Past, present and future of the Baltic Sea – what do models tell us?

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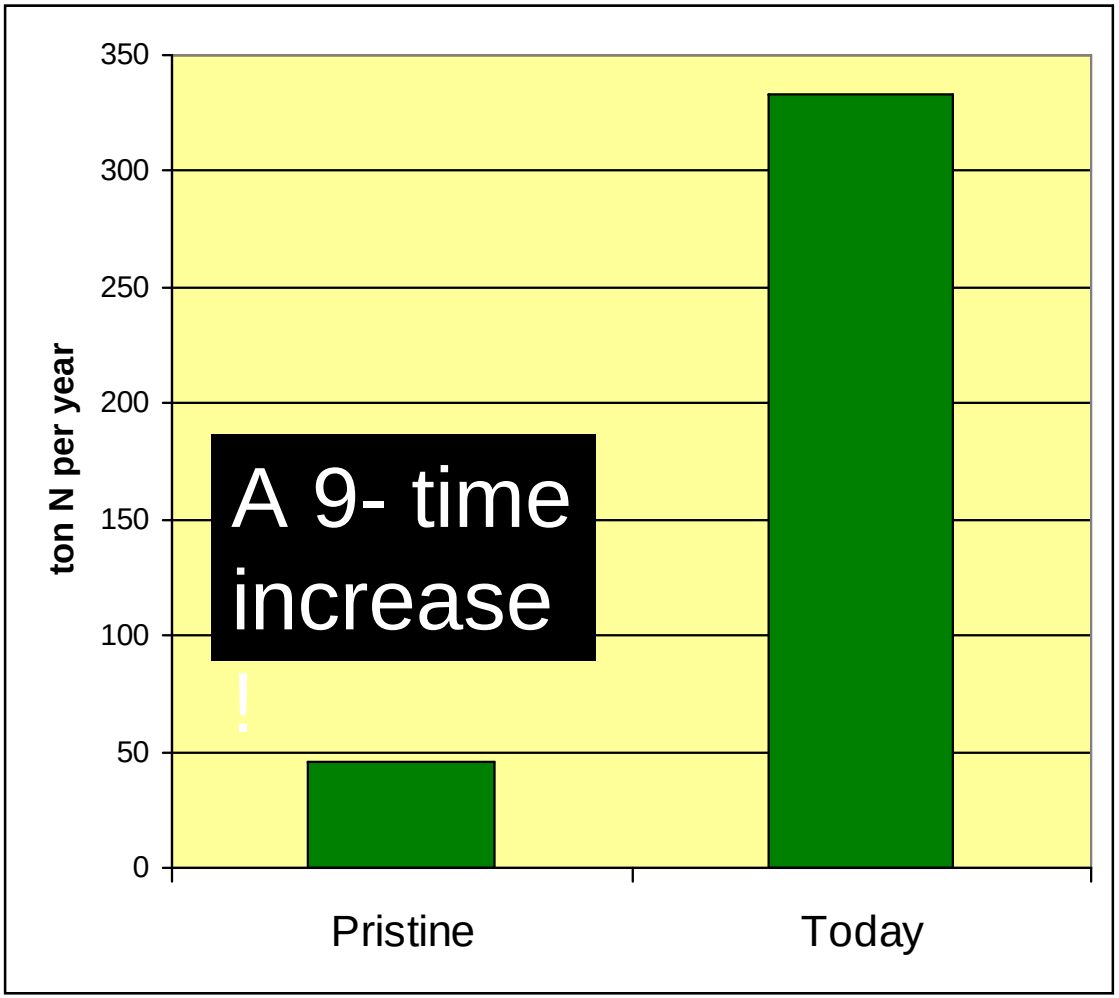
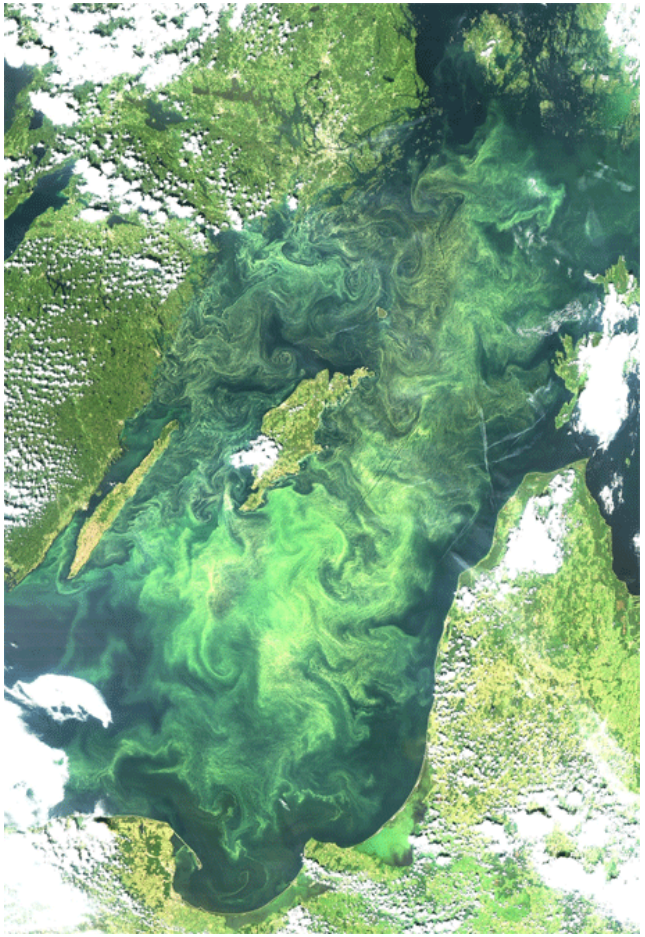
Content

