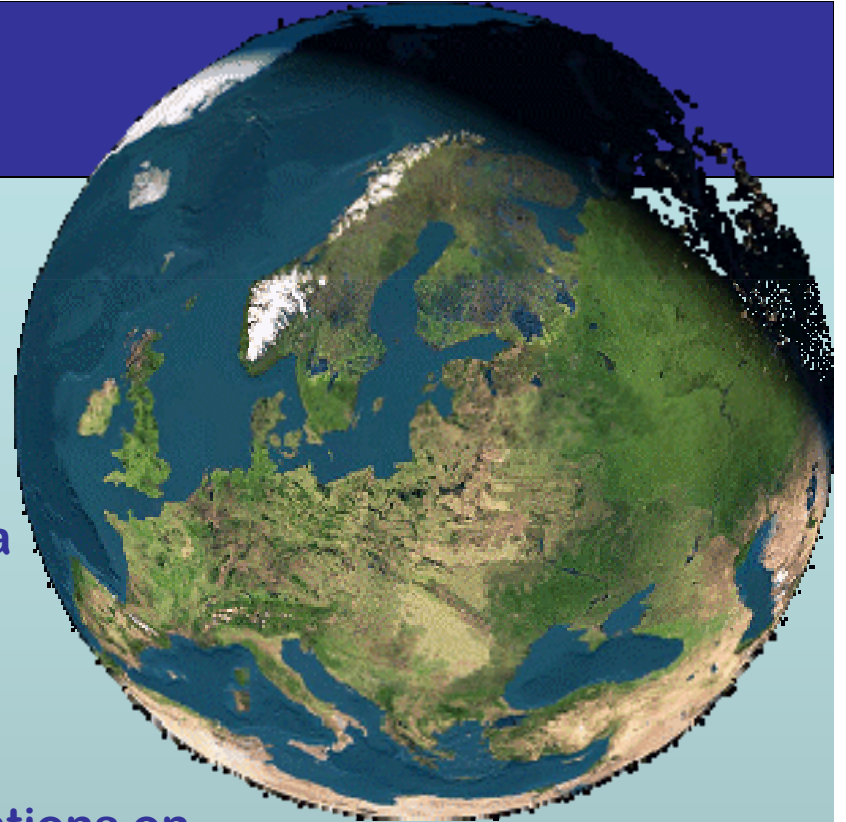


Institute for Baltic Sea Research – Warnemuende (IOW)



Closely entwined with the Baltic Sea
Monitoring Programme (HELCOM,
sovereign task in the German EEZ)

Major pathway to society

Research programme : guideline for investigations on


- external forcing by changes in the natural & human system
- ecosystem response: internal processes & regulations
- strategies for data collection, data management and models


Overarching Goal: promoting prediction capacity of ecosystem responses

*Baltic Sea as a model area for the transfer of results
& approaches to other marginal seas*

