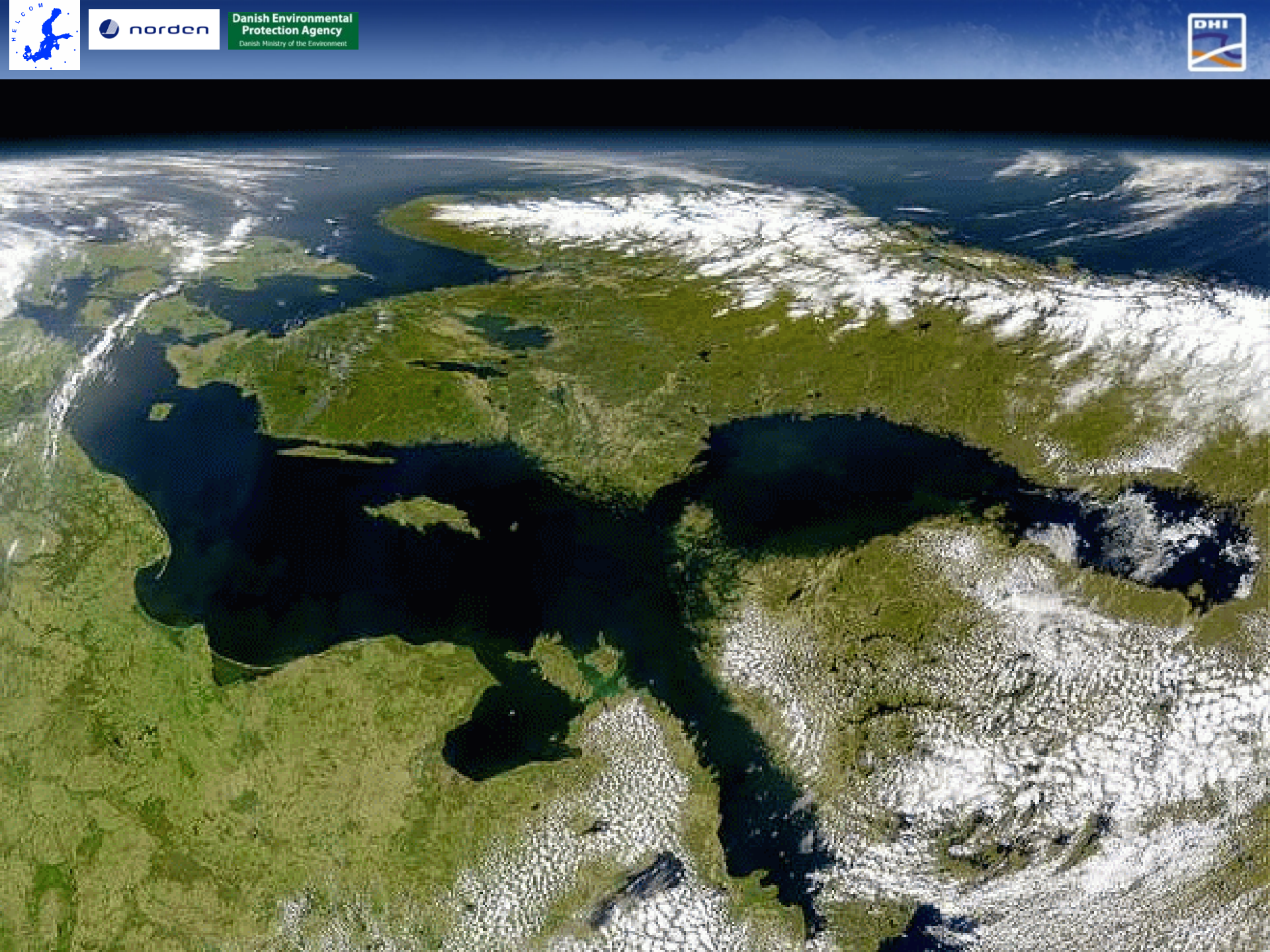
Eutrophication of the Baltic Sea – the unsolved problem?

CCB/PKE/GWP Conference
”Agriculture – key sector responsibility for the Baltic Sea eutrophication”

3-4 November 2010, Warzaw, Poland

Gunnar Norén
CCB Executive secretary


HELCOM
norden
Danish Environmental Protection Agency
Danish Ministry of the Environment
DHI

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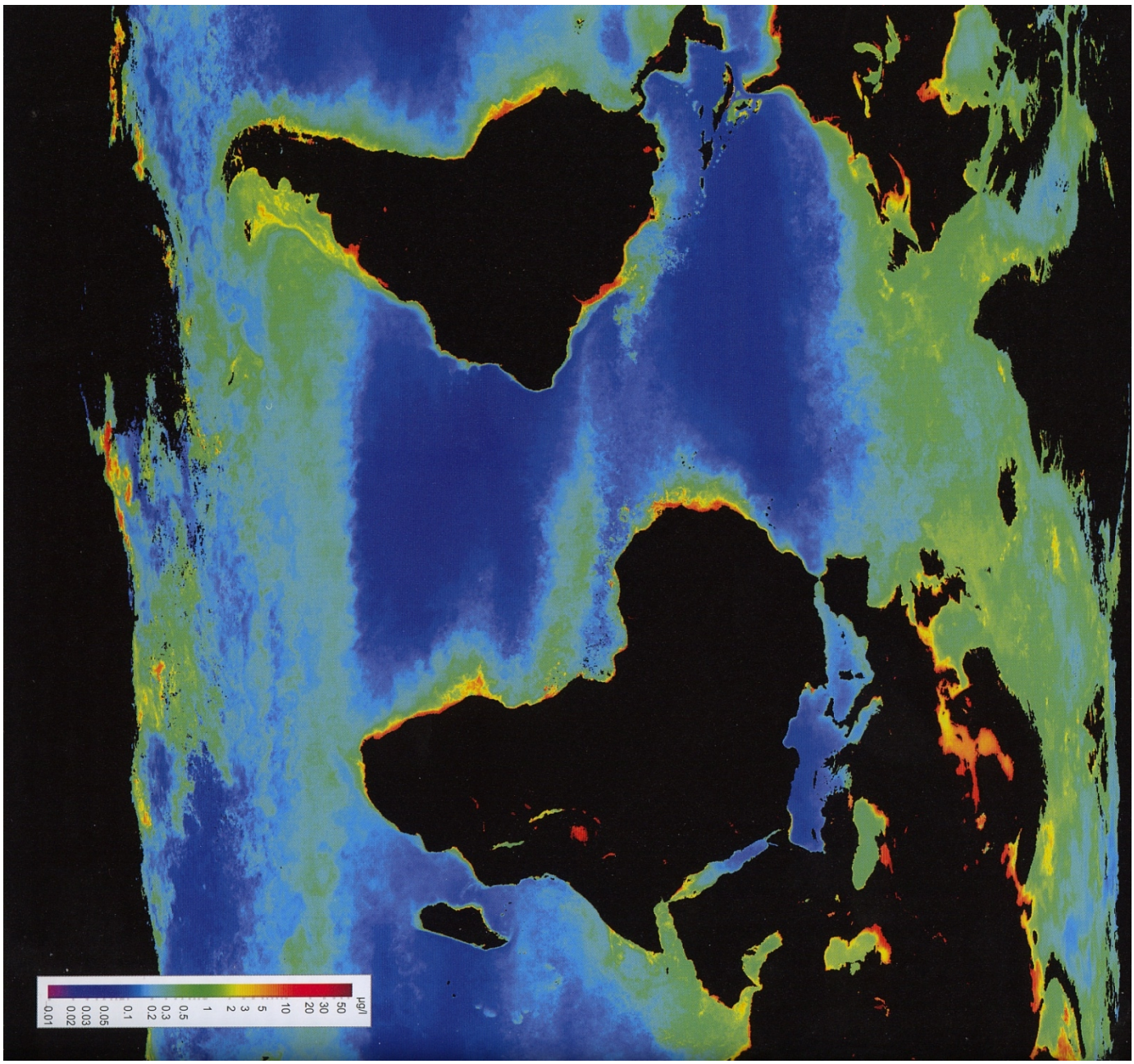

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What is eutrophication ?

-Excessive amounts of nutrients, mainly nitrogen (N) and Phosphorus (P) but also organic matter (represented by carbon (C),
build up in aquatic ecosystems and cause accelerated growth of algae and plants, often resulting in undesirable effects.

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Why is Baltic Sea sensitive to eutrophication ?

-nearly enclosed brackish-water area

-seawater renewal through narrow Dansih Straits and Sound (retention time 30 years)

-vertical salinity stratification of the water masses (halocline) prevents vertical mixing of the water, and prevents ventilation and oxygenation

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How is eutrophication manifested in the Baltic Sea ?

