

Biogeochemical processes and primary production in the Baltic Sea

State Research Program, Work Package 5

Rationale

- ◆ Long term observations along with predicted effects of climate changes indicate that several marine key factors are changing or are going to change in the foreseeable future.
- ◆ These changes combined with anthropogenic pressure might further overstress the tolerance of the Baltic Sea ecosystem and/or offset management activities targeted at ecosystem quality improvements.
- ◆ Therefore, there is a clear need to predict climatic change impacts on ecosystem in order to deliver reliable scientific advice for current and future management plans of Baltic Sea ecosystem.

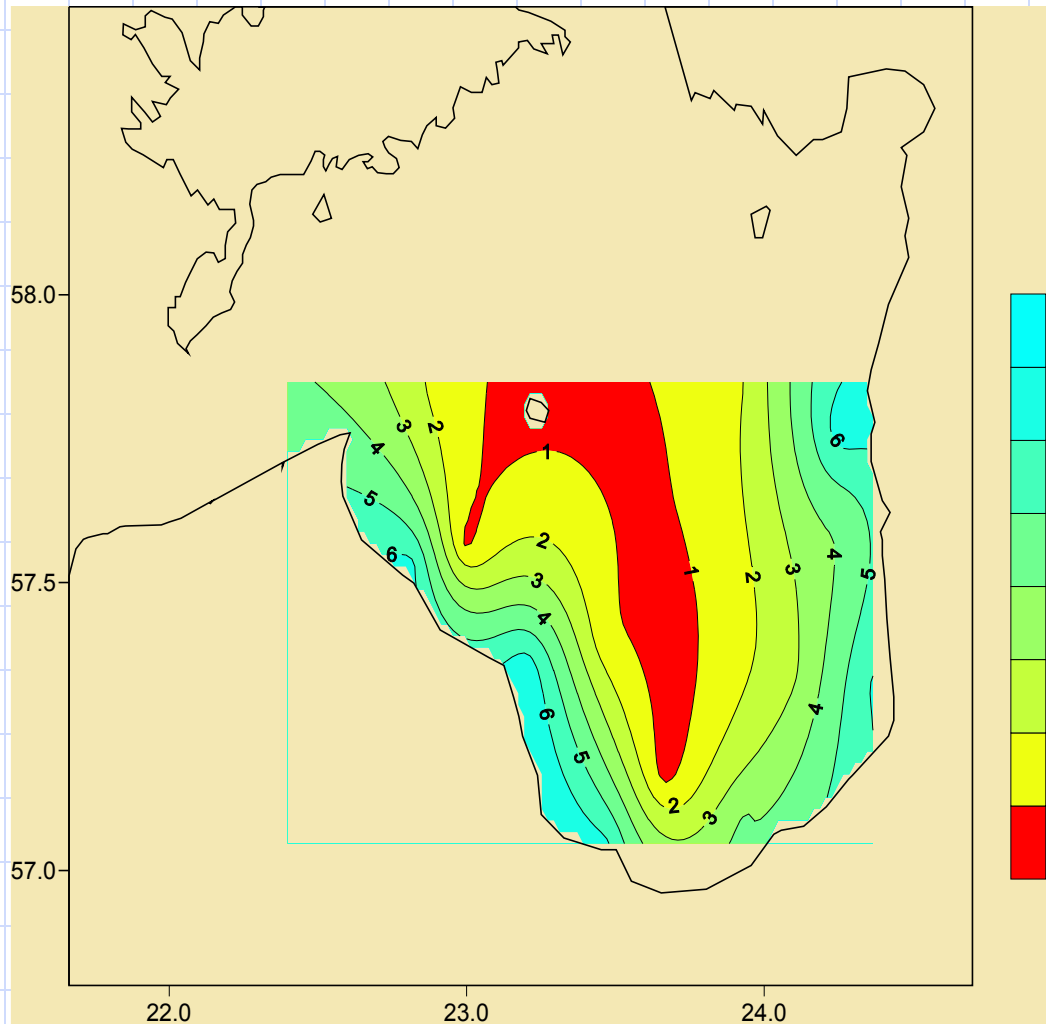
Aim

- ◆ The aim of WP 5 is to predict the impact of climatic change on biogeochemical cycles of the Baltic Sea ecosystem in the Latvian EEZ.
 - 5.a Boundary layer processes
 - 5.b Production and sedimentation
 - 5.c Biogeochemical modeling
 - 5.d Ecosystem state predictions
 - 5.e Recommendations

