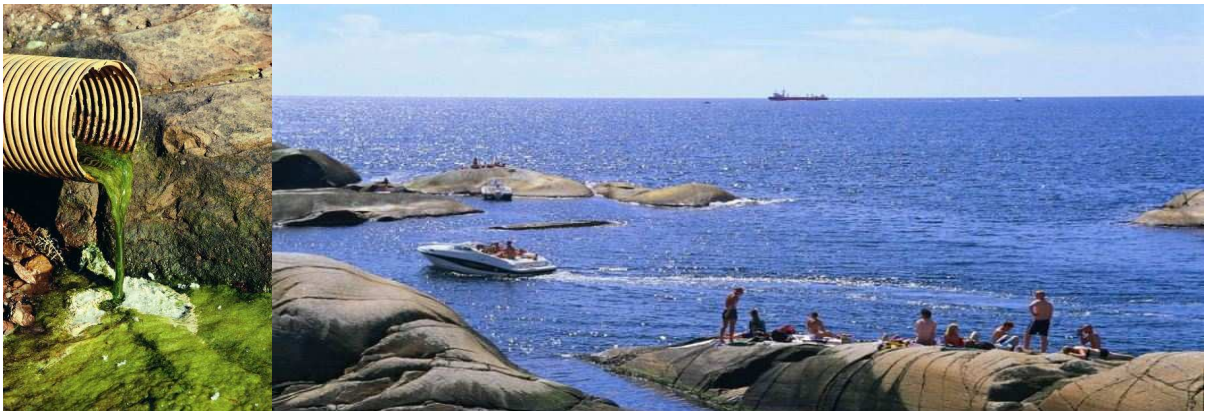
Can we save the Baltic Sea?
Eutrophication in future climate



Workshop at SMHI Tuesday October 21st

Time: October 21st at 10.00-16.00
Coffee from 09.00
Place: Hörsalen at SMHI in Norrköping
To register for the workshop e-mail gunn.persson@smhi.se
at latest Oct 13th

The workshop is free of charge

Much is said about the situation of the Baltic Sea ecosystem and much more can be said. But how can we act? Which is the most efficient way of getting an improved state and how can we stop the increasing euthropication in the Baltic Sea?

With the help of numerical models the effects of nutrient load reduction scenarios were studied earlier. However, the combined future impacts of climate change and industrial & agricultural practices in the Baltic Sea catchment have not been investigated thoroughly.

The aim of this workshop is to bring scientists and stakeholders together and to discuss the latest results of climate change impact studies. A vision of an advanced modelling tool for scenario simulations of the whole marine ecosystem that can underpin and inform management strategies to ensure water quality standards, biodiversity and fish stocks will be presented and discussed.

SMHI

Workshop program October 21

From 09.00 Registration and coffee

10.00 Welcome

10.10-10.40 Baltic Sea Action Plan

- **Fredrik Wulff,** Stockholm University

10.30-11.00 Will the Baltic Sea Action Plan work in future climate?

- **Markus Meier**, SMHI and Stockholm University

11.10-11.15 leg stretch

11.15- 11.45 Is eutrophication all bad? Impacts of Ocean Acidification on marine ecosystems

- **Jon Havenhand**, Tjärnö Marine Biological Laboratory

11.45- 12.00 Discussion

12.00-13.00 Lunchtime

13.00-13.30 Interaction climate and fish

- **Brian McKenzie**, Technical University of Denmark

13.30-14.00 Engineering methods

- **Bo Gustavsson**, Göteborg University

14.00-14.15 Discussion

14.15-15.00 Mingel session with coffee

15.00-15.45 Oceanography at SMHI

- **Bertil Håkansson, Philip Axe** and **Eleonor Marmefelt**

15.45-16.00 Discussion and Summing up

Welcome!

SMHI

Background

Baltic Sea Action Plan
Measures against eutrophication in the Baltic Sea have been discussed for a long time. Various differing opinions exist. The ambitious Baltic Sea Action Plan of HELCOM (www.helcom.fi) has been signed by the ministers of all Baltic Sea countries. It will hopefully lead to significant nutrient load reductions. However, the response of the Baltic Sea is slow and an improved state is not expected to occur before several decades after the implementation of the measures. Are we sure that the plan will work?

Impact of climate change
In addition to changing nutrient loads due to changing land use and changing atmospheric emissions a changing climate has to be considered. Within the recently performed Baltic Sea Experiment (BALTEX) Assessment of Climate Change for the Baltic Sea Basin (BACC, www.baltex-research.eu/BACC) it was concluded that global warming may cause increased water temperatures, reduced sea ice cover, increased winter mean wind speeds causing increased vertical mixing, and increased river runoff causing reduced salinity. The projected hydrographic changes could therefore have significant impacts on the marine ecosystem and its biodiversity. Although the complex response of the ecosystem is unknown, new results from physical-biogeochemical modeling might give insights into possible changes. Will the future state of the Baltic Sea be better or worse?

Acidification effects
Acidification of the oceans is an emerging and potentially critical threat to marine ecosystems. Decadal records of pH in the Baltic Sea show acidification proceeding at rates 2 – 5 times faster than in the open ocean. The effects of these changes and their interaction with other climate variables, in mediating both gradual and state-shifts in marine ecosystems are currently unknown but likely to be considerable. What might be these effects? Perhaps the greatest impact of acidification will manifest in the reduced capacity of many marine species to build the calcareous skeletons and shells that are essential for their survival. This will be a particular problem for microscopic plankton and larval stages, causing direct impacts on reproductive success and survival in key ecosystem structuring species within the Baltic Sea such as blue mussels. However, how serious are these threats for the entire ecosystem?

Interaction climate and fish
Projected temperature and salinity changes will have large impacts on species distributions, growth and reproduction of organisms including zooplankton, benthos and fish. These changes could include the complete loss of entire species and major restructuring of the food web and trophic flows (e.g., if falling salinity prevents cod reproduction or if the multiple anthropogenic impacts make the system more vulnerable to invasions by biological ecosystem engineers). For example, given that the three fish species in the Baltic Sea which have dominated commercial landings for the past several decades are of marine origin (i.e., cod, herring and sprat), is it realistic to expect that all these will continue to support comparable fisheries in future?

Engineering methods
As the impact of nutrient load reductions counteracting the current eutrophication of the Baltic Sea will take several decades, engineering methods are intensively discussed to achieve faster improvement of the ecological status. Is there any chance to speed up the recovery of the Baltic Sea?

Questions like these will be discussed at the workshop.