



A group photo of the Danish-Swedish Baltic Nest team in the kickoff meeting in 3-5 October 2007 at Vickleby Öland, Sweden. Standing (from left to right): Jingjie Zhang, Olle Hjerne, Oleg Savchuk, Miguel Rodriguez Medina, Maciej Tomczak, Sij Johansson, Henrik Andersson, Jacob Carstensen, Alexander Sokolov, Cordula Göke, Christoph Humborg, and Ole Manscher. Sitting (left to right): Erik Smedberg, Fredrik Wulff, Anders Windelin, Bo Riemann, Hans Esdrup Andersen, and Henrik Österblom.

Baltic Nest – a helping hand to the management of the Baltic Sea Ecoregion

The Baltic Nest Institute is an international institute that started on 1 September 2007, with a department in Sweden and one in Denmark. The Institute shall further develop the decision-support system Baltic Nest and apply ecological and economic models, scenarios and prognoses to the entire Baltic Sea ecoregion. It shall provide managers and politicians with answers to the issue: If you want a better environmental quality, the Baltic Nest model can tell which 'buttons' to turn and what are the ecological and economic consequences. This is the first time in the world that inputs from land, rivers and lakes, the atmosphere and the sea are integrated over such large geographic scales and combined with economy to provide a suite of models and scenarios.

Baltic Nest Institute (BNI) is a formal collaboration between the National Environmental Research Institute (NERI), University of Aarhus and the Resilience Centre, Stockholm University. The cooperation includes the Swedish Environmental Protection Agency, Danish Institute for Fisheries Research at the Technical University of Denmark, Danish Meteorological Institute and four departments in NERI. In Sweden, BNI is established in the Resilience Centre located at Stockholm University, and in Denmark BNI is hosted by NERI in Roskilde. Each of the two BNI departments will have about ten scientists and database specialists covering catchment ecology, run-off models, marine models, fisheries models, atmospheric models, databases and statistics as well as the economy.

BNI is under management of an executive board representing the financing institutions, and a management board including the heads of the two departments (Fredrik Wulff

and Bo Riemann) and one policy officer to promote collaboration with international organisations. The daily work is managed by Frederik Wulff in Stockholm and Jacob Carstensen in Roskilde.

Why is the Baltic Nest unique?

The geographical extent of BNI is unprecedented anywhere in the world. BNI covers the entire Baltic Sea, from the northern part of the Danish Straits to the Bothnian Bay. The Baltic Sea region includes 85 million people, a drainage area of 1.6 million km², and the surface of the Baltic Sea is 370,000 km². BNI combines strong competences, linking basic and applied research, within all relevant disciplines in marine ecosystem management through the well-recognised research teams in Denmark and Sweden. The majority of the work to be carried out in BNI will involve the further development of the Baltic Nest, applications and

dissemination of the models, scenarios and prognoses for ecological and economic questions. It is globally unique to link ecology, economy and management in a complete set of models covering a geographic area of this size. The tight coupling between research and management will guarantee an efficient consultancy of politicians and authorities. BNI products are developed in collaboration with the Helsinki Commission (HELCOM) and other end-users, and national and regional authorities are invited to participate in the work to be carried out.

Why the Baltic Sea ecoregion?

The Baltic Sea is an ecosystem under threat with numerous indications of worsening ecological conditions. Examples include large areas with cyanobacterial blooms and hypoxia, and overfished fish populations. Continuous excessive loads of nutrients and contaminants from land, the adjacent sea, and atmosphere combined with intensive fisheries are the most important pressures to the system. This negative trend has been present over the past 100 years. Figure 1 shows that the input of nitrogen to sea by cyanobacteria has increased about nine times during the last 100 years.

We have also made future scenarios. If we build additional phosphorus removal in all sewage treatment plants in the catchment area and use phosphorus-free detergents in all rural areas combined with using best practise in agriculture, the cyanobacterial blooms will decrease substantially. On the other hand, if the present trends in agriculture continue with more industrialised agriculture and no further removal

of phosphorus, cyanobacterial blooms will increase and contribute significantly to the deterioration of water quality, reduced tourism and reduced quality of life conditions for the human population around the Baltic Sea.

Similar to the cyanobacteria example, the status and development of hypoxia, fish populations and a number of other relevant environmental indicators can be illustrated. The ultimate solution to better water quality in the Baltic Sea can only be found from an integrated management of the catchment area, considering inputs from the adjacent sea and from atmosphere.

Future developments – nitrogen or phosphorus removal?