-nutrient enrichment, increased nutrient concentrations

-increase in phytoplankton primary production

-growth of short-lived macroalgae

-turbidity in the water – decrease in light penetration

-reduce colonization depth of macroalgae and seagrasses (e g bladder wrack)

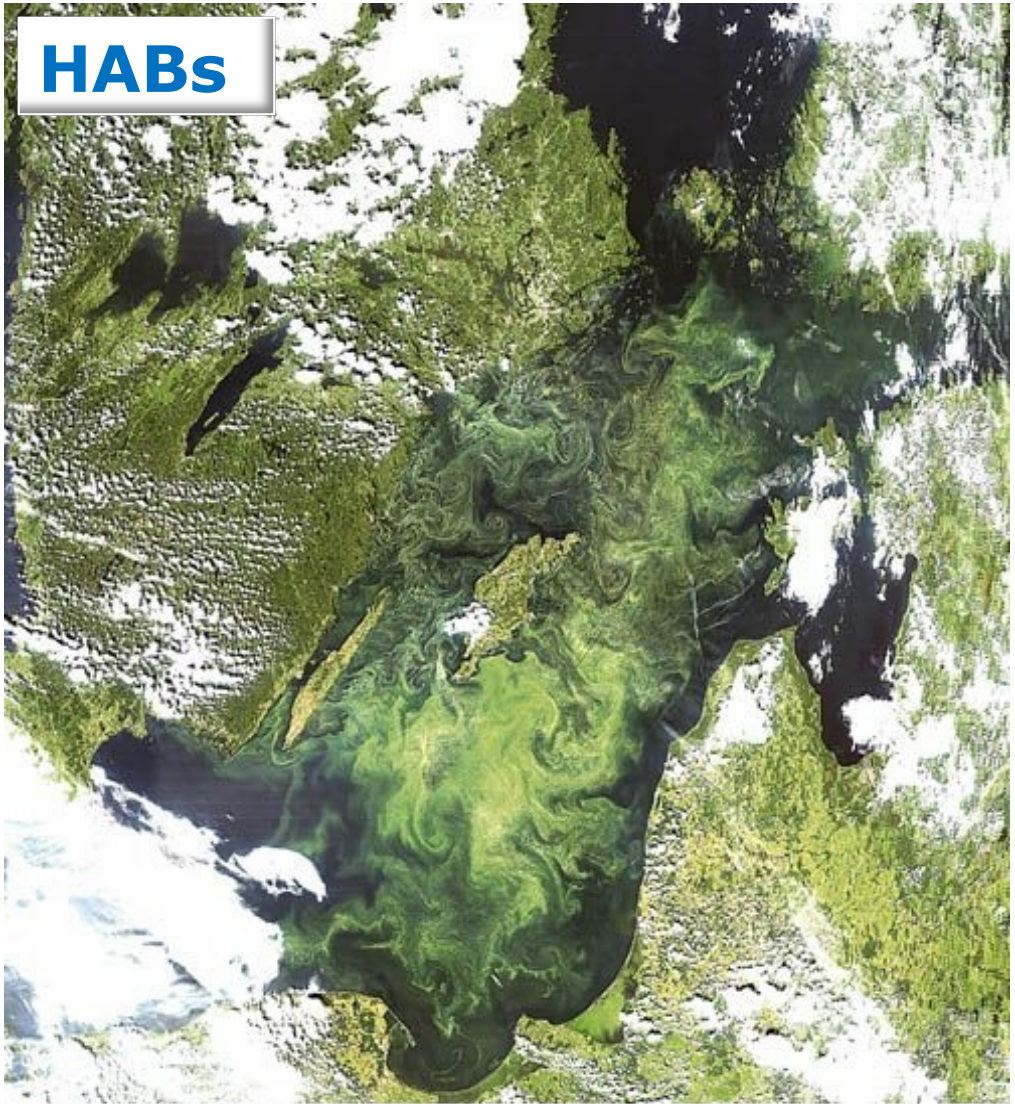
-changes in dominance of various species groups

-increase sedimentation of organic matter to seabed

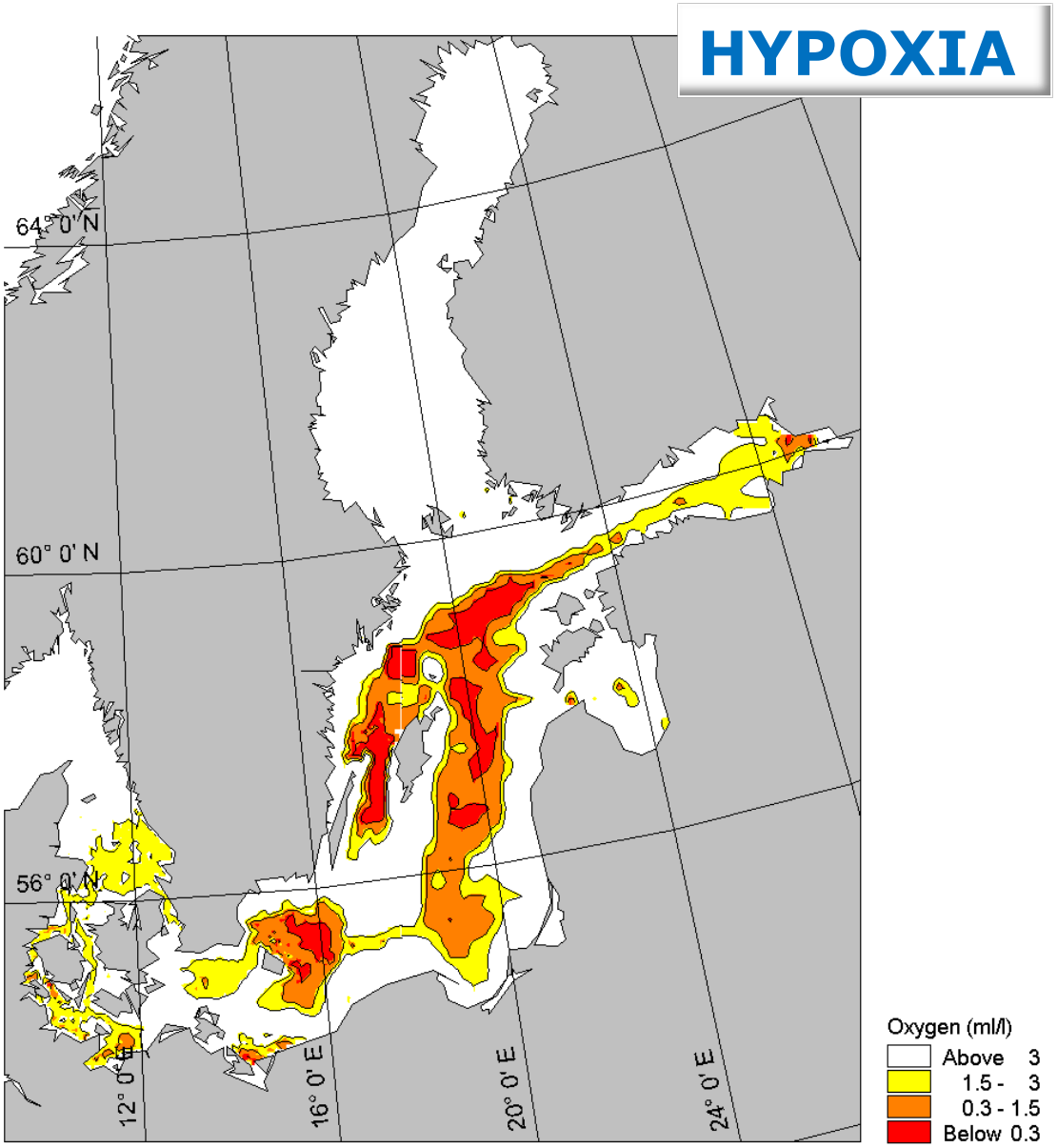
-oxygen depletion in sediments & bottom water (hypoxia)