Nutrient loads: N

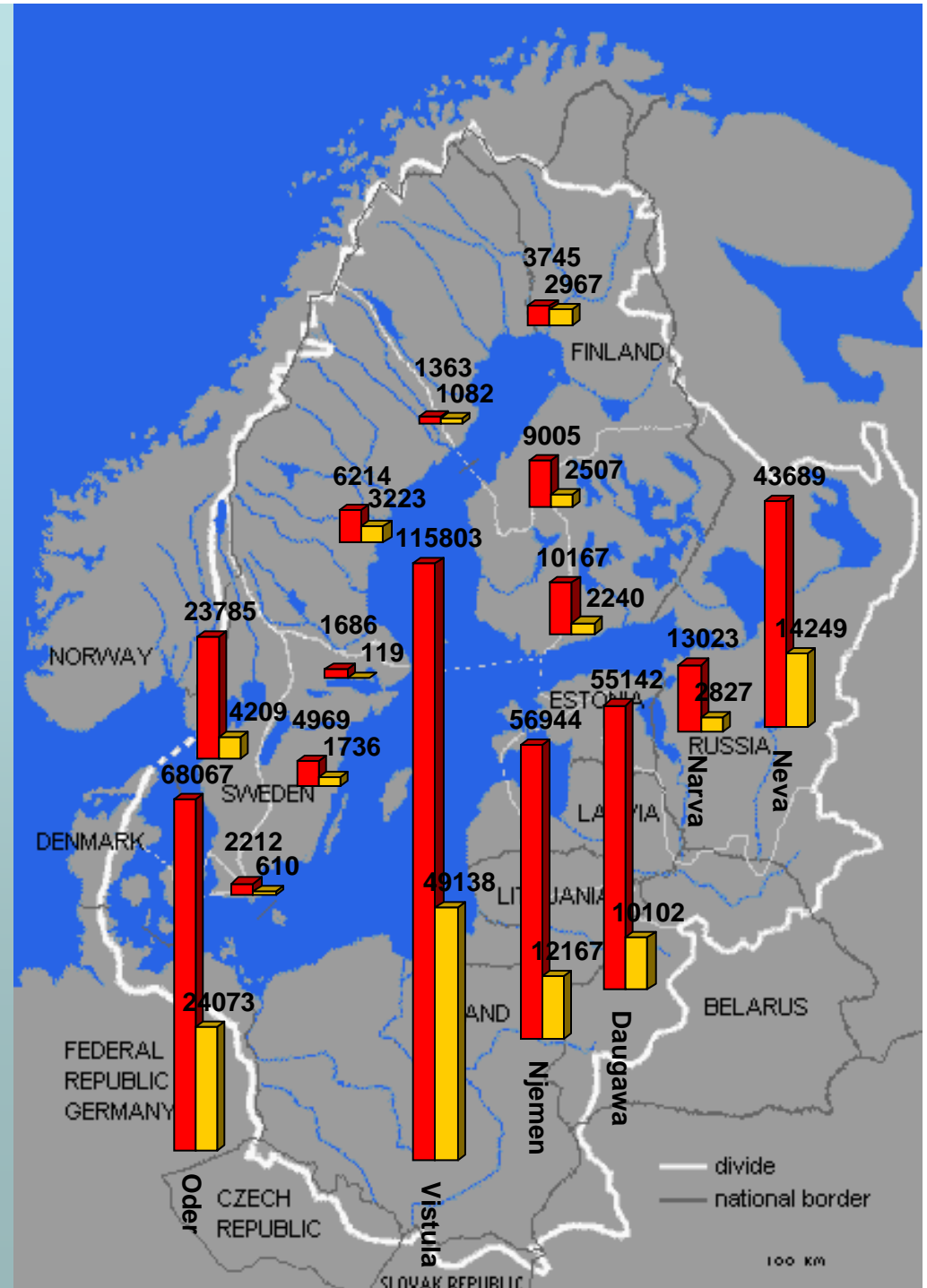
Average nitrogen loads to the Baltic Sea (1980-1990) as well as the historic loads. All loads are attributed to the 15 major rivers

 Nitrogen loads of the 1970-1990
(total loads: 416 kt)

 Nitrogen loads historic
(total loads: 131 kt)



Load reduction: 68 %

River basin loads
largely control the
trophic state of the
Baltic Sea !