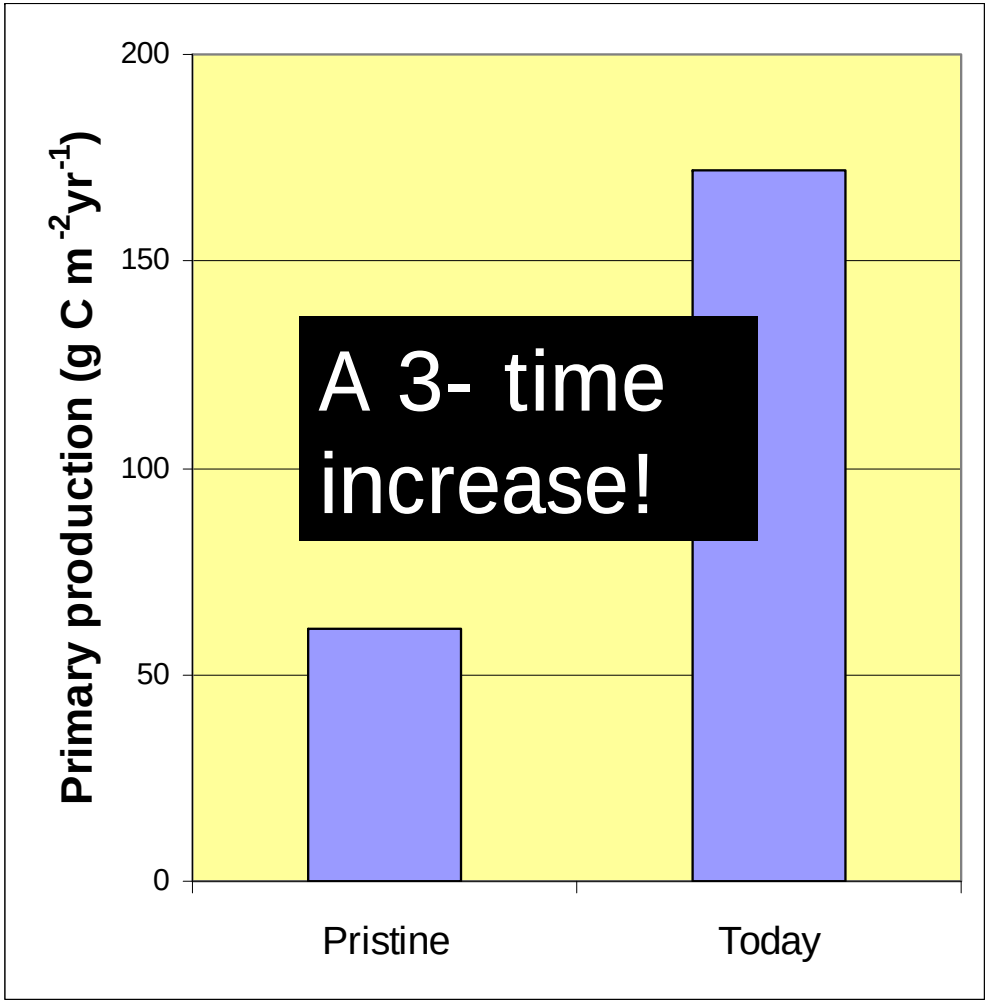
- How has the Baltic evolved into an eutrophied sea?
- What is the cure? Is there hope for the future?