Task a: Boundary layer processes

- ◆ To perform experimental work in order to define threshold values of critical parameters, which trigger cardinal changes of biogeochemical processes at the sediment – water interface
 - Several laboratory experiments will be conducted where we will simulate environmental conditions predicted by climate change models

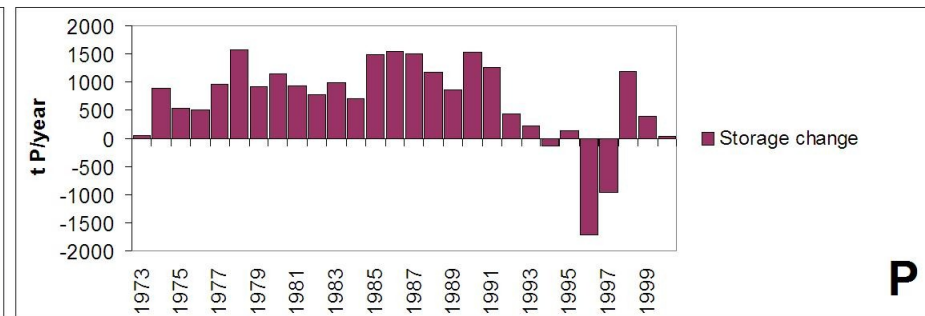
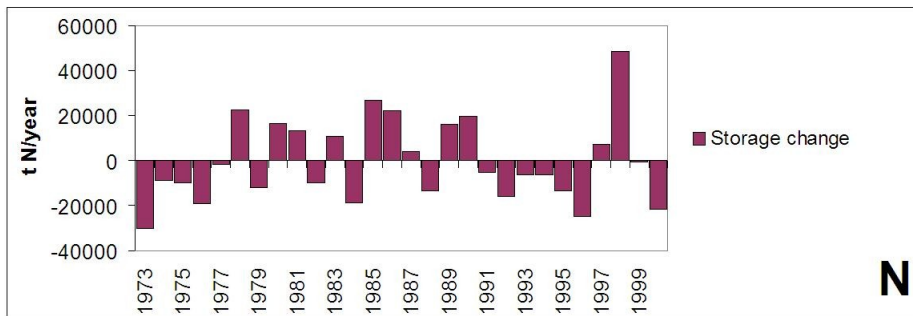
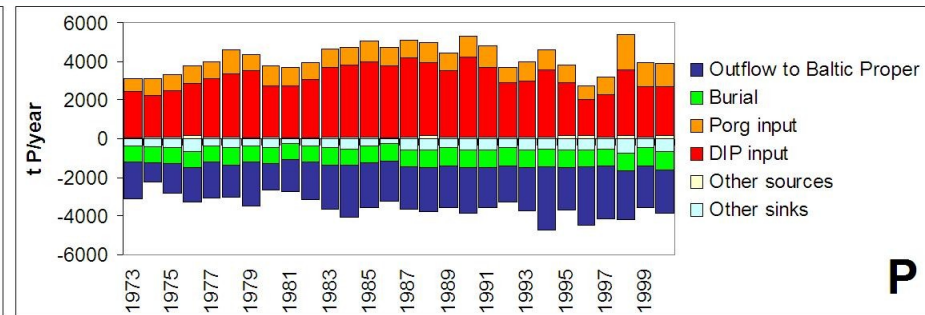
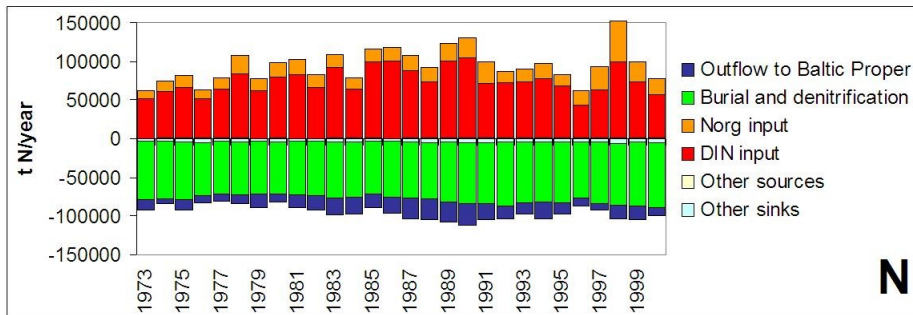
Near bottom oxygen concentrations October 2006



