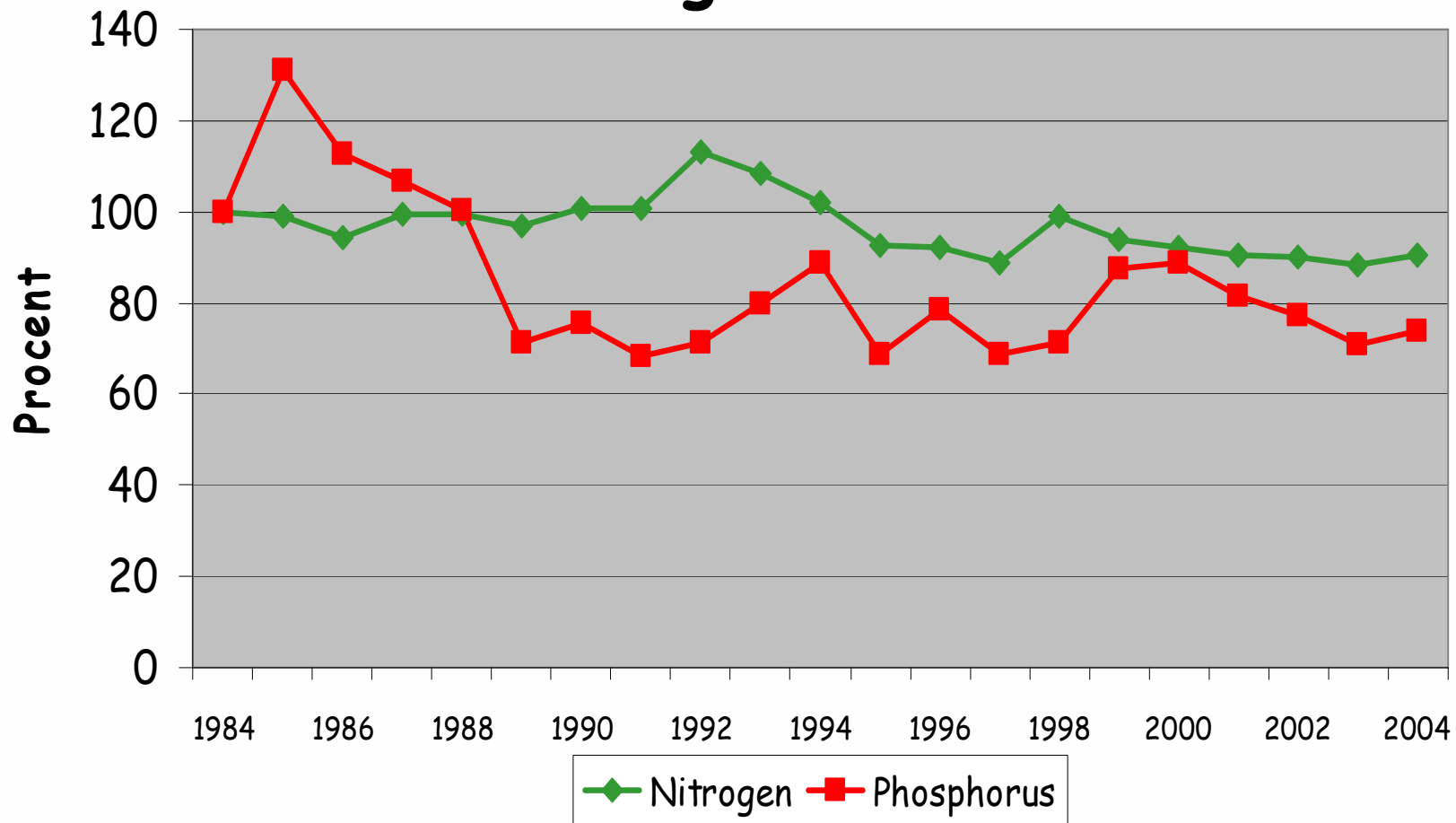
Sewage and industry



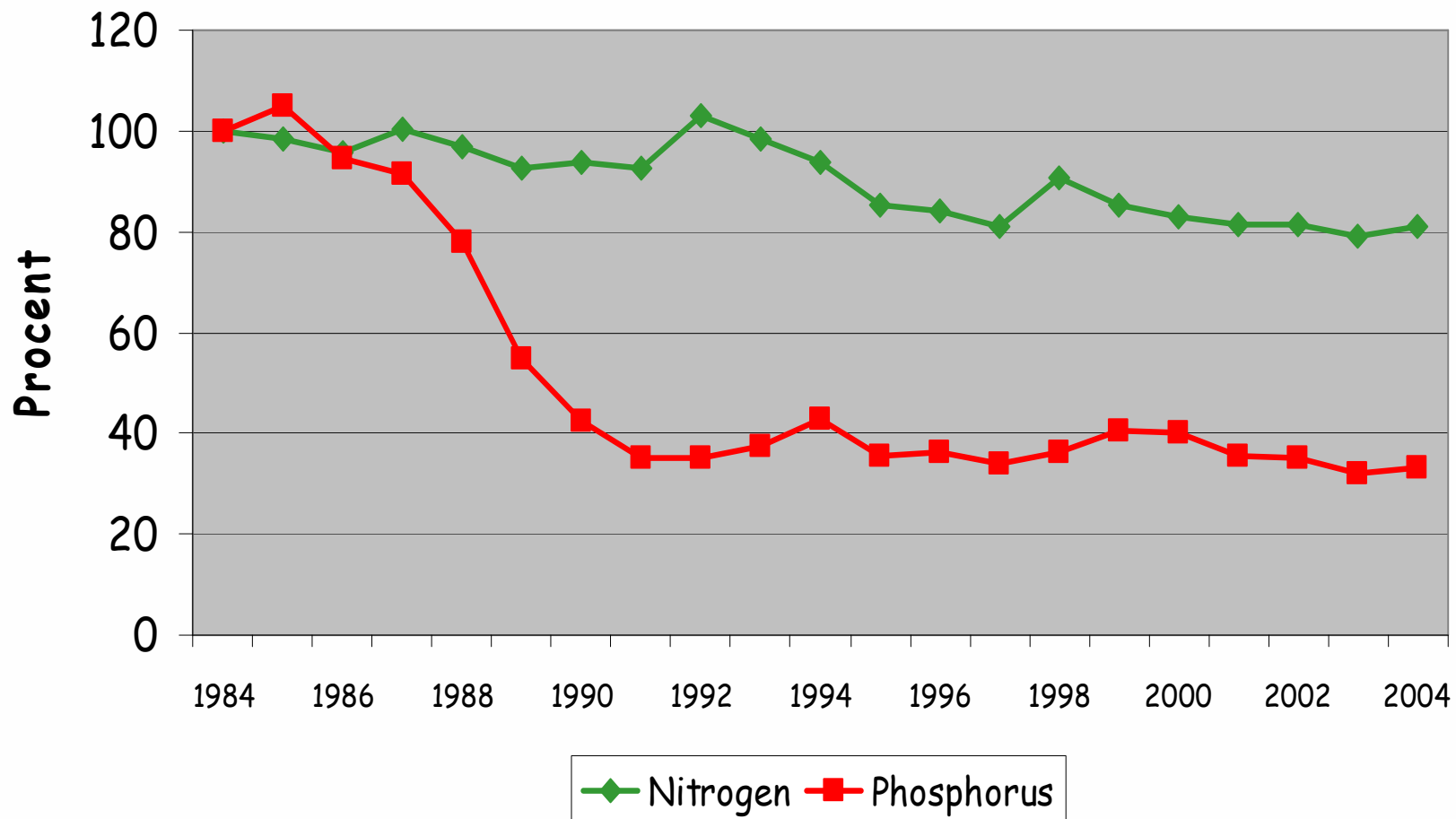
Fish farms



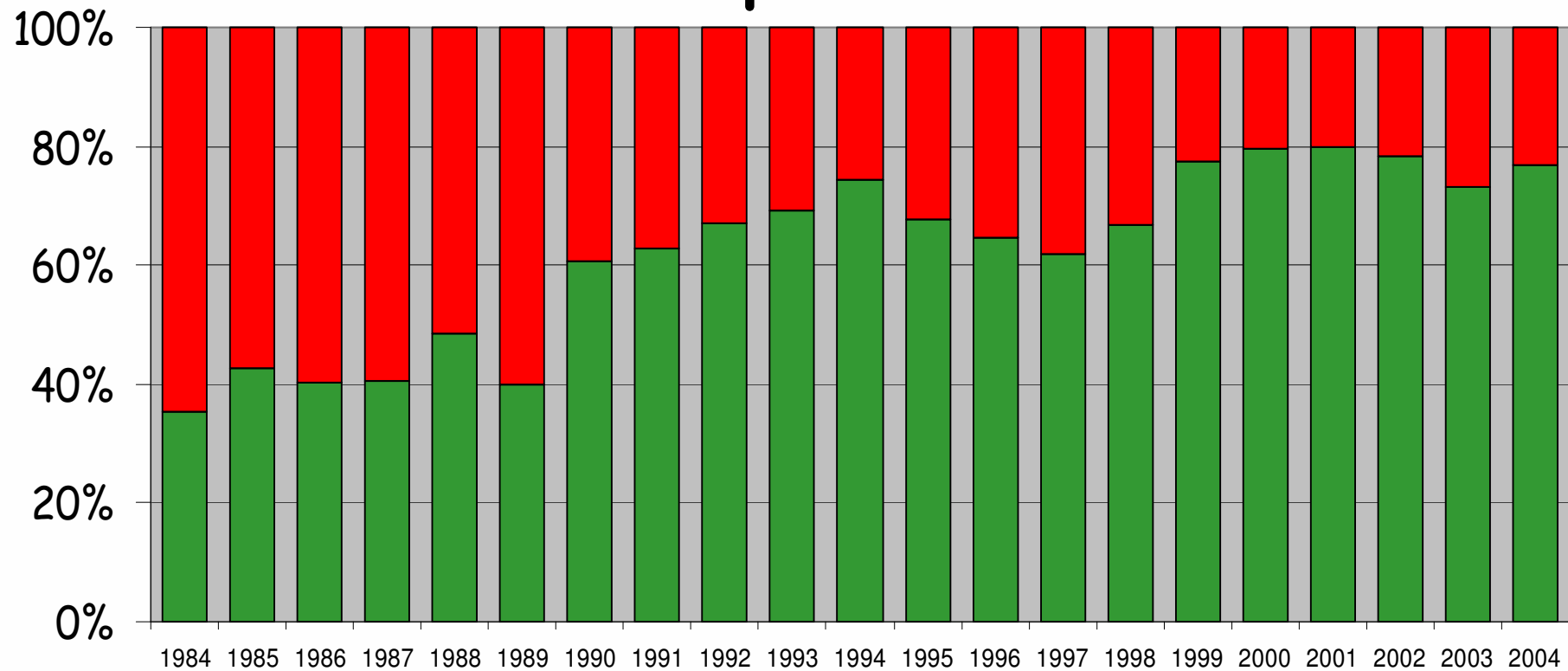
Agriculture



Total



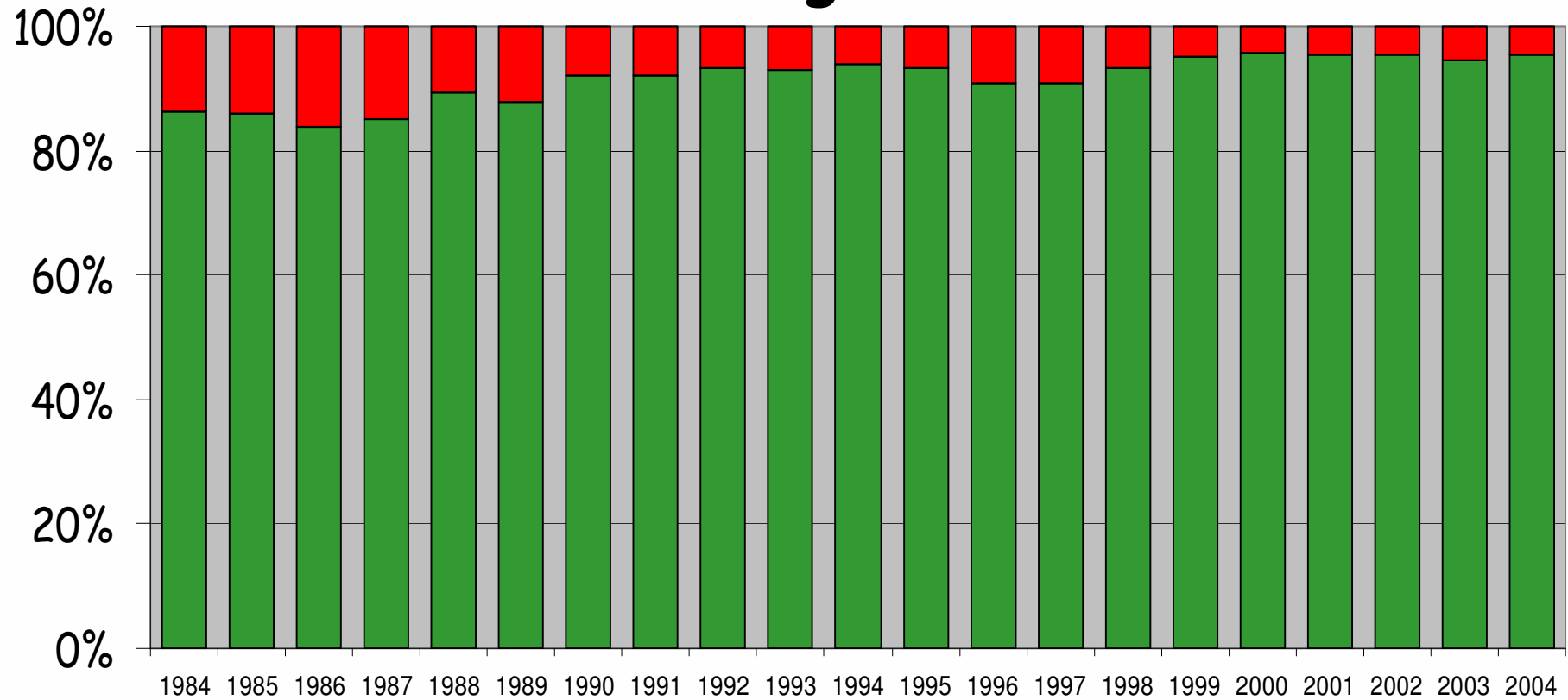