-loss in benthic/bottom-living animals and fish

Eutrophication – at the surface



Eutrophication – below the surface



Oxygen conditions in bottom waters

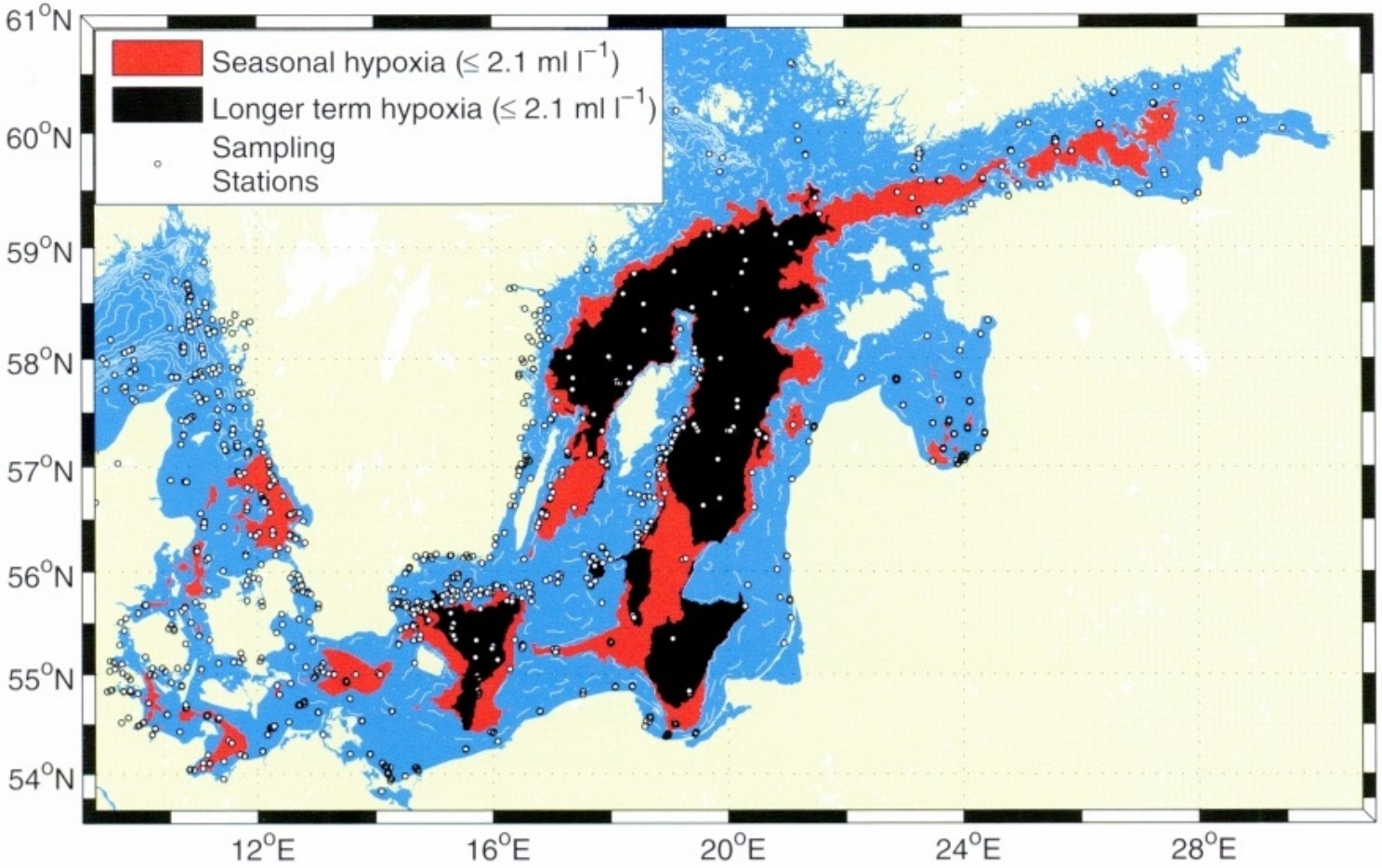


Figure 8. Extent of seasonal hypoxia (red) and longer-term hypoxia (black) during 2001–2006.

HEAT – an example, one out of 189

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Figure 7. Free sulphide at the surface of the water in Odense Fjord, released because of hypoxia.

Changes in food-web

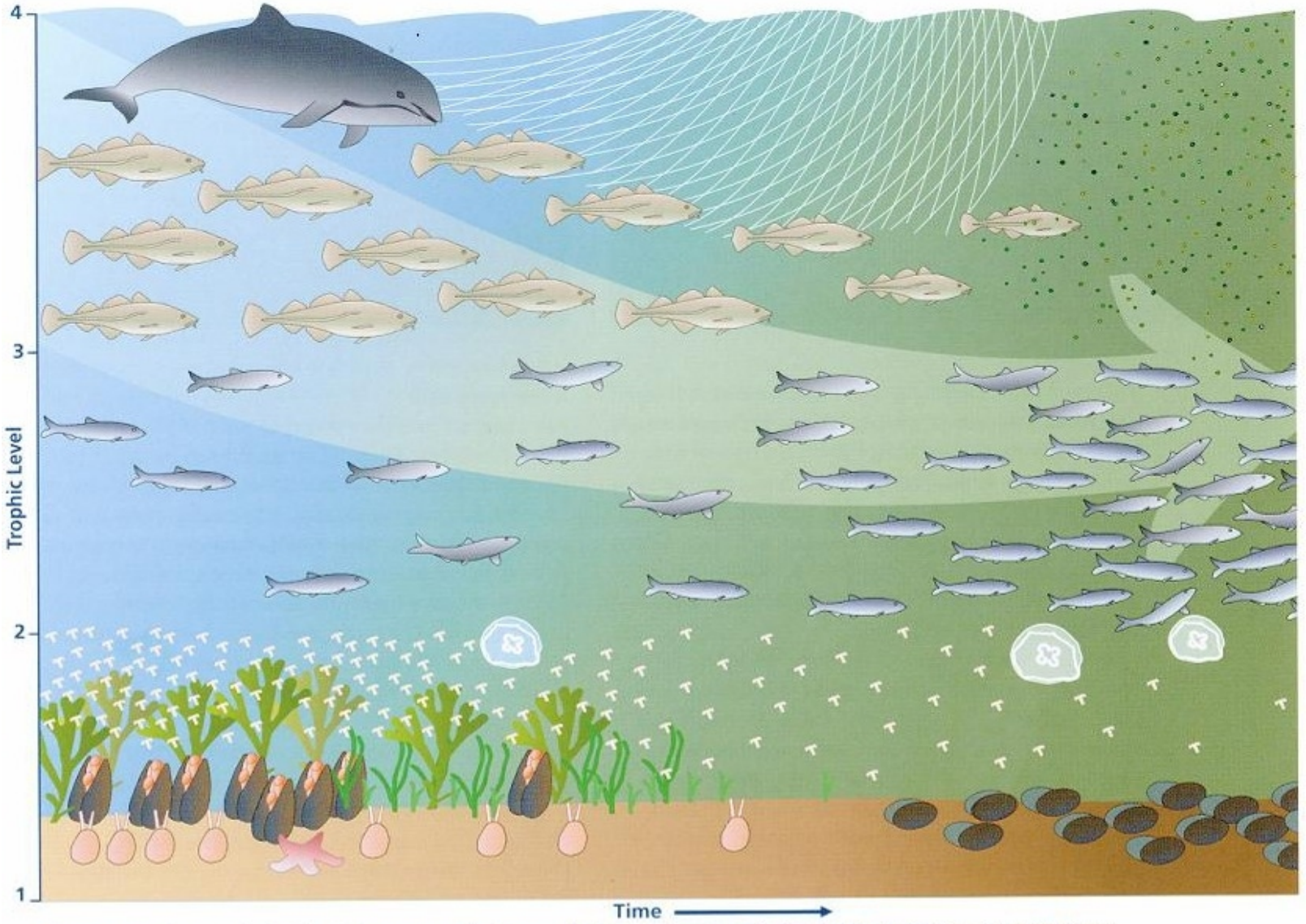
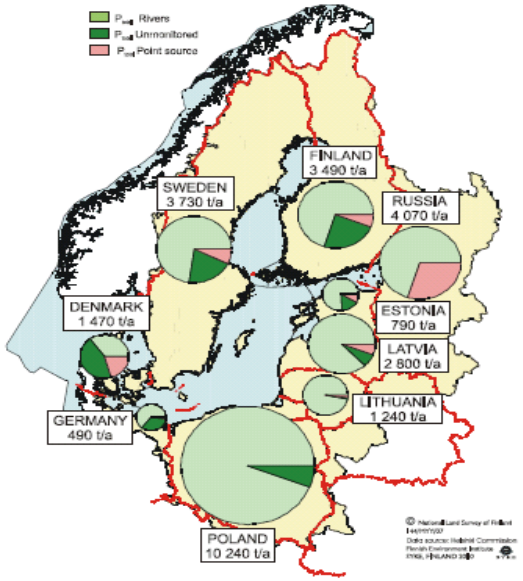


Figure 2.12 Changes in food-web structure due to overfishing and eutrophication in the Baltic Sea. Adapted from Watson and Pauly (2001).