Driving the Gulf of Riga nutrient trends – long term N and P budgets

Differences between inputs and outputs led to changes in nutrient storage in the Gulf. Storage changes occurred in the water column, causing the observed nutrient trends, and temporally also in the sediments.

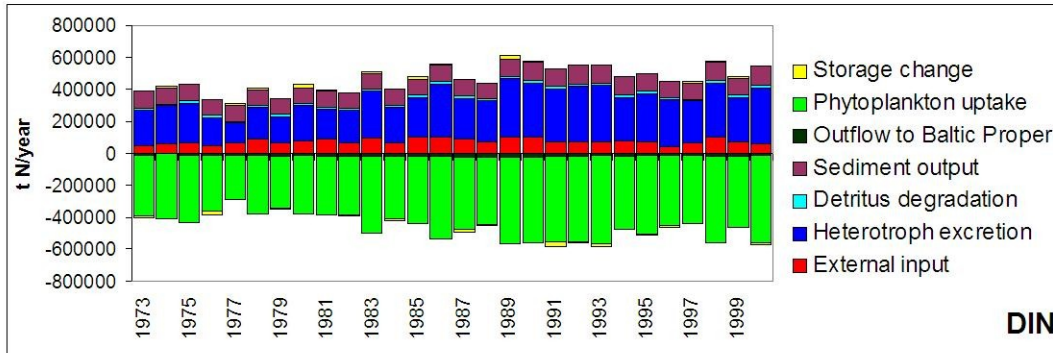
After 1990, nutrient inputs decreased both for P and N. Because of the large denitrification sink, the N pool declined immediately, while for P, which is removed mainly by export to the Baltic Proper, decreases in storage occurred only during low input and high outflow to the Baltic Proper in 1996/1997.



Task b: Production and sedimentation

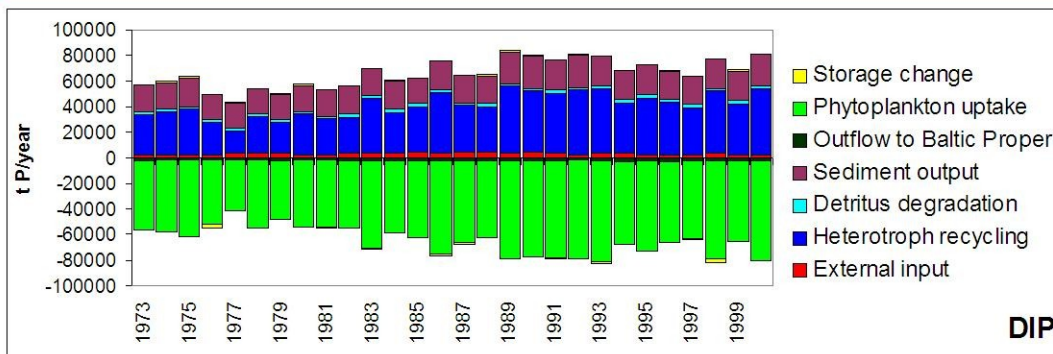
- ◆ To perform seasonal sedimentation research in order to refine correlations between primary producers, abiotic factors controlling sedimentation and the vertical flux of particles.
 - A multitraps will be purchased, amended with several additional sensors and deployed in the central part of the Gulf of Riga. Data will be combined with biological information measured in the pelagic layer.

Simulated water column DIN and DIP budgets



Recycling, mainly due to heterotroph excretion, dominated DIN and DIP fluxes in the Gulf.

Changes in storage were small compared to the total nutrient turnover, making long term nutrient trends difficult to simulate.