During the past decades, there has been an intense debate on what should be done to maintain a satisfactory environmental quality of the Baltic Sea ecoregion. A well-known discussion issue is the nitrogen or phosphorus removal, which is not a simple problem because of the differences in physical, chemical and biological conditions from the Bothnian Bay to the Kattegat. These conditions will also change depending on the management actions taken. BNI will assess consequences of nutrient management based on sound scientific principles of nutrient limitation.

Overfishing and toxicants

A number of the fish populations in the Baltic Sea live under severe stress. Overfishing of cod has severely influenced the sea ecosystem. Presently,

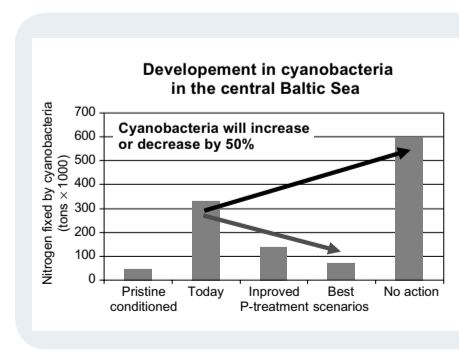


Figure 1. Occurrence of cyanobacteria in the Baltic Sea. The relative amount of cyanobacteria is presented, as tons nitrogen fixed from the atmosphere, about 100 years ago, as it is today, and also in three scenarios: 1) improved P removal from sewage, 2) reduced loss of nitrogen from agricultural areas and improved P removal from sewage, and 3) no action taken.

the model includes the interactions between fishing of cod, herring and sprat and how it is linked to the productivity in the sea. However, this has thus far only been documented in open areas for the commercially most important species. Today, the collapse of the pike and perch populations along the Swedish east coast is still not accounted for, i.e. we do not know whether it was caused by overfishing, hypoxia, toxic compounds or a mixture of these factors. Many species contain significant concentrations of toxicants, which has led to restrictions on their use for human consumption. Dioxin is found in large concentrations in fat fish like salmon and herring, which has led to restrictions. BNI will focus on the most important toxic pollutants and analyse the interplay between growth, mortality and survival of fish populations, the importance of the toxicants and thereby evaluate the factors controlling the quality of the fish as a healthy food source for the human populations around the Baltic Sea.

A base for decisions – International quota arrangements for N and P in the Baltic Sea?

A complete master plan for the Baltic Sea can only be realistic by involving all the countries in a close mutual binding collaboration agreeing on necessary actions. In addition, such a plan can only be realistic by involving all agricultural sectors in improved sewage treatment and reduction of airborne elements. An important route in this process is to document the cause-effect costs chain:

Loads of elements –
Concentrations of elements –
Effects of elements –
The required costs

Maximum permissible loads of nitrogen and phosphorus as well as other relevant elements for the entire Baltic Sea ecoregion and for regional areas

individually have to be determined from relations to concentrations and effects complying to the requirements in the EU Water Framework Directive and the Habitats Directive. It is of importance to establish such relationships and compare them to the actual effects and costs. Presently, BNI collaborates with HELCOM to develop a quota system to be suggested at the HELCOM Ministerial meeting in late autumn 2007. BNI has already established tools for such analyses, which are available on the Internet. Future work includes continued improvements of tools and models to be used in integrated ecological and economic analyses.

Baltic Nest Institute – reproduce by budding?

The institute originates from a research programme, MARE, funded by the Swedish MISTRA Foundation. The current NEST is a result of this programme. It is the inten-

tion that the BNI concept shall be spread out to other institutions and areas. There have been initial negotiations with institutions in Finland and Germany aiming for new BNI departments. In the future, the idea is to establish similar institutes for other ecoregions such as the North Sea, the Black Sea, the North Atlantic, the Mediterranean Sea and the Greenland Sea.

More on BNI is available at www.mare.su.se, <http://dmu.dk/Vand/BNI/>, and www.mare.su.se/nest.

Bo Riemann and Jacob Carstensen, National Environmental Research Institute, University of Aarhus, Denmark

Fredrik Wulff, Resilience Centre, Stockholm University, Sweden

Sif Johansson, Swedish Environmental Protection Agency, Stockholm, Sweden

Baltic Sea Action Group (BSAG)

The Baltic Sea is the most polluted sea in the world. Eutrophication caused by various factors is generally considered the greatest threat to and major driver of recent changes in the Baltic Sea ecosystem. The well-being of the Baltic Sea is also threatened by numerous other hazards, such as chemical pollutants and oil accidents.