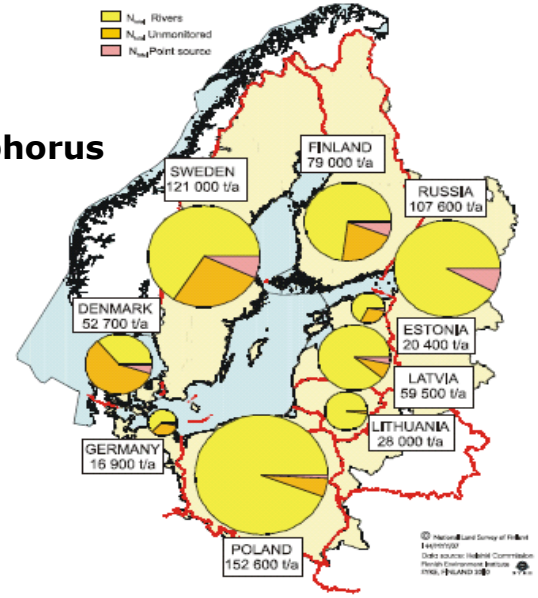
Eutrophication – major Baltic problem

- Change into eutrophic marine environment
- High nutrient inputs
- Imbalanced ecosystem
- Major source – land-based pollution
- Diffuse sources, especially agriculture biggest polluter
- Pollution from non-HELCOM countries significant

Nitrogen



Phosphorus



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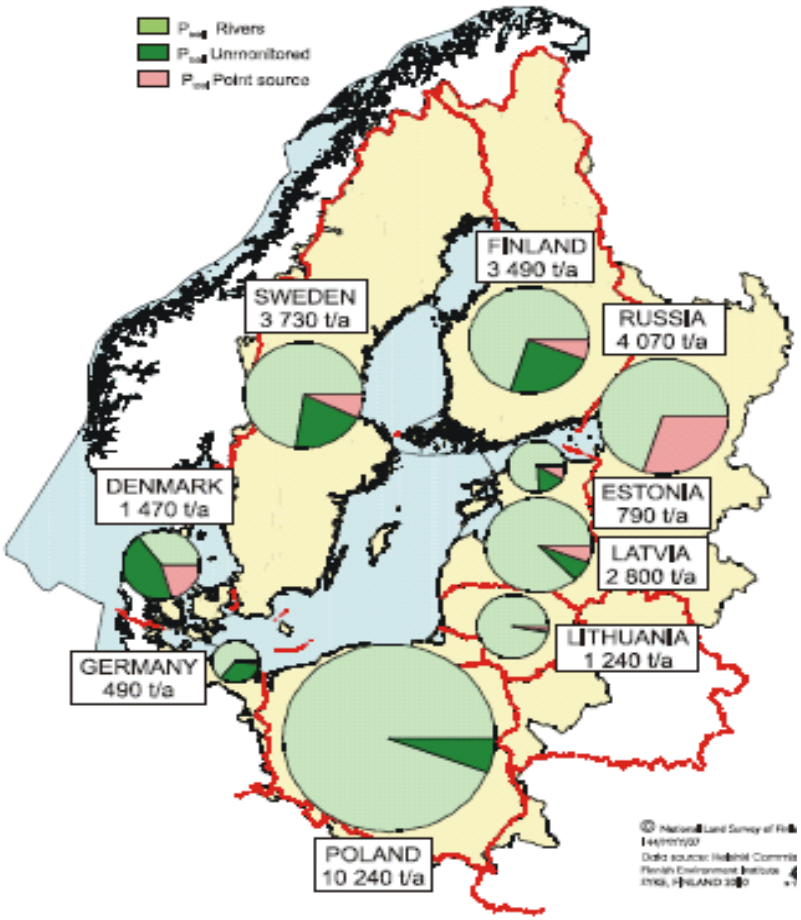
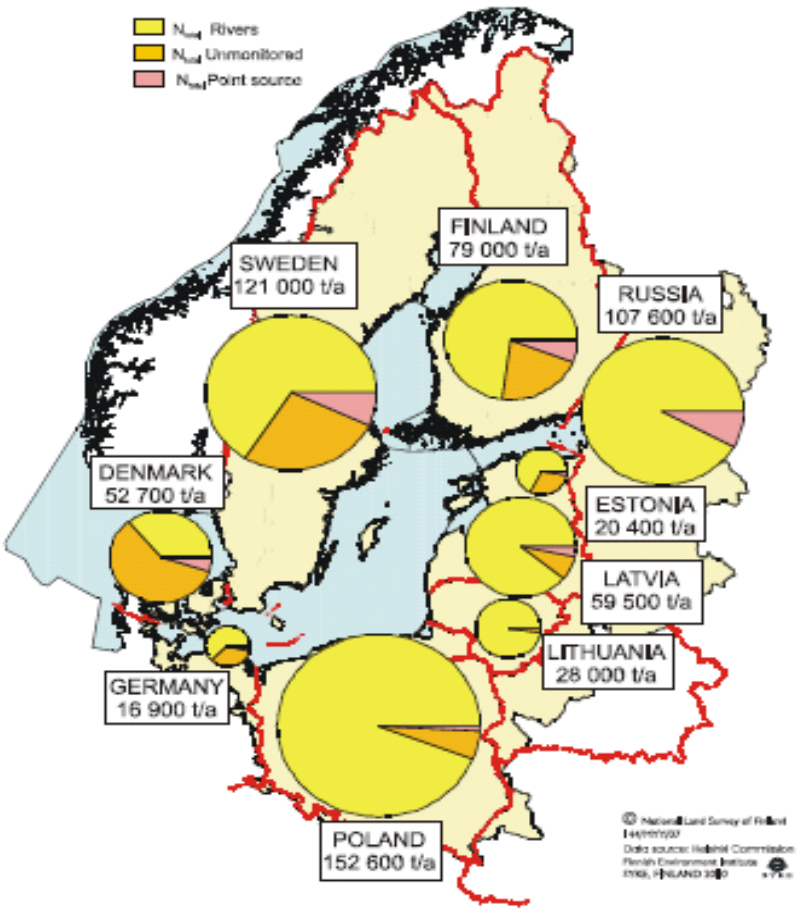
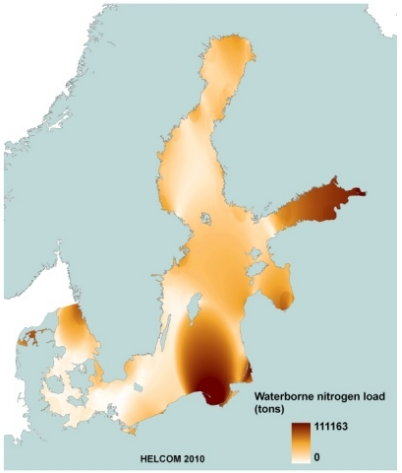
Phosphorus