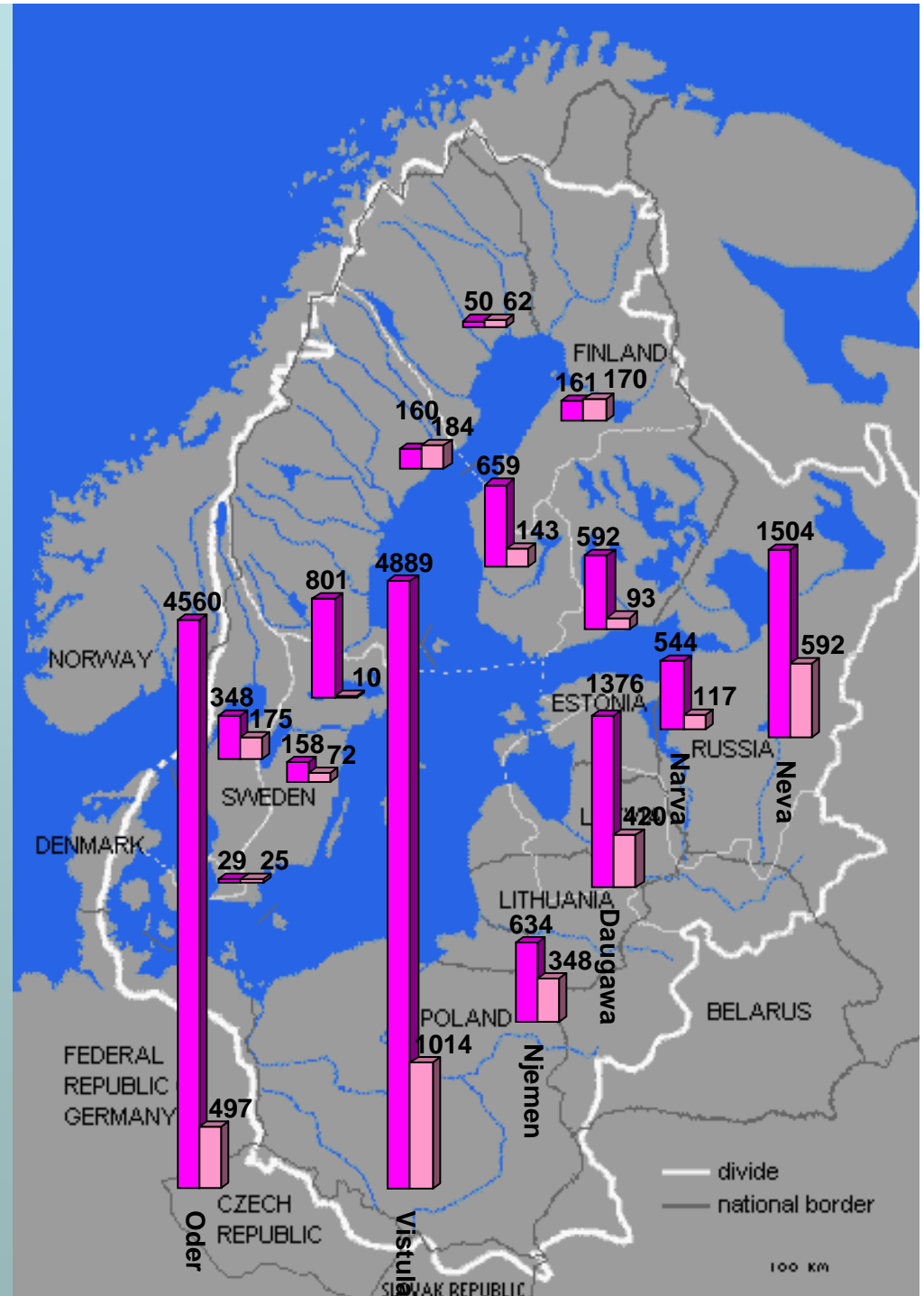
Nutrient loads: P

Average nitrogen loads to the Baltic Sea (1980-1990) as well as the historic loads. All loads are attributed to the 15 major rivers

-  Dissolved phosphorus loads of the 1970-1990 (total loads: 16 kt)
-  Dissolved Phosphorus loads historic (total loads: 4 kt)