Bluegreen algal blooms today

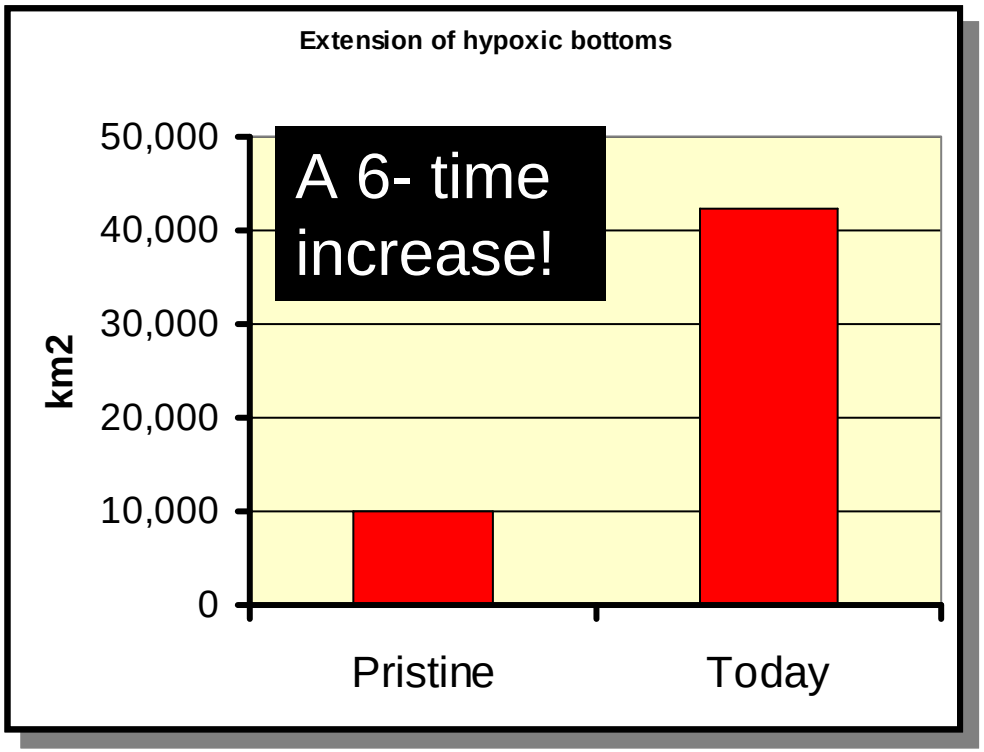




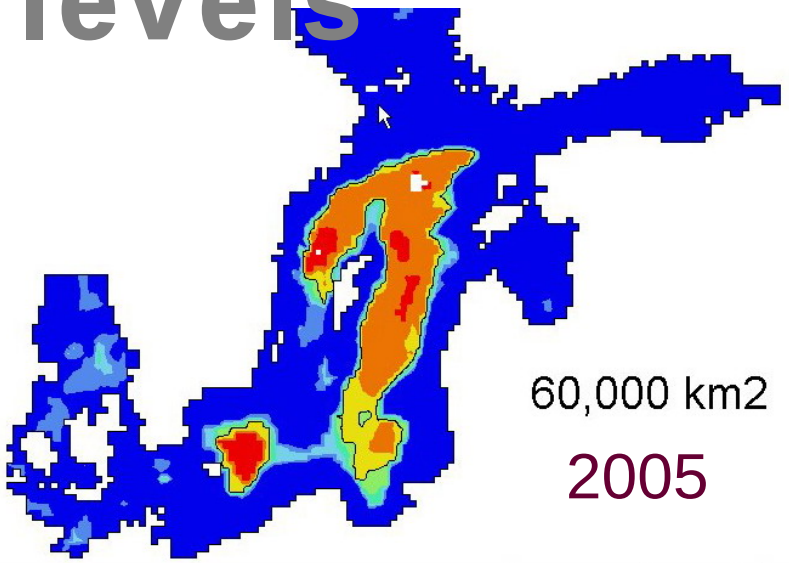
Algal production

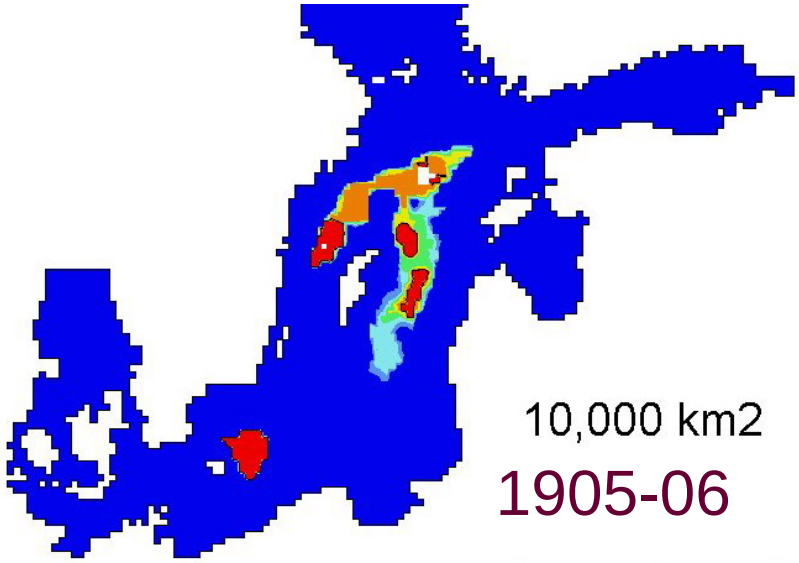