The Baltic Sea is also one of the world's most studied sea areas. Scientists know well how the Baltic Sea environment, both abiotic and biotic, functions in a natural and human-induced state. Thus, the patient and its multiple illnesses have been diagnosed. Why is it that although we possess adequate knowledge for healing the patient, not enough, or sometimes even nothing at all, is done to cure it? Here we face a wide range of explanations, ranging from ignorance, conflicting interests and priorities to a lack of communication, even pure selfishness. In many cases, it is a question of an inadequate flow of information and contacts between academia and other stakeholders.

What is Baltic Sea Action Group (BSAG)

The Baltic Sea Action Group (BSAG, Figure 1) is an initiator of and a catalyst for action aimed at healing the patient. BSAG is the facilitator between knowledge and action, i.e. research, HELCOM, communities, private sector and stakeholders (Figure 2). BSAG's approach is very conscious of economic realities, aiming at finding the drivers and incentives that spur different sectors

to participate. The crux of the BSAG is finding the best and the most efficient ways of doing things, not just taking the traditional approach with relatively small-scale efforts.

BSAG action so far

The initiator of BSAG is Mr Ilkka Herlin, Chair of the Board of Directors of Cargotec Corporation (www.cargotec.com), the world's leading provider for cargo handling solutions. Mr Herlin's motivation for protecting the Baltic Sea comes from his personal love for the Baltic, dating back to his early childhood.

BSAG's pilot project was introducing chemical removal of phosphorous into St. Petersburg's waste water treatment (opened 1 Oct 2007). This project, with total a cost of 1.9 million euros, was funded by Vodokanal, company operating waste water treatment in St. Petersburg, (1 million euros), The Finnish Ministry of the Environment (0,6 million euros), and John Nurminen Foundation (0,3 million euros). The funds from John Nurminen Foundation were collected solely from the private sector (private persons and companies).

BSAG has also invited the research community to participate in its actions. It organised a two-day workshop in Helsinki in September 2007. During the workshop, Baltic Sea experts had an opportunity to influence what actions BSAG will start to promote, aiming at a healthier future of the Baltic Sea. As a result of the workshop, a list of actions



Figure 1. BSAG-task force (from left): Saara Kankaanrinta, Ilkka Herlin (Cargotec Corp.), Anna Kotsalo-Mustonen (John Nurminen Foundation), and Johanna Ikävalko (Baltic Sea Action Group)

with research-based justifications is now under construction and will be published soon. This invited group of experts will form the Scientific Council of BSAG.

BSAG has brought together all vital actors to reach its goal: the public sector (e.g. EU, Finnish Ministry of the Environment, Ministry of Agriculture and Forestry, and Ministry of Trade and Industry), research (e.g. BONUS EEIG and the Scientific Council) and the private sector (companies willing to finance actions). Legally, BSAG will become a foundation by the end of 2007.

Take part in the challenge

BSAG challenges the research community to provide the best available

knowledge for the identification of possible BSAG actions. These actions should be environmentally clearly profitable, cost-effective, well-focused and, finally aim at significant improvement of the state and recovery of the Baltic Sea. Identification, formulation and implementation of BSAG actions will vary substantially in different targets, as the size and nature of our patient's illnesses are heterogeneous in nature.

BSAG is strongly linked to the Academy of Finland through the BONUS+ Call. The Academy of Finland has earmarked funding for projects that have a strong potential to clearly influence the environmental status and a healthier future of the Baltic Sea, and that can provide vital information for managing the Baltic Sea environment and improve communication between academia, stakeholders and the private sector. Through participating in BONUS+ and providing adequate information on the need and methods for saving our sea, researchers can affect what actions BSAG will take in the future.

The Baltic Sea Action Group invites the whole scientific community to join us for a cleaner, healthier Baltic Sea!

For more information, please contact **Johanna Ikävalko**, BSAG/Cargotec Corporation, P.O. Box 61, FI-00501 Helsinki, .tel: +358 400 291066, email johanna.ikavalko@cargotec.com

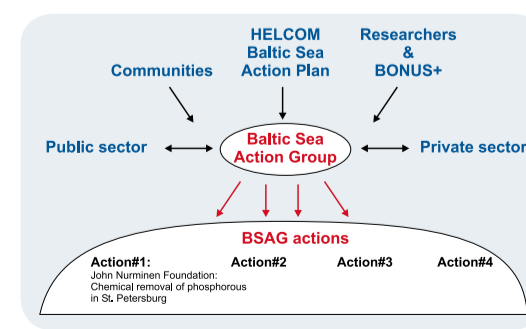


Figure 2. Schematic presentation of the structure of the Baltic Sea Action Group