

Sustainable marine management

An advanced modelling system...

The EU has established an integrated maritime policy to address the growing importance of maritime activities and the associated increased potential for negative impacts to the marine environment. Part of the EU's strategy is to integrate marine and maritime research disciplines in order to build the knowledge base for a sustainable growth of sea-based activities and, in particular, to reconcile sea-based activities with environmental sustainability.

The Arctic is an area rich in natural resources and thus is experiencing a significant increase in sea-based activities related to maritime transport, offshore energy, tourism, coastal development, fisheries and aquaculture. This northwards expansion is partly due to new discoveries of natural resources, but also to improved access routes and newly available infrastructure in the region.

A programme is under way that creates a modelling system for integrated ecosystem-based impact assessments that will improve the scientific foundation for sustainable management of Europe's sub-Arctic to Arctic seas. This modelling system, known as SYMBIOSES, is designed to perform realistic simulations to examine the possible outcomes of different combinations of maritime activities. Initially, SYMBIOSES will examine the impact of operations of the fisheries and petroleum industries on fish and plankton communities.

To simulate impacts on the marine ecosystem, SYMBIOSES links several existing ecosystem models into a single framework using a plug and play approach. Initially, the system includes a physical model to simulate the oceanographic features of a given

region, biological models to simulate the distribution and behaviour of different life stages of important commercial fish species, zooplankton prey species and phytoplankton, a model to simulate the transport and fate of petroleum components, and models to predict the effect of petroleum components on fish and their prey.

The system generates a range of outputs from water current fields and plankton distributions to toxicological endpoints and effects, to fisheries parameters. Results are then presented using easily understandable numerical and visual presentation tools, including the presentation of prediction uncertainties. The SYMBIOSES integrated modelling system also provides a framework to synthesise and organise knowledge acquisition activities to improve the identification of knowledge gaps for further scientific research.

System applications include:

- Performance of spatial/temporal planning and risk reduction;
- Comparison of impacts associated with combinations of sea-based activities;
- Evaluation of various sustainable management options for individual maritime actors.


SYMBIOSES is a decision support system that is being developed by a consortium of 15 European partners from research institutes, universities and private companies. Akvaplan-niva, one of Scandinavia's largest research-based environmental services companies, and a premier expert on Arctic environmental challenges related to maritime activities, is leading the development of this advanced modelling system. It is initially being developed and tested in the spatially managed sub-Arctic to Arctic area of



the Lofoten/Barents Sea. The Lofoten/Barents Sea region is rich in petroleum resources and is also characterised as a key spawning area for several North Atlantic commercial fish species.

The development of SYMBIOSES is financed through a major public private partnership between the Research Council of Norway and seven international petroleum companies. The first version of SYMBIOSES will be available in late 2014, with plans to extend its application into other maritime areas and applications thereafter.

SYMBIOSES will be a key support for integrated marine policy decision-making by improving the prediction of marine ecosystems' response to a combination of natural and anthropogenic factors, and allowing different actions for sustainable management to be evaluated.



JoLynn Carroll
Assistant Director

Akvaplan-niva
Fram Centre
9296 Tromsø
Norway

Tel: +47 77750314
+47 77750301

jo@akvaplan.niva.no
www.akvaplan.niva.no
www.symbioses.no