Phosphorus



■ agriculture and background ■ Point sources



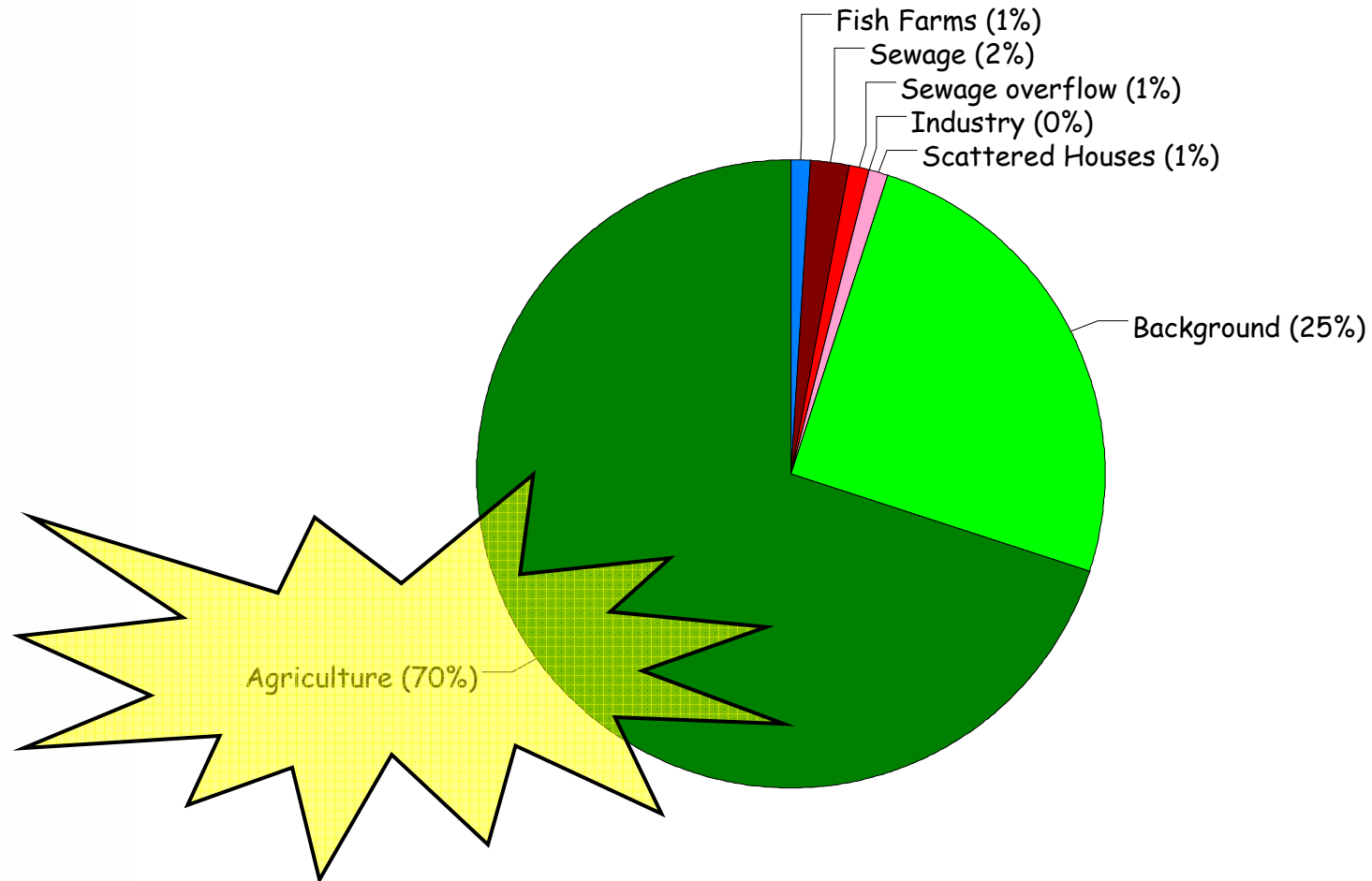
Nitrogen



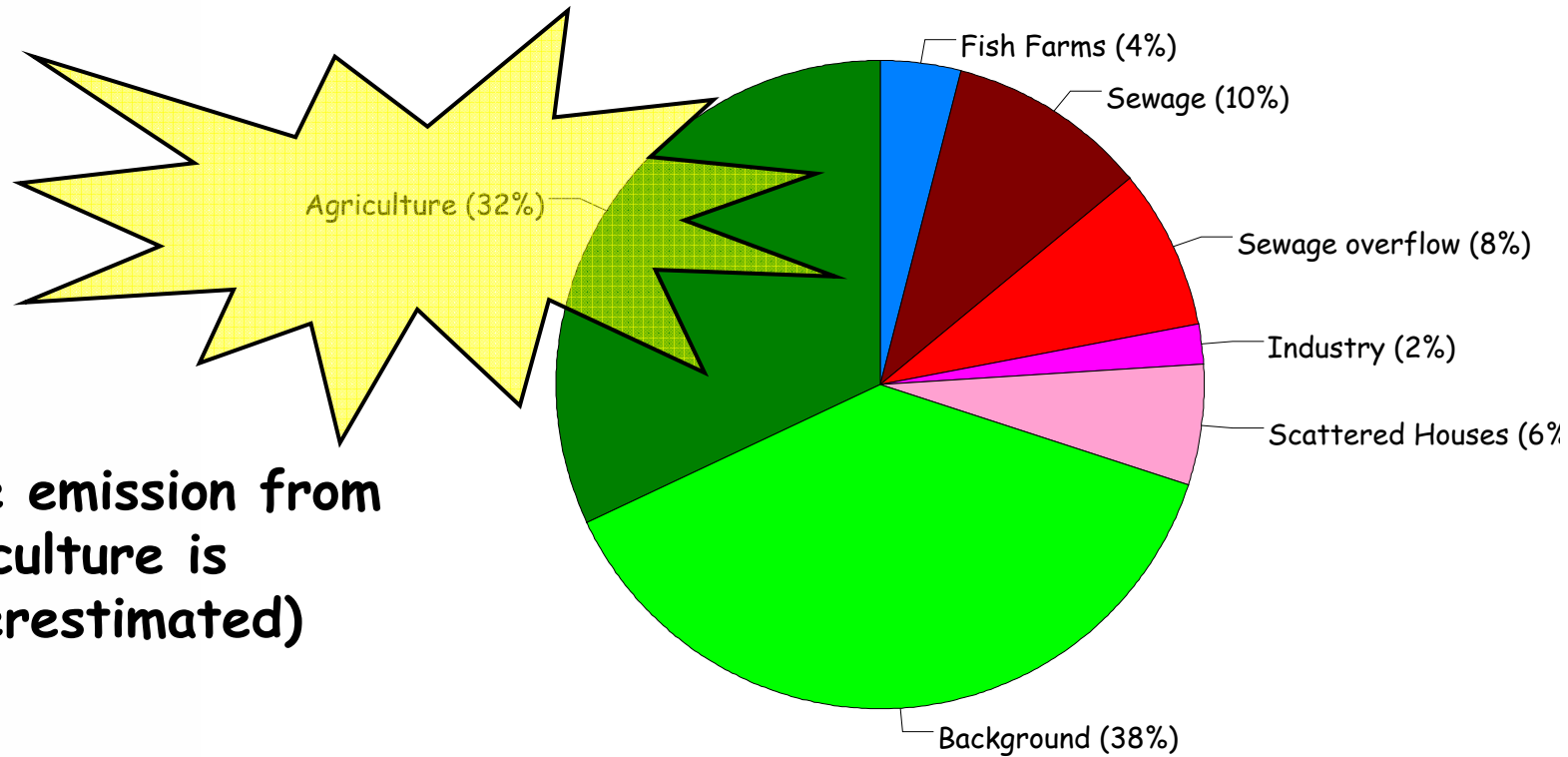
■ agriculture and background ■ Point sources



Nitrogen



Phosphorus



(The emission from agriculture is underestimated)



Achieved improvements 1987 to 2003

- The leaching of Nitrogen from the root zone has decreased 44 %
- The surplus of Phosphorus has been reduced from 25 to 13 kg/ha



Conclusion regarding WFD

- The Danish legislation on diffuse loss of nutrients is in general insufficient to meet the environmental objectives of WFD
- Only voluntary instruments are available for the programme of measures (WFD art. 11) to be produced by the water district authorities



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Management Plan

What are the objectives for good ecological Status?

What are the possible actions?

- Sewage; overflows, treatment plants, rural areas.
- Fish farms; best practice, lower production.
- Agriculture; best practice, lower production.
- Creation of wetlands.
- Plantation of forest.
- Production of shellfish.