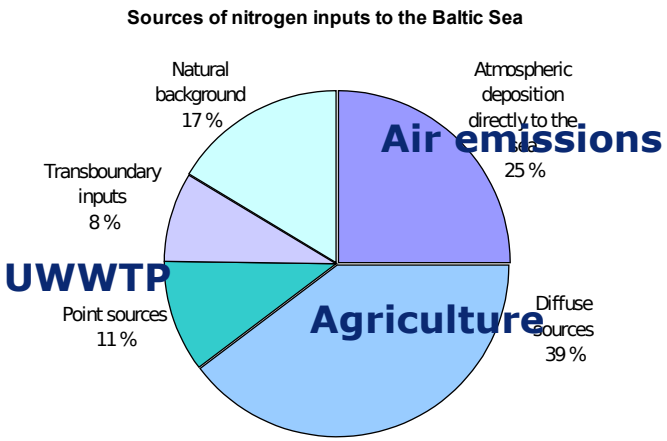


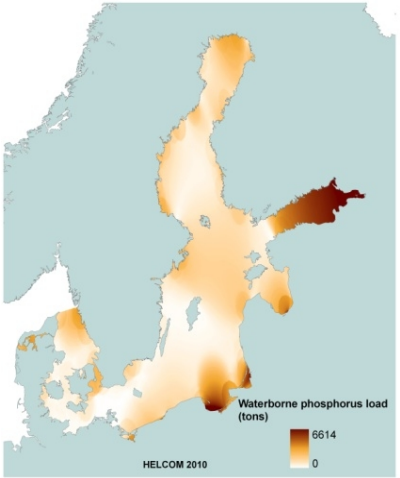
Nitrogen

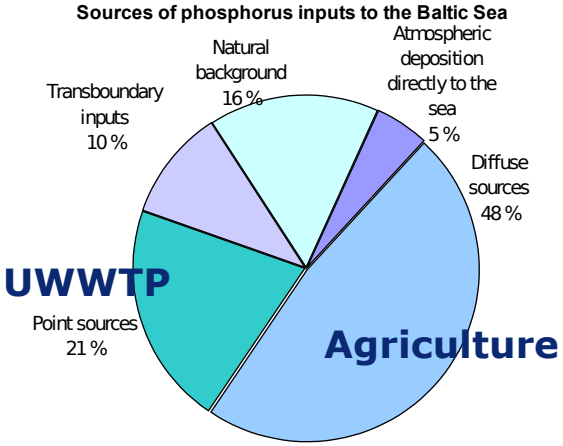


Eutrophication: Inputs of nutrients









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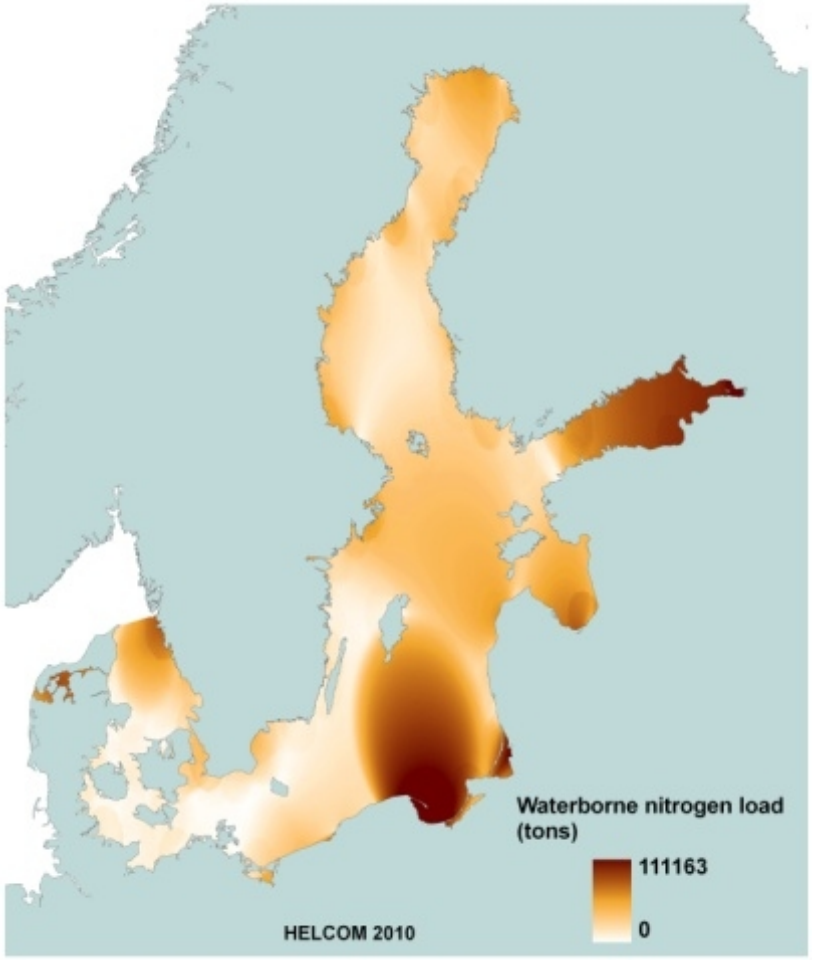
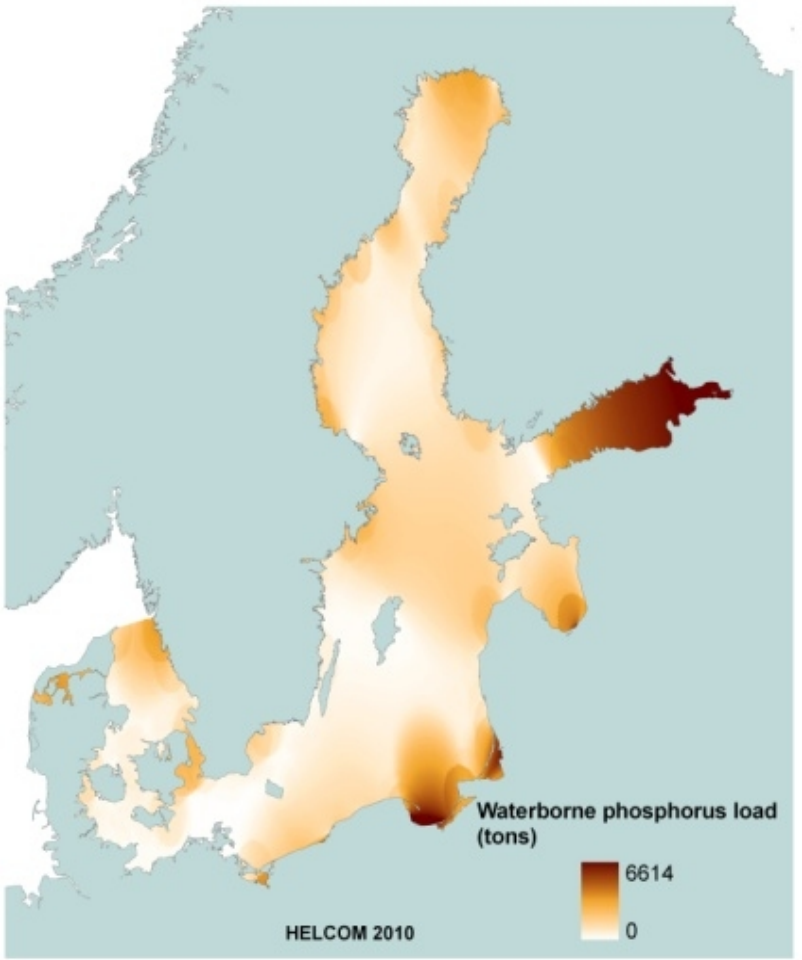
Nitrogen



Phosphorus



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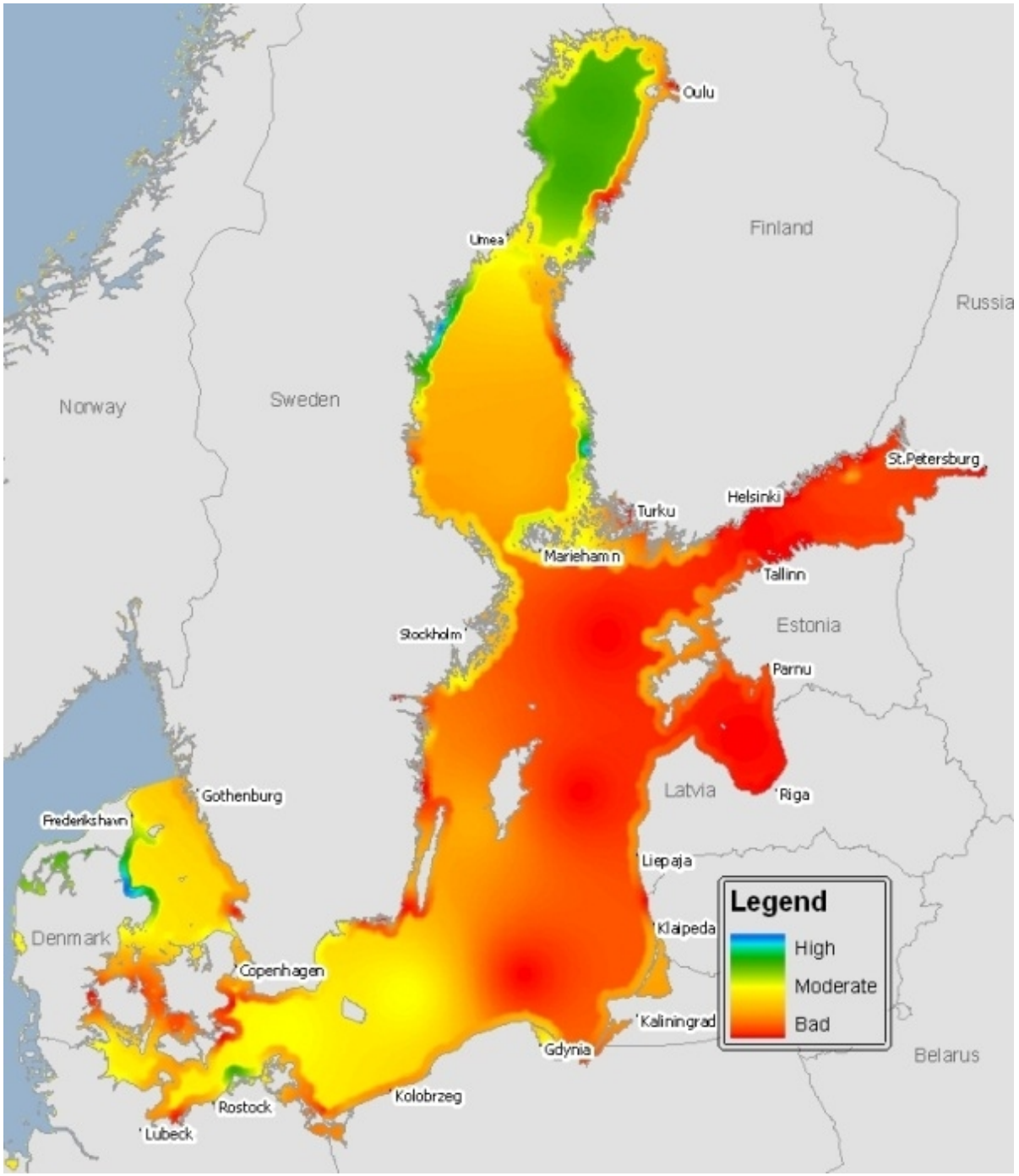
HELCOM Integrated Classification Of Eutrophication Status in the Baltic Sea