Low oxygen levels



Savchuk et al. 2008

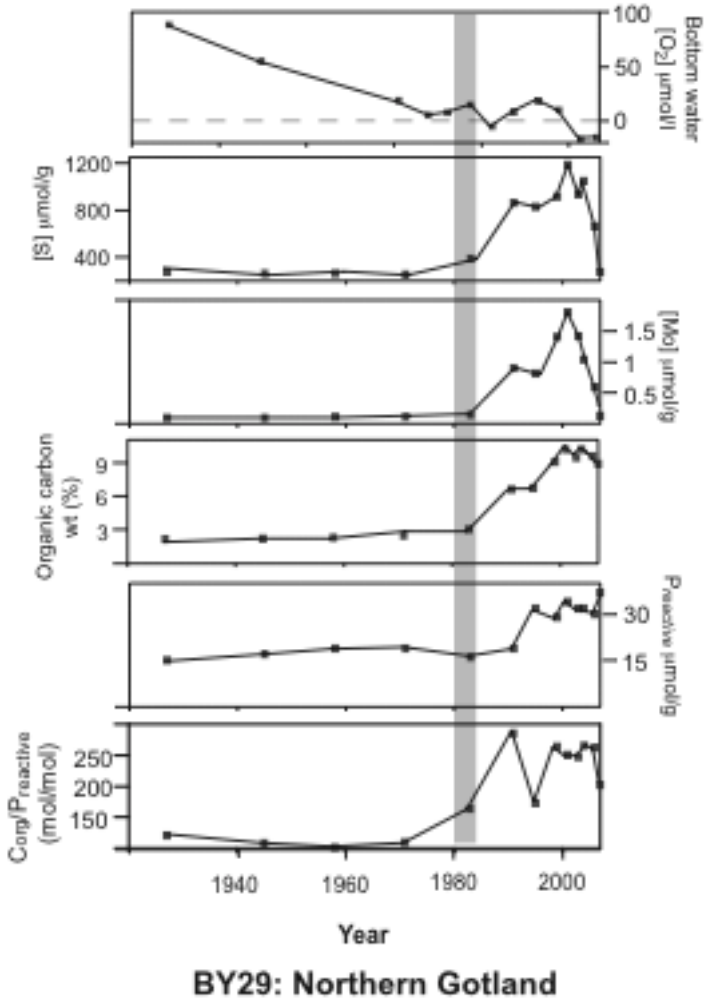




Observed drastic changes in sediment composition concurrent with O2 decrease in bottom waters