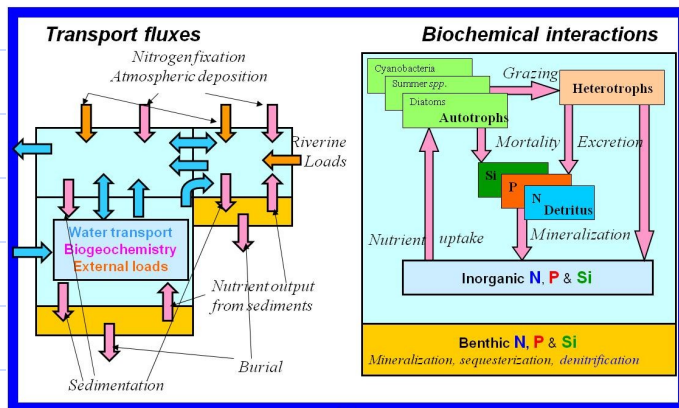


Task c: Biogeochemical modeling

- ◆ Develop and calibrate a biogeochemical model of the Gulf of Riga. The output of WP 1 and 2 as well as the results from Tasks a and b will be used in development and parametrization of the model.

Biogeochemical model

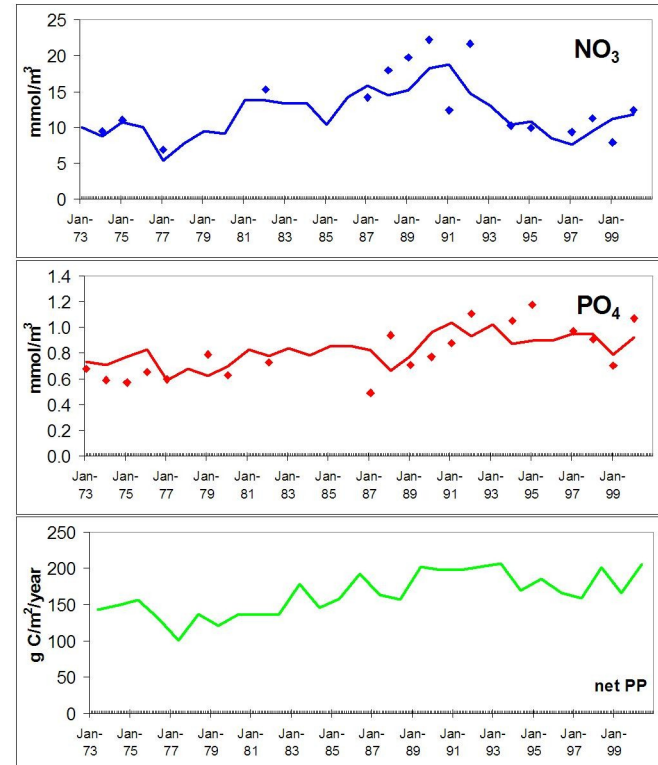
3-box model of the Gulf or Riga



1973 – 2000 Marine monitoring data
External N, P, Si inputs

Numerical routine (simulated annealing)
for parameter calibration

Simulated trends in winter nutrient concentrations and net primary production



Task d: Ecosystem state predictions

- ◆ Based on model outputs (Task – c) elaborate scenarios of changes in Baltic Sea environmental quality and productivity up to 2100.

Task e: Recommendations

- ◆ According to predicted changes of Baltic Sea environment quality and productivity elaborate recommendations for adaptation and mitigation of climate change consequences

Time frame

- ◆ Main activities of Tasks a and b are planned during 2007 and 2008,
- ◆ Task c started already in 2006 and is expected to run up to and including 2008,
- ◆ Activities of Tasks d and e are planned mainly during 2009

Short description of progress 2006.g.

- ◆ Literature studies to define conditions for sediment incubation experiments (Task – a),
- ◆ Technical specifications for laboratory (oxymeter) and field equipment (multitrap), procurment for multitrap in May (Task – b),
- ◆ Phytoplankton data formating for modelling purposes (Task – c),
- ◆ Marine biogeochemical model refinement and reprogramming started (Task –c).

Activities in 2007. – present status

- ◆ Most initiated activities are going on according to schedule.
- ◆ Due to somewhat late and nonsufficient funding, Task – b is experiencing delays in procurement and consequently in experimental phase initiation.



THAT'S ALL FOR NOW