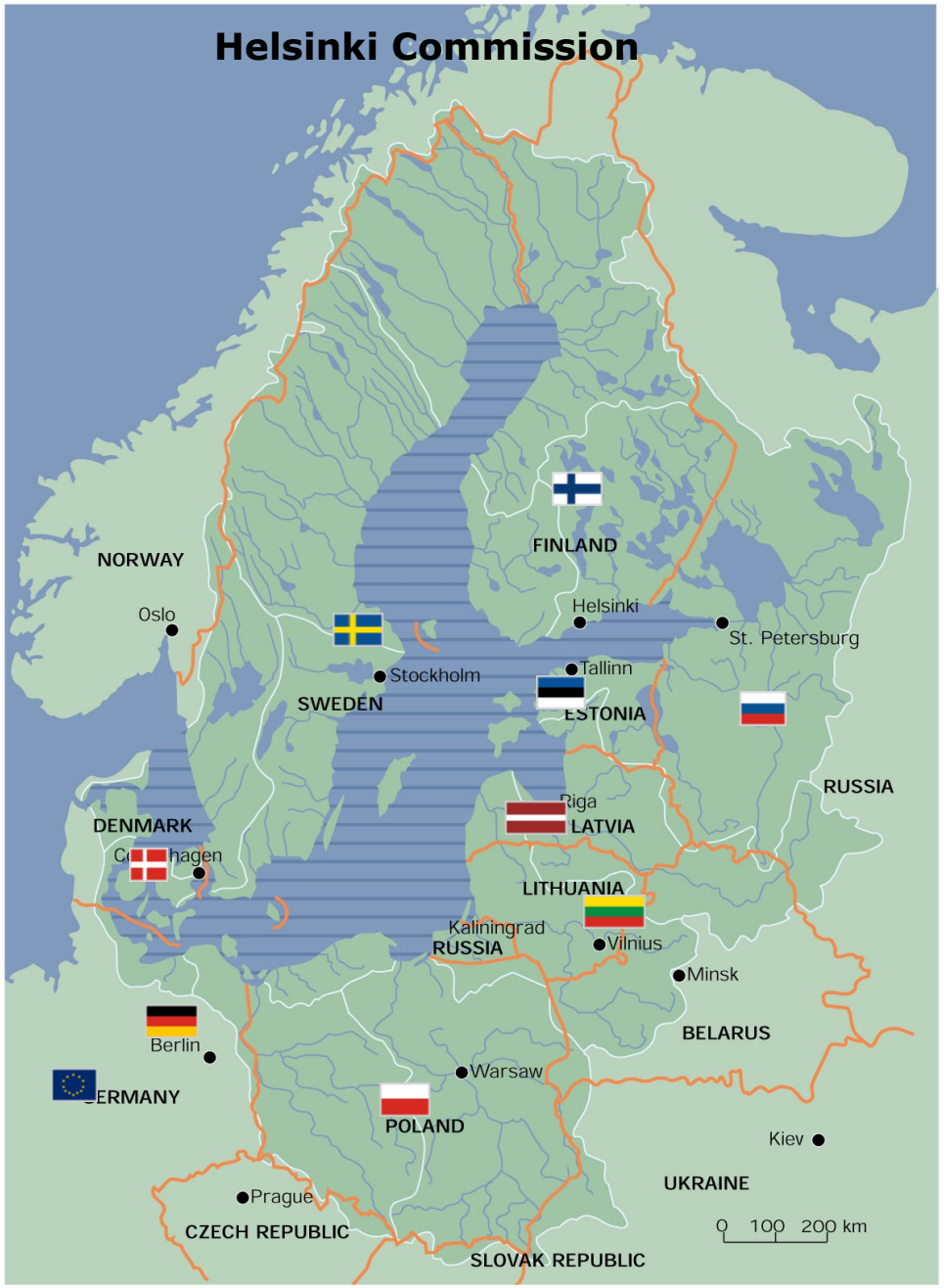
Green areas – Areas unaffected by eutrophication

Yellow, orange and red Areas affected by eutrophication



HELCOM

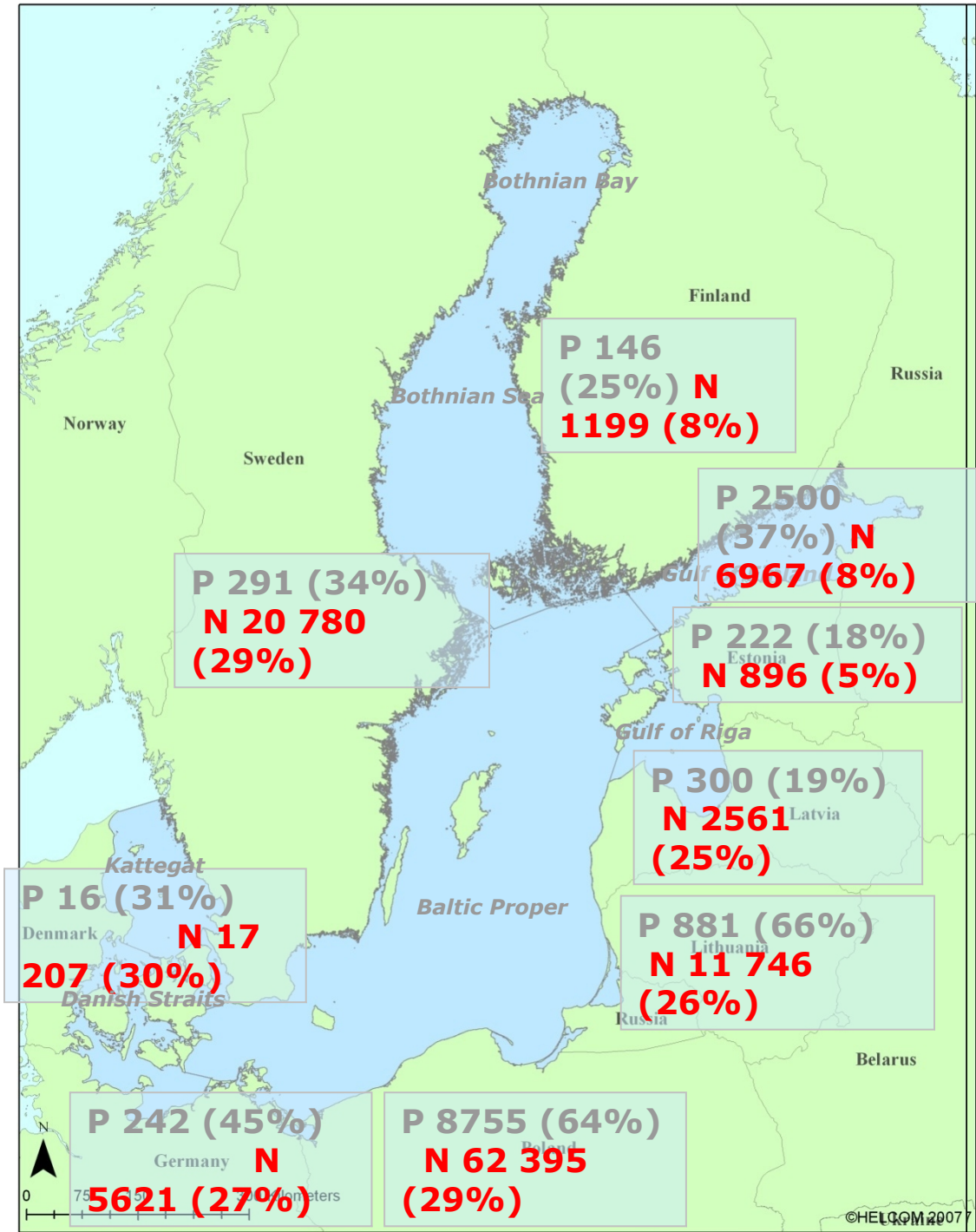
- intergovernmental organisation
- nine coastal countries and the EU
- protection the marine environment
  - pollution prevention,
  - nature conservation,
  - safety of navigation
- watershed approach
  - 14 countries
  - 85 million people
- voluntary commitment and legal obligation