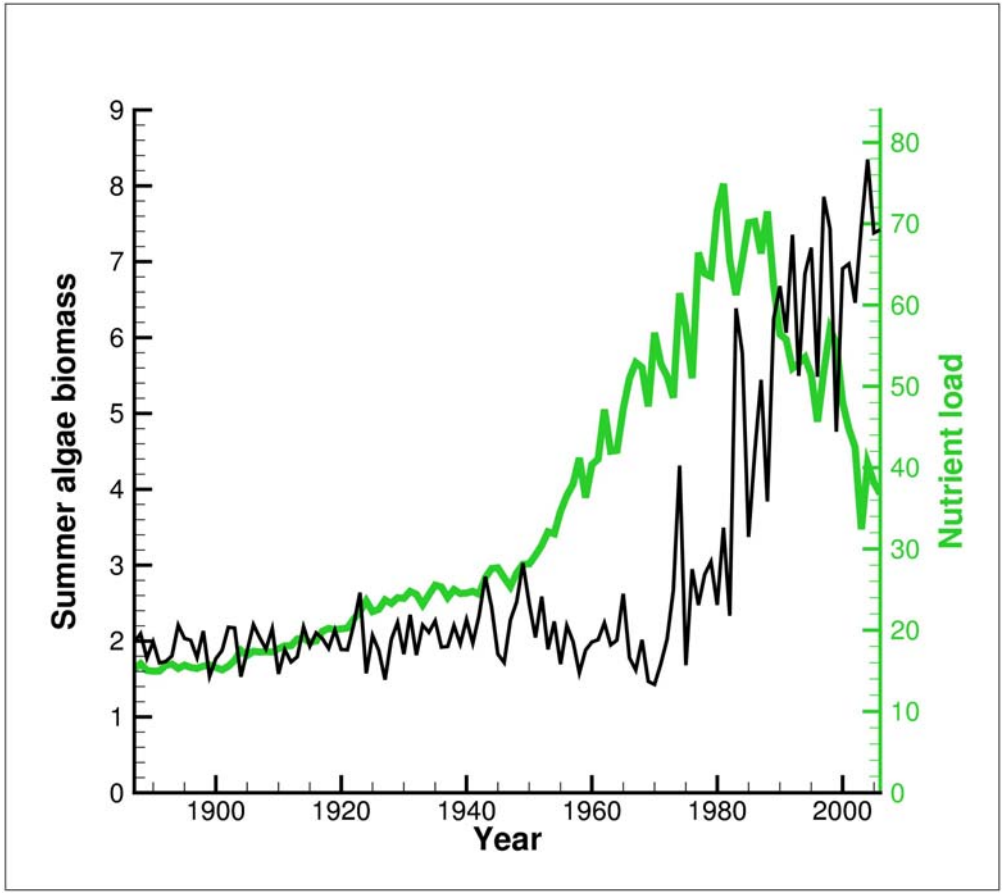
Oxygen decline (top graph)

Leading to a complete shift in sediment biogeochemistry occurs (other graphs)