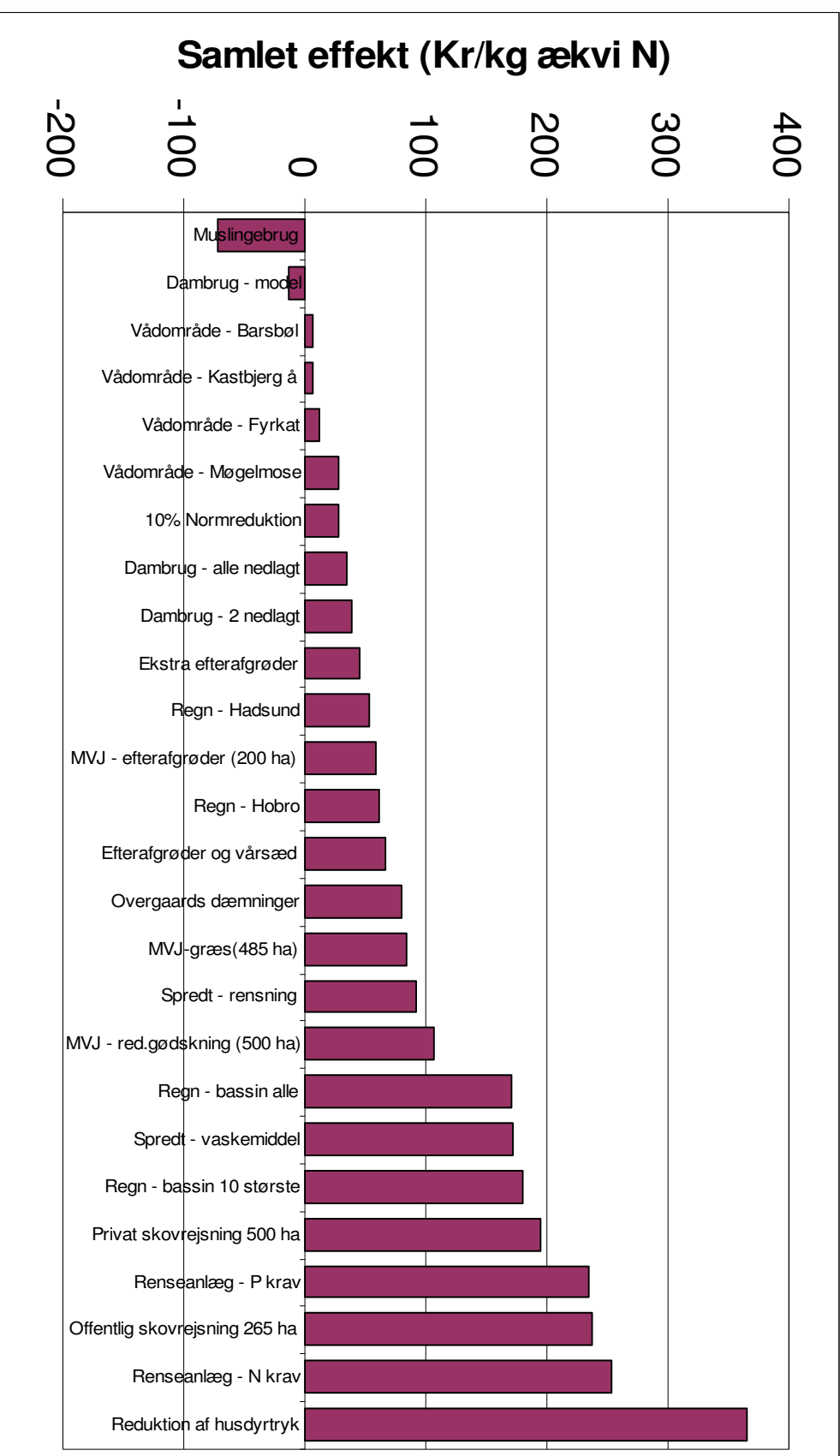
Cost effectiveness analysis of possible actions