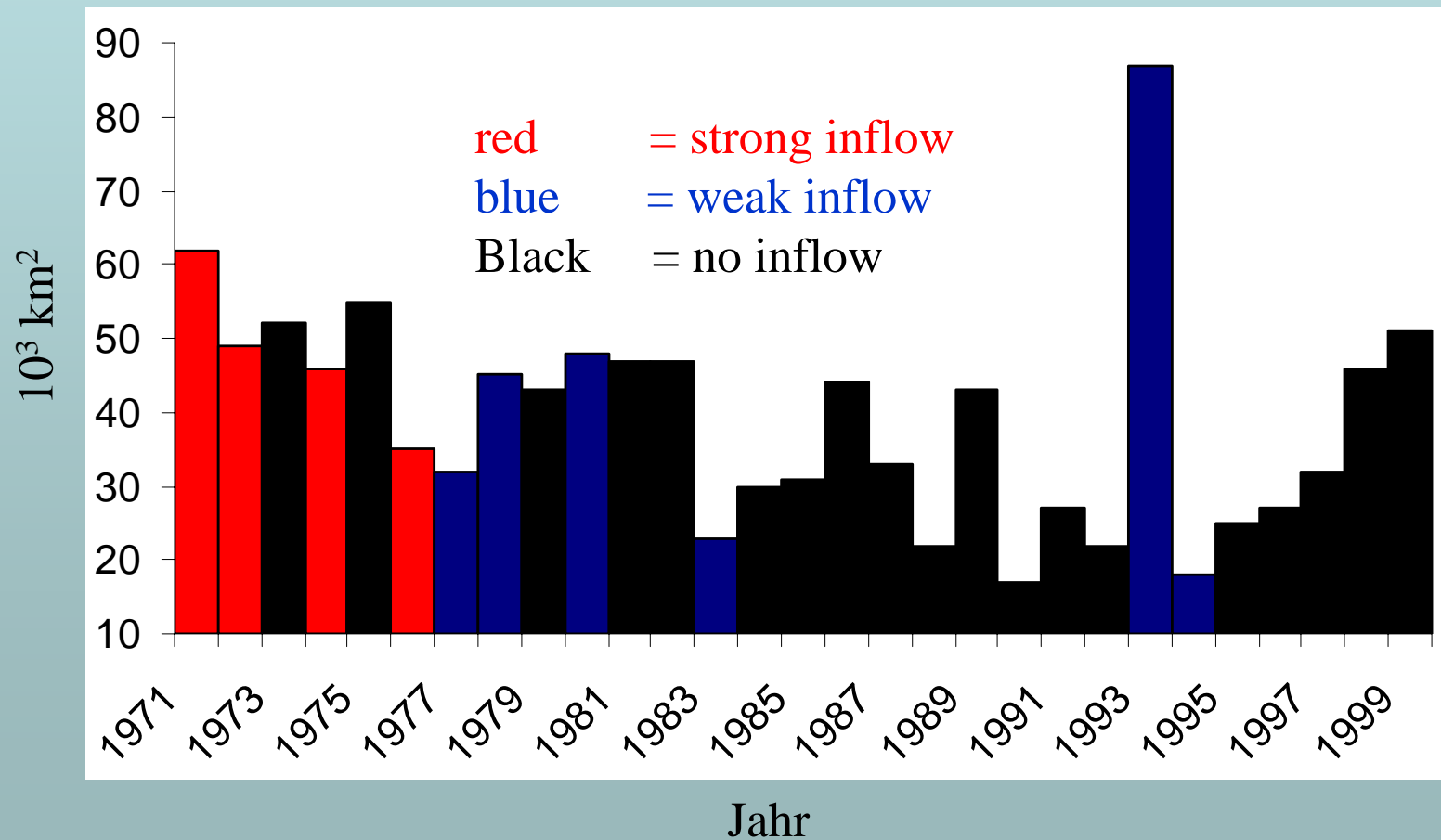
Load reduction: 76 %

River basin loads largely control the trophic state of the Baltic Sea !



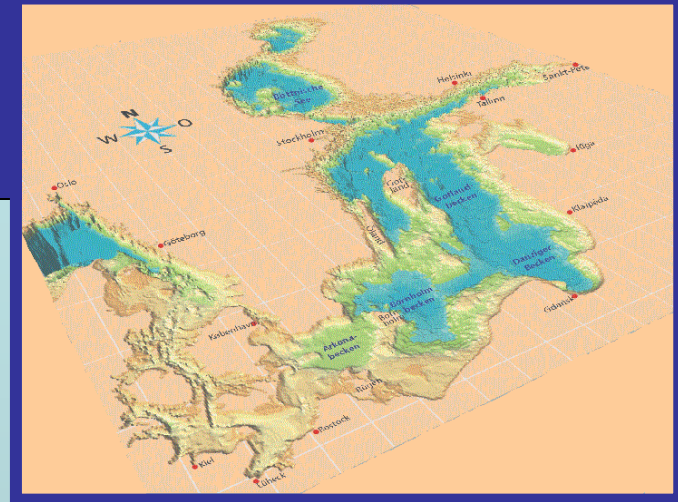
Development of hypoxic bottom area in the Baltic Sea 1971 – 1999

Unsel, PhD UNI Greifswald



The System Approach

Interaction between Theory & Observation



Identify scales of changes

- through long-term data collection & time series measurements
- from the Danish Straits to the Northern Baltic Sea
- from decades & centuries to millenia