Total reductions needed (tonnes/year)

Reductions/ sub-basin (tonnes/year)

Reductions/ country (tonnes/year)



HELCOM Baltic Sea Action Plan

Actions addressing Eutrophication

1. **Point sources / Municipal sewage**
   - **possibilities to speed up implementation of the existing EU legislation (e.g. UWWTD);**
   - **advanced HELCOM requirements in nutrient removal from municipal sewage**
   - **more stringent requirements for wastewater discharges in scattered areas and for single houses**
   - **introduction of phosphorous-free detergents**
   - **sewage from shipping**

1. **Diffuse sources / Agriculture**
   - **a palette of measures in agriculture to choose from according to the sub-regional needs**
   - **new agricultural hot spots**

1. **Reduction of airborne load**
   - **Control/reduction of NOx emissions from ships**

HELCOM and EC, regulation frame

Category of UWWTP, p.e.	P		N		BOD		COD	
	EU UWWT	HELCOM	EU UWWT	HELCOM	EU UWWT	HELCOM	EU UWWT	HELCOM
>100 000	80% 1 mg/l	90% 0,5 mg/l			70-90% 25 mg/l	80% 15 mg/l		
10 001 - 100 000	80% 2 mg/l	90% 0,5 mg/l			70-90% 25 mg/l	80% 15 mg/l		
2 000 – 10 000	secondary treatment	80% 1,0 mg/l	secondary treatment	30 %	70-90% 25 mg/l	80% 15 mg/l	75% 125 mg/l	
300 – 2 000		70% 2,0 mg/l		30 % 35 mg/l		80% 25 mg/l		
Up to 300		aiming 70%		aiming 29 %		aiming 80%		

Agriculture:
Amended Annex III of the Helsinki Convention

- **Addressing large agro-industrial cluster**
  - Integrated permits for farms with intensive rearing of animals(poultry 40 000, pigs 2 000, cattle 400 au)
  - Simplified permit system or general rules for farms bigger than 100 a.u.

- **Environmentally sound manure management,**

  - 9 months manure storage
- **Application rates for nutrients**
  - nitrogen 170 kg/ha
  - phosphorus 25 kg/ha

- **Identification of agricultural areas that are critical for nutrient pollution of the Baltic Sea**
  - Designation of relevant parts of agricultural land as NVZ
  - Performing risk assessments of nutrient leaching from agricultural areas

- **Establishing HELCOM Agricultural / Environmental Forum by 2010**

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AGRICULTURE and EUTROPHICATION

Baltic agriculture – contribute with approx 50 % of the nutrient load (Nitrogen & Phosphorus)

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This conference should contribute to answers/solutions on

***How to minimize/stop leakage of nutrients from agriculture to the Baltic Sea**

Agricultural production – a Systematic Error ?

*Intensive agriculture practices

*Specialisation of agricultural production
(crop production farms)
(animal production farms)

-create inbalance in nutrient use

-create surplus of nutrients on agricultural land

- such farms, incl. its vicinity areas, are not Nutrient-balanced

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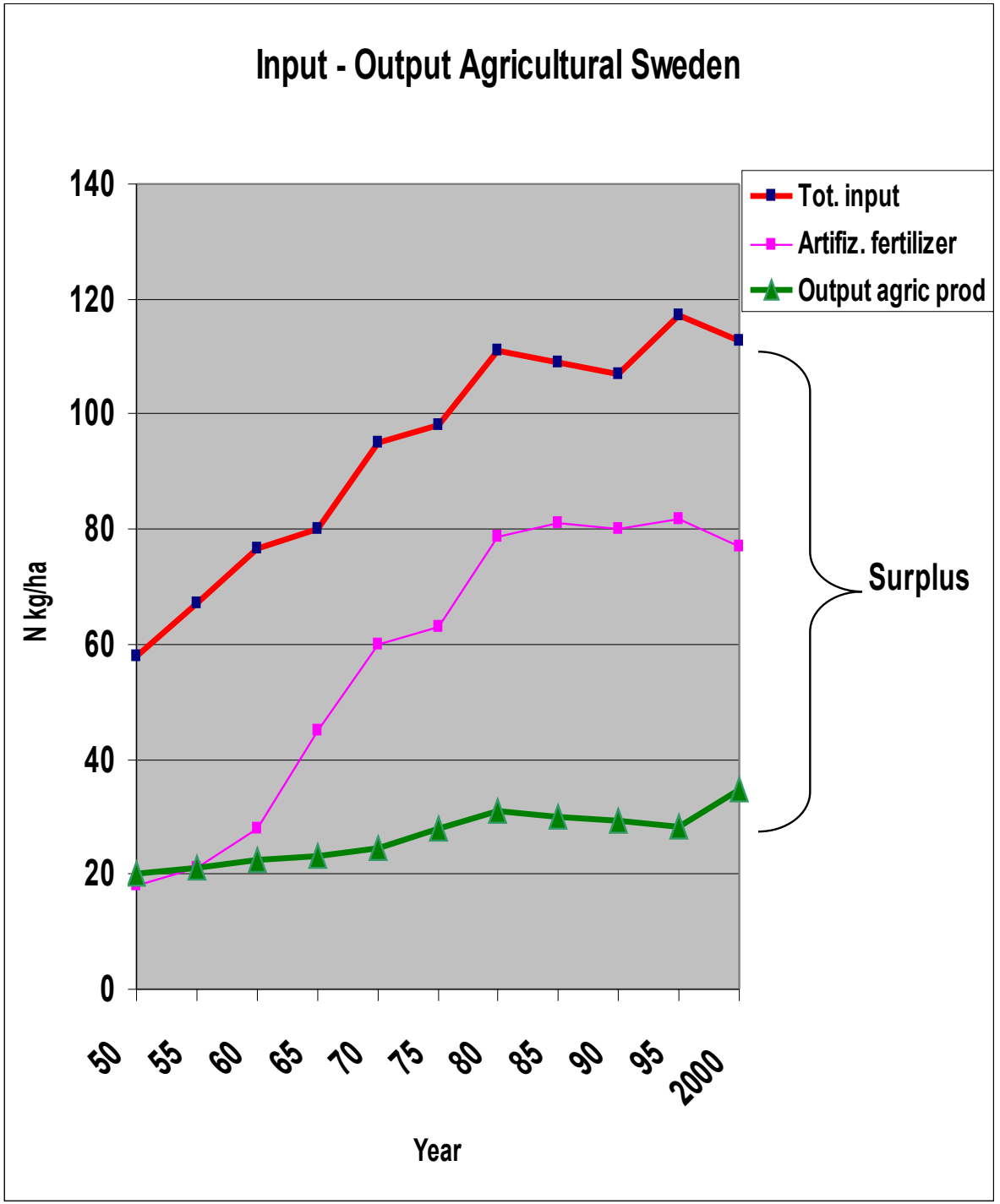