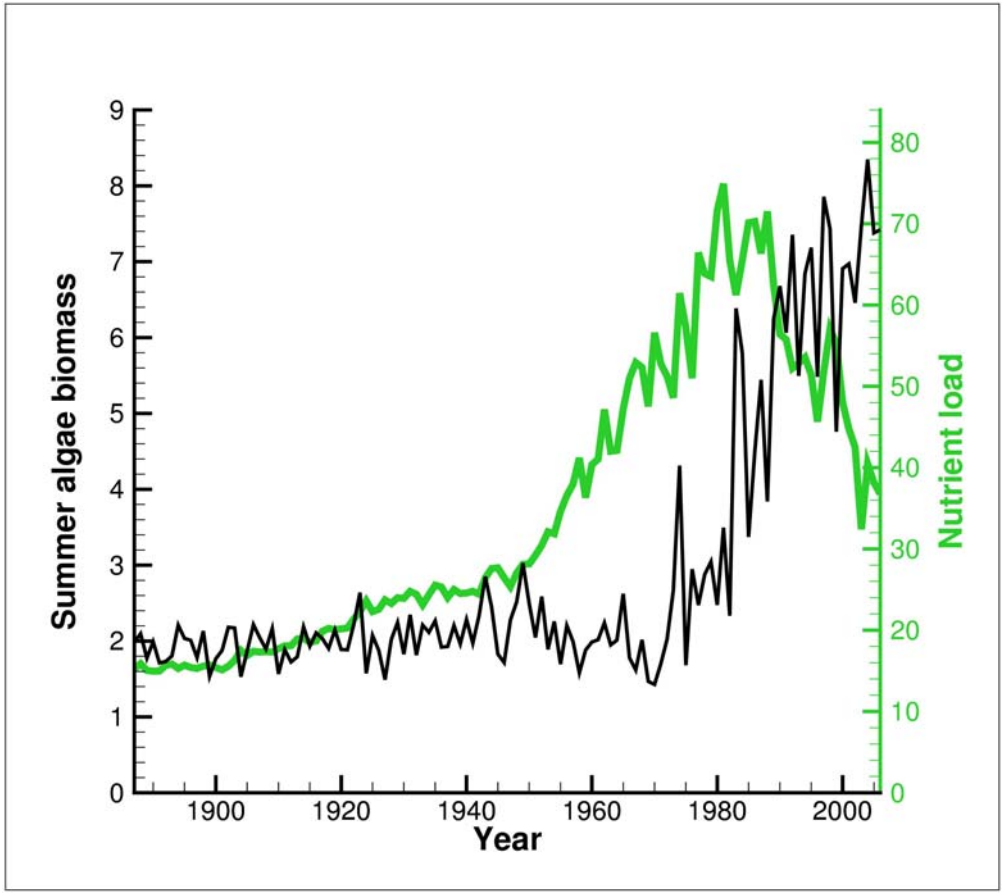


BY29: Northern Gotland

Concern: load has decreased but eutrophication is sustained

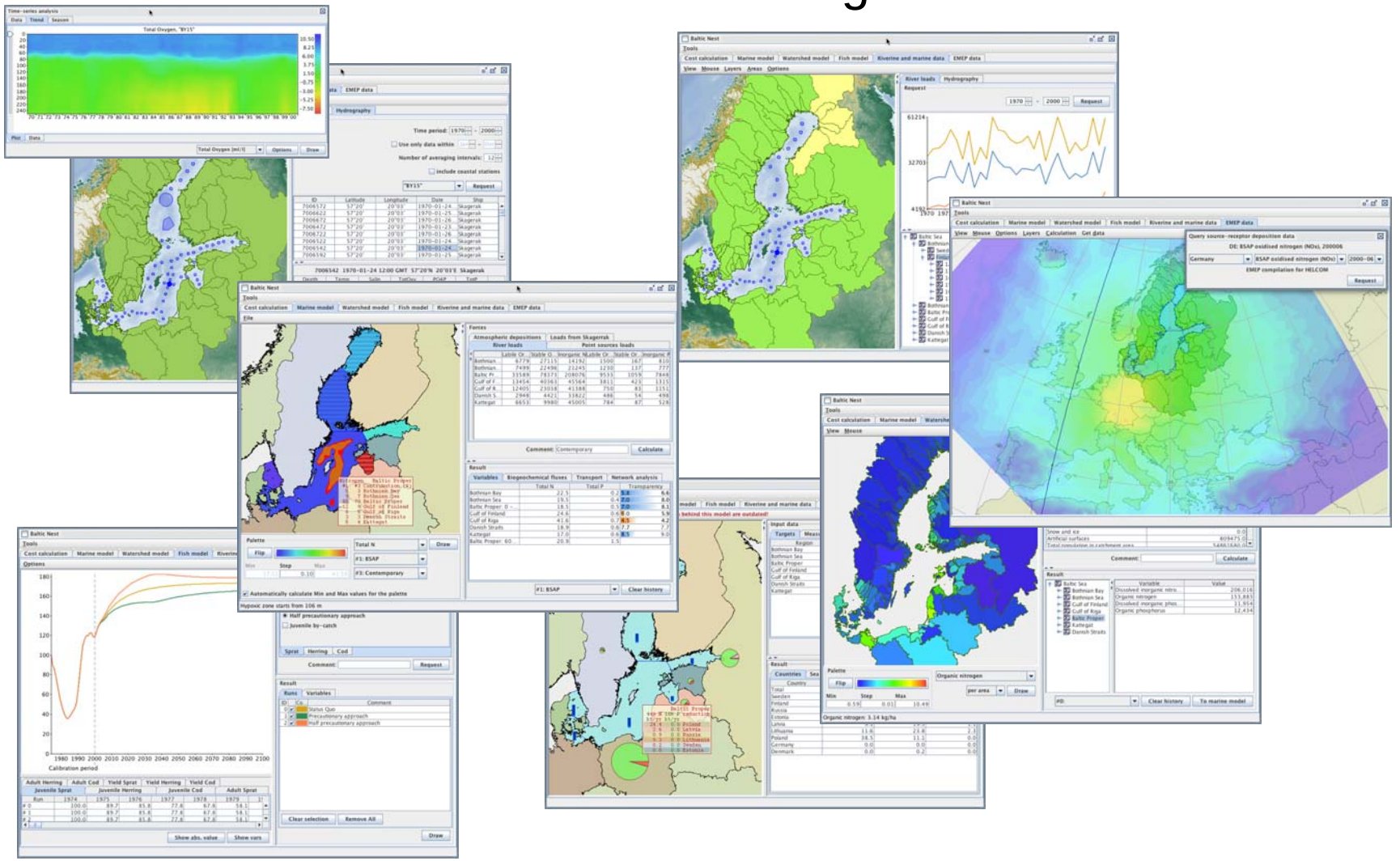


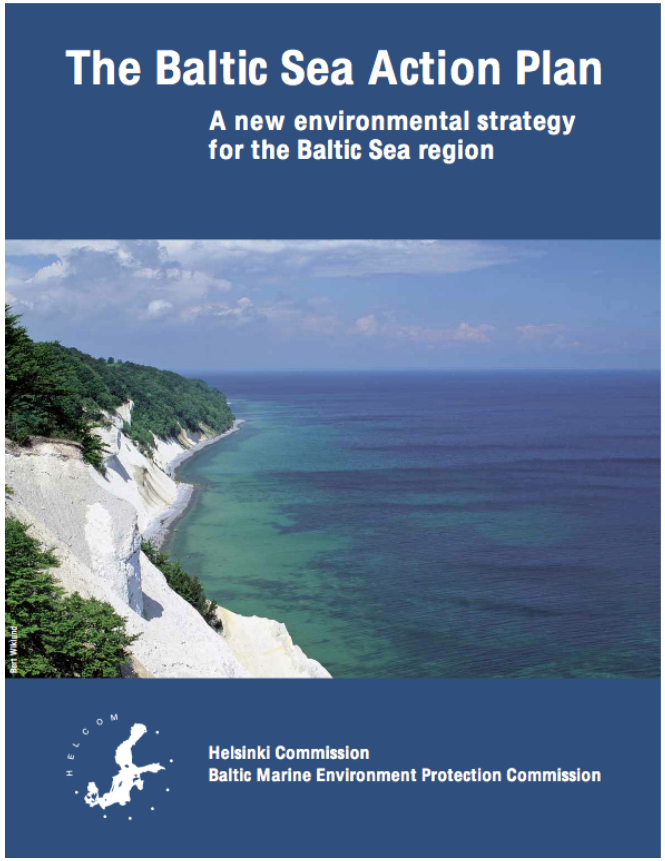
To understand and predict we need model tools



Decision support system Nest

http://www.balticnest.org





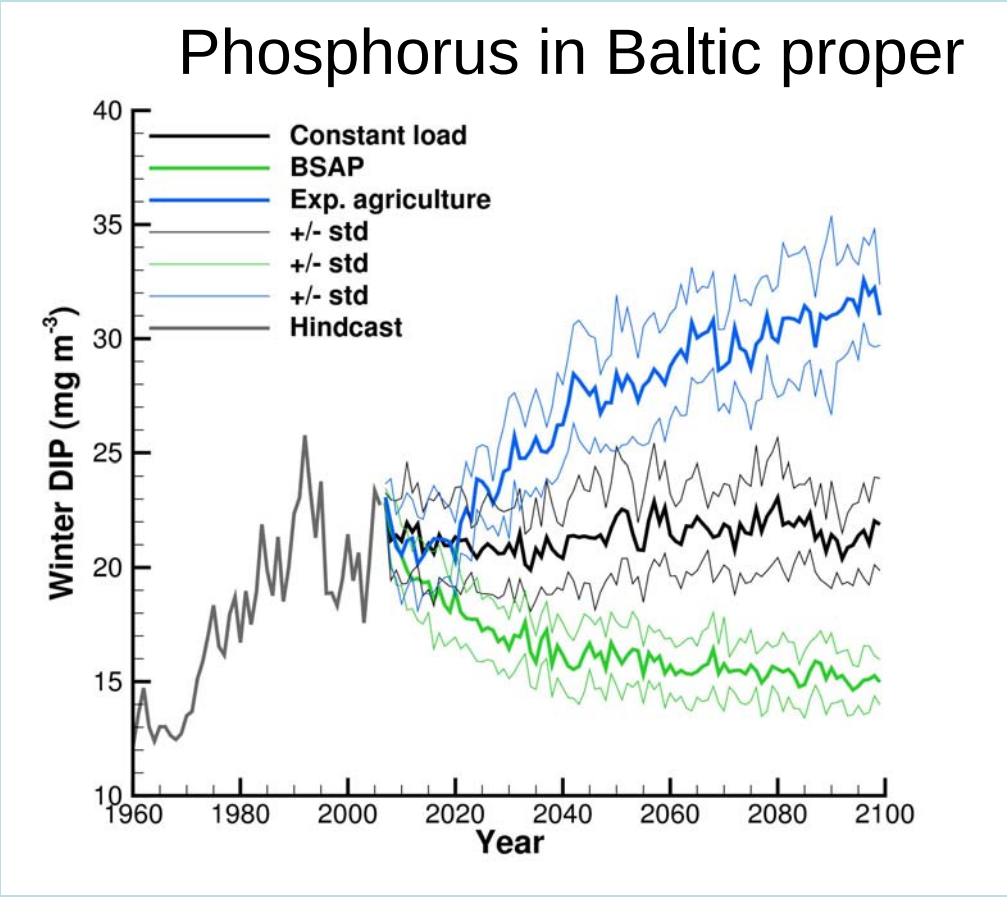
Decision Support

"BEARING IN MIND that the figures are **based on the MARE NEST model**, the best available scientific information, and thus stressing the provisional character of the data WE ACKNOWLEDGE that the maximum nutrient input to the Baltic Sea that can be allowed and still reach good environmental status with regards to eutrophication is about 21,000 tonnes of phosphorus and 600,000 tonnes of nitrogen …"

Eutrophication segment of the HELCOM Baltic Sea Action Plan

The future!