Analyse relations between external forcing & internal response

- by field campaigns
- by simulations: laboratory, mesocosms, numerical models

Describe causal relationships on respective scales

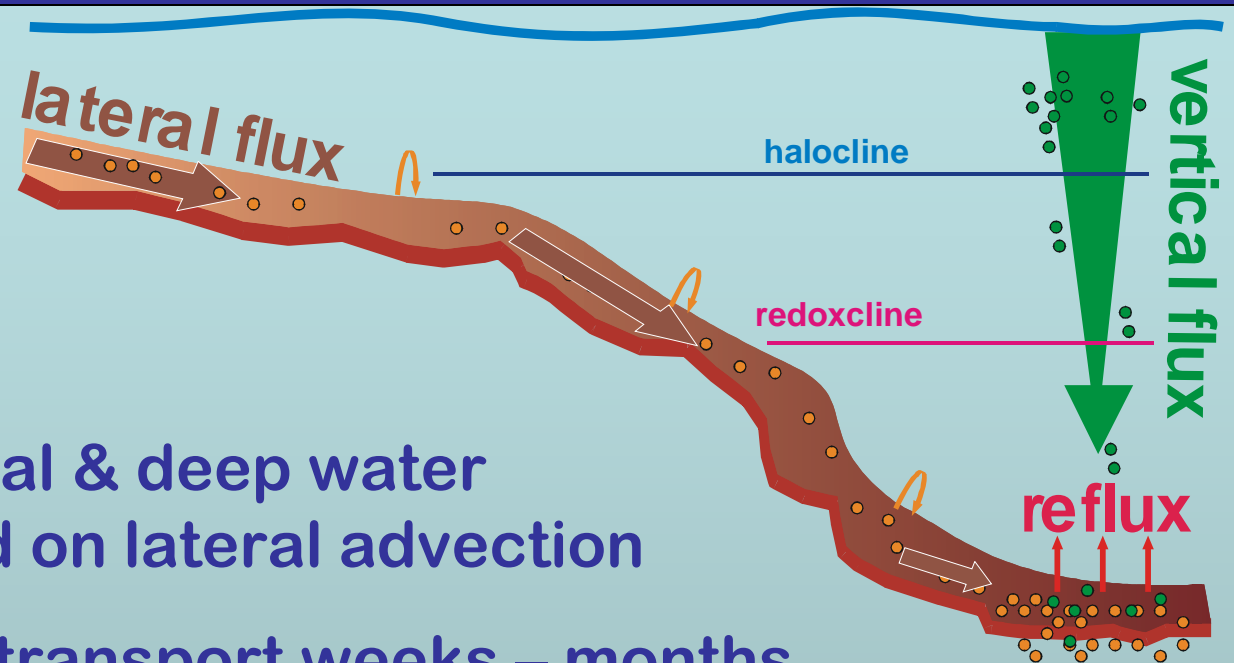
- by models with high flexibility through modular designs

Implementation via 3 reasearch foci:

FS 1: Transport & Transformation Processes in the Sea

Achievements

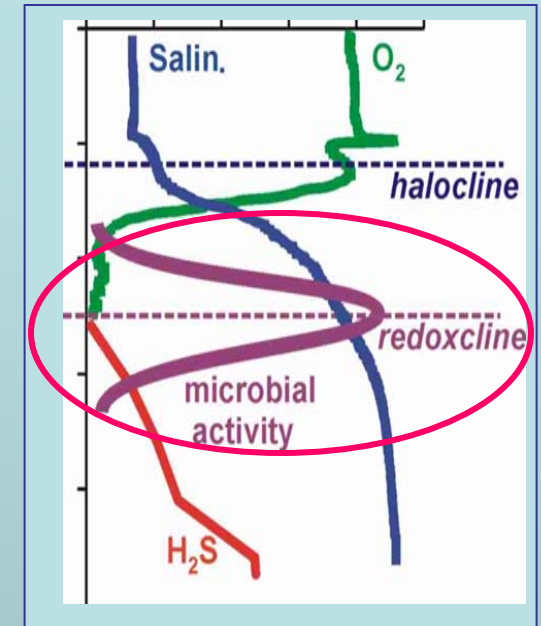
- 80% of carbon burial & deep water CO₂ release based on lateral advection
- Duration of lateral transport weeks – months
- Sources and sinks of mineral particles quantified
- No river-borne nutrients directly reaching the open sea



FS 2: Marine Communities & Matter Cycles

Achievements

- N₂-fixation a major N-source in the open Baltic Sea
- Maximum fixation weeks before occurrence of surface slicks
- New estimate: 4×10^5 tons N a⁻¹
(river load 9×10^5 , atmospheric input 2×10^5 t a⁻¹)



- Pelagic redoxcline: microbial key organisms for N-cycle identified
- Chemolithoautotrophic CO₂-consumption ~30% of photosynthesis

FS 3: Changing Marine Ecosystems

External Influence & Internal Change

Achievements

- Reconstruction of onset of eutrophication in the system
- First insight into time-scales of reaction
- Identification of changes in redox status