Public debate

Political decision



Cost effectiveness analysis



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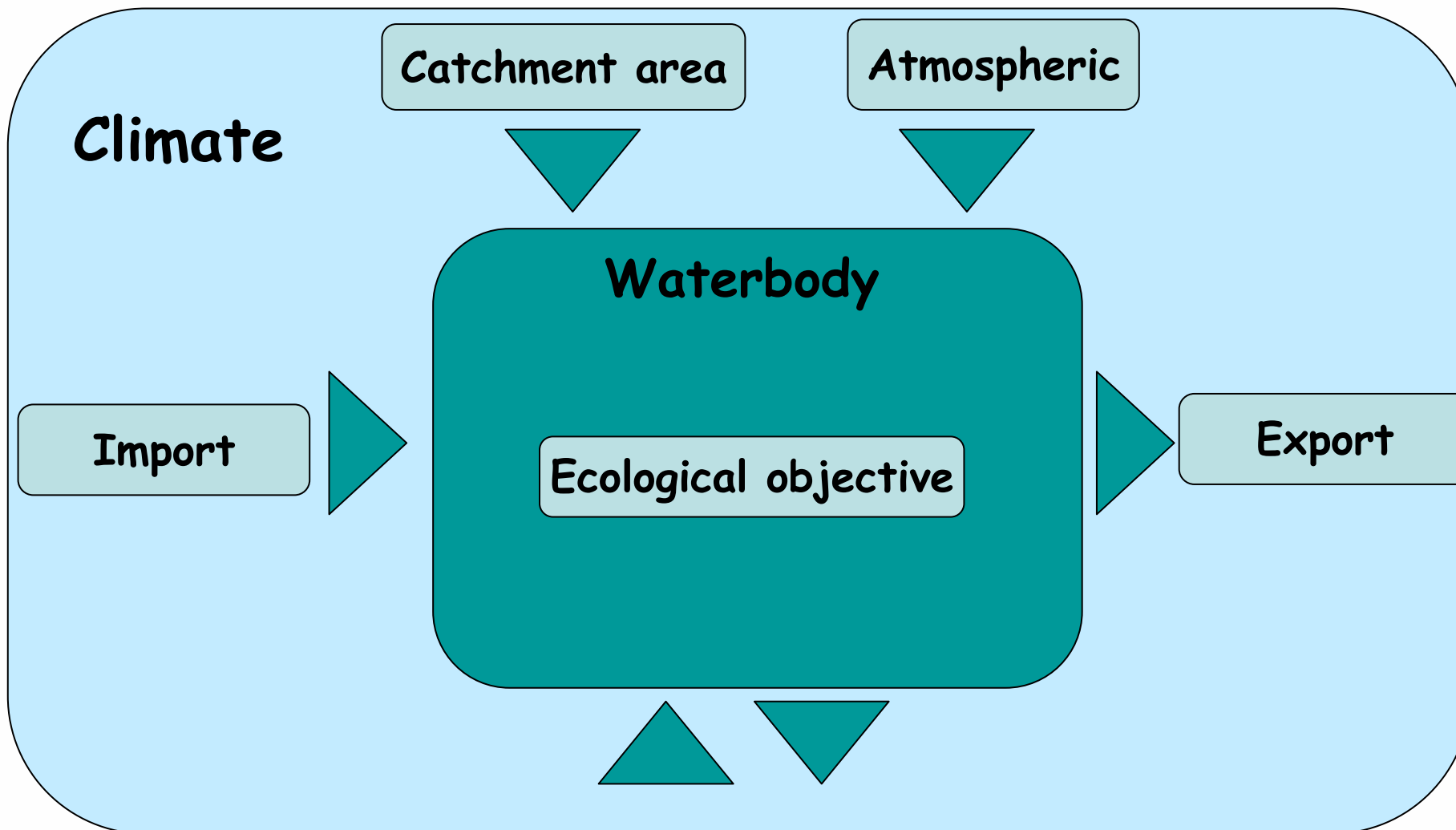


What are the main problems just now

Ecological modelling must give us the objectives for good ecological status and the allowed emission of nitrogen and phosphorus.

We need at least 8 different models.





What are the main problems just now

Delayed responses in river transport of nitrogen.

Different reduction rates from the root zone to the rivers.

Different losses of phosphorus by erosion and leaching.

The spatial distribution of agriculture

Global warming



NO₃-N, summer median (1/5 - 31/8)