If responsibility is taken conditions will improve with time



Three scenarios:

- Nutrient loads continues as present (black)
- All countries comply to the Baltic Sea Action Plan (green)
- An expanding agriculture scenario (blue)

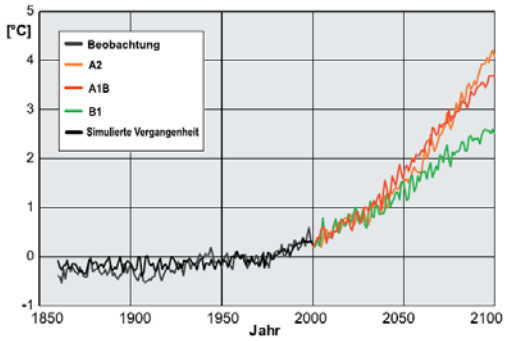
BONUS
SCIENCE FOR A BETTER FUTURE OF THE BALTIC SEA REGION

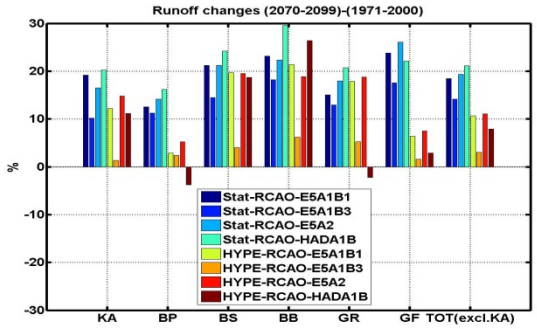
IPCC
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
WMO UNEP

HELCOM Baltic Sea Action Plan
Helsinki Commission

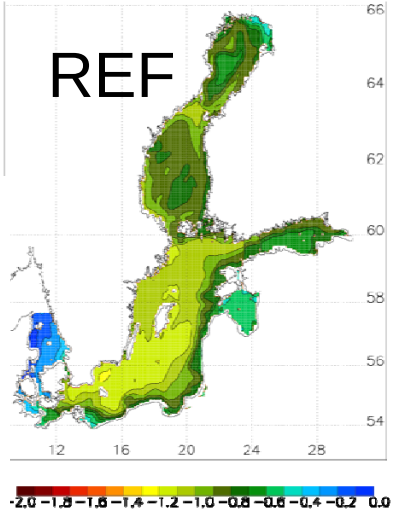
ECO SUPPORT

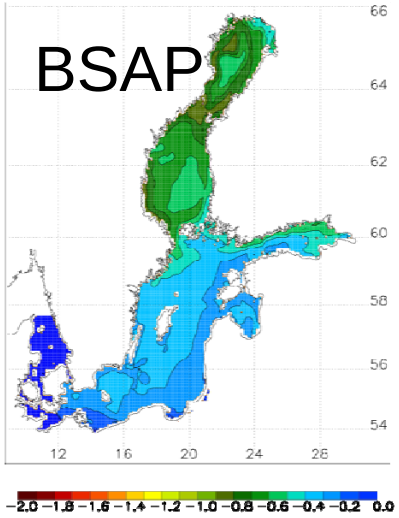
DECISION SUPPORT

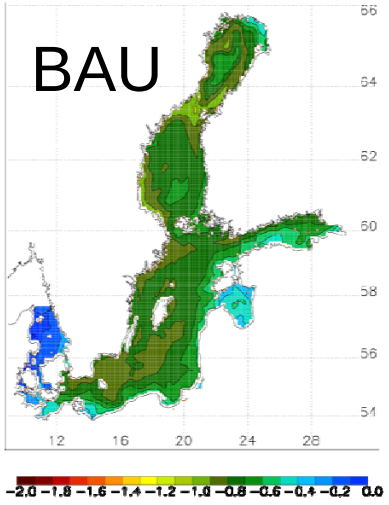




Climate impact: temperature and runoff increase
Marine imprint: e.g. future change in water clarity (Secchi depth)







Conclusions

- Anthropogenic nutrient supply supplies have severely disturbed the Baltic Sea ecosystem
- It is not a hopeless case:
  - Countries around the Baltic have taken action to reduce loads
  - Load reductions will improve the Baltic Sea environment
- However:
  - It will take time for the system to recover
  - Load reductions are even more important in the long-term perspective of climate change