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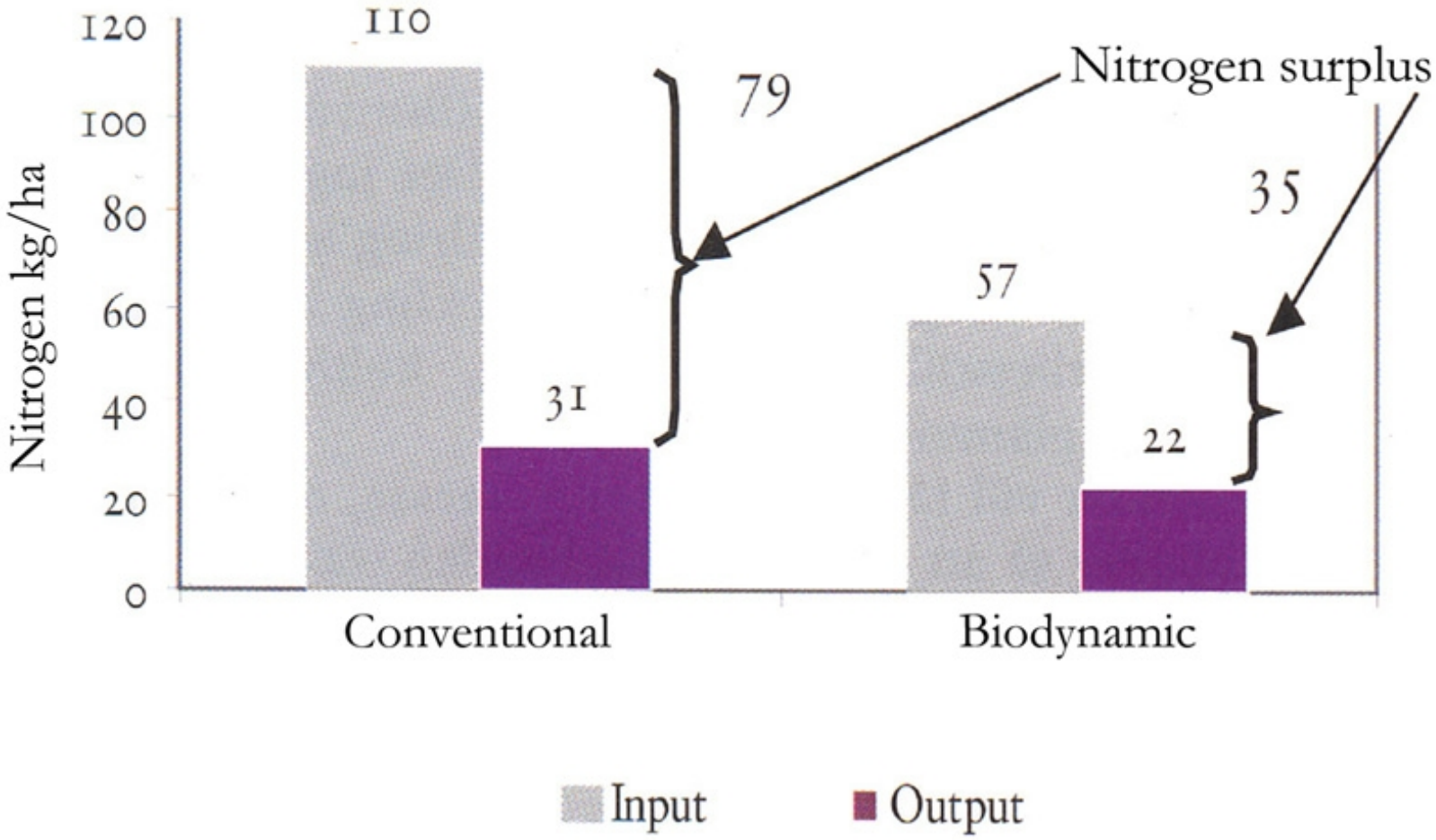
Nitrogen balance in Swedish agriculture 2003



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Future development of Baltic agriculture

Two directions:
- Quality production based on nutrient-balanced farming
- Quantity production based on intensive use of fertilizers and pesticides

Growing trend for industrial/intensive agriculture and specialisation into either
crop producing or animal breeding farms

has become a ***systematic error*** in terms of environment protection and sustainability – "big nutrient surplus"

Development in new EU-member states

-Present CAP-scheme favours farmers in the new EU-member states to intensify production schemes to compete on the common market.

-Extensive farming, still an important section of agricultural production in new EU-member states is decreasing

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Scenarios for Baltic region agriculture

More intensive farming

-Agriculture in Poland, Estonia, Latvia and Lithuania will convert to intensive agriculture practices (as most old EU-member states already made.)

-calculated *nitrogen surplus through leaching will thus increase by 58%.*

More Organic farming and nutrient-balanced recycling agriculture

-Agriculture in the whole Baltic Sea drainage area converts to nutrient-balanced ecological recycled agriculture

-will give a *reduction of nitrogen surplus from agriculture by 47%* and an elimination of the surplus of phosphorus.

[figures from INTERreg project: Baltic Ecological Recycling Agriculture and Society, BERAS (Artur Granstedt, 2006)]

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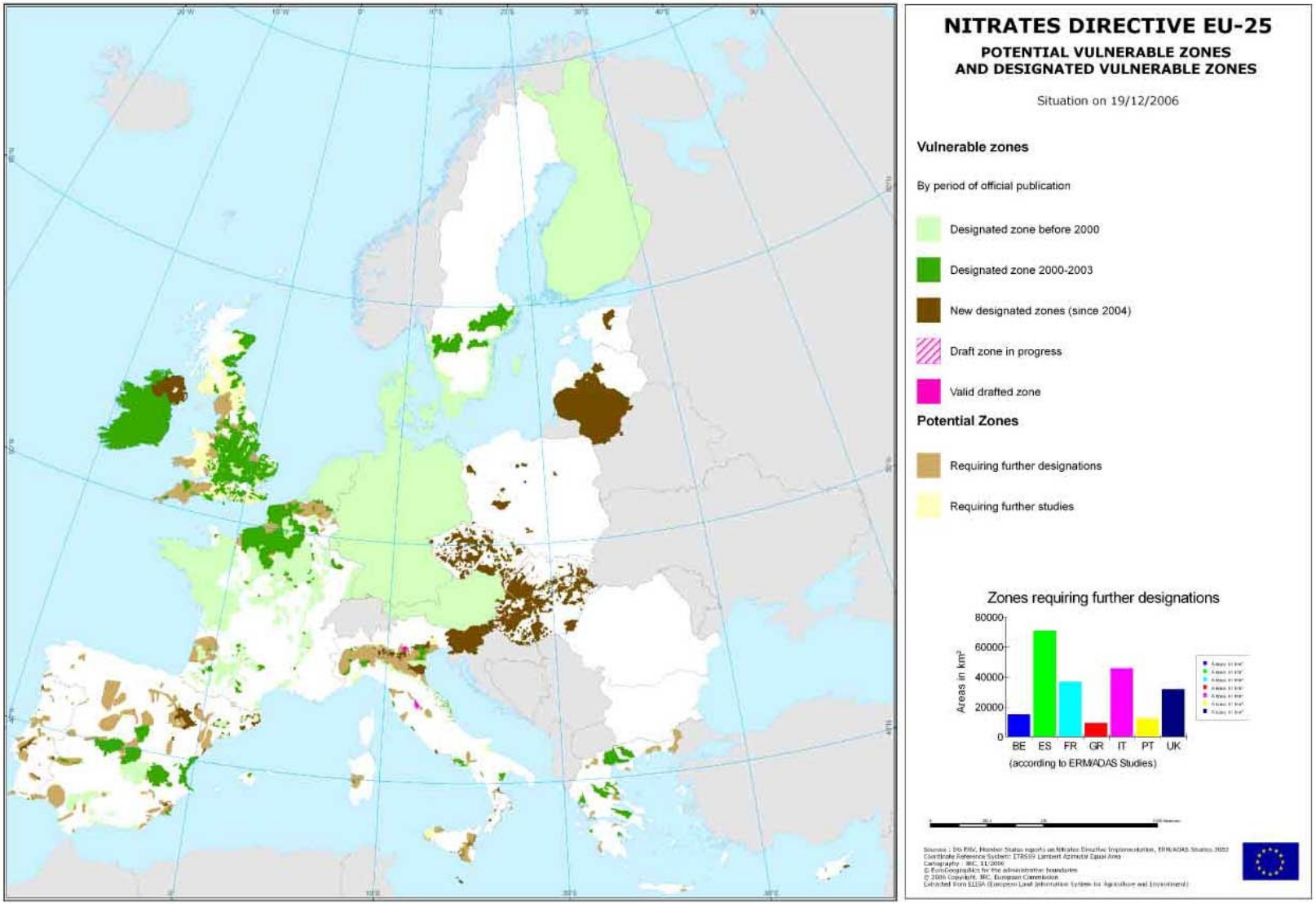
Nitrate Vulnerable Zone designation EU 25 (year 2006) and area requiring designation according to Commission assessment



Way forward - Future Vision

- Nutrient Balanced Recycling of all nutrients in agriculture production

- New instrument, with strict figures on maximum allowable nutrient surplus on farmland.
apply nutrient-balanced practices, all future investments for agricultural production meet a requirement of maximun N-surplus of 60 kg N/ha.

- All farms, in a local region, are independent from imported fertilizers and fodder,

- Application of CAP subsidies in Baltic catchment, that favour nutrient-balanced production

- Tax system is favoring environmentally friendly agriculture,

- Only low nutrient-leakage agriculture, e g extensive/organic farming, allowed in coastal zones/areas,

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Baltic Sea Eutrophication –

the unsolved problem?

-So far eutrophication not solved

-Regional and national political priorities can solve the problem

-Full implementation of the HELCOM Baltic Sea Action Plan (BSAP) – an important step

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Thank you for the attention !

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Possibilities to solve Eutrophication

Introduction of high standards for Wastewater treatment – P-removal (>95 % P-removal) in former Eastern Baltic Countries

Reduce the P-load to Baltic Sea with 10 000 tons

Costs would be 2 – 5 million Euro/year