

# The application of ecological quality objectives for eutrophication at a regional level – North Sea

## 1. Policy Objective & Theme

- ADAPTATION TO RISK: Preventing and managing natural hazards and technological (human-made) hazards
- SUSTAINABLE USE OF RESOURCES: Preserving coastal environment (its functioning and integrity) to share space
- SUSTAINABLE ECONOMIC GROWTH: Developing Europe's regional seas sustainably

## 2. Key Approaches

- Integration
- Knowledge-based
- Socio-economic

## 3. Experiences that can be exchanged

The concept of ecological quality objectives (EcoQOs) for eutrophication can be applied in other European regional seas for e.g. HELCOM, Barcelona Convention, despite differences in approaches and geographical coverage. There are also synergies with the ecological quality status of surface water under the EC Water Framework Directive.

## 4. Overview of the case

A series of EcoQOs has been defined for eutrophication in the greater North Sea. This target-oriented approach has been designed to reduce nitrogen and phosphorus loadings by 50% in order to achieve a healthy marine status. A whole suite of EcoQOs will form an important operational framework and tool for applying the Ecosystem Approach.

## 5. Context and Objectives

### a) Context

OSPAR, in 2002, agreed to further develop and implement Ecological Quality Objectives as agreed by Ministers at the 5th North Sea Conference. This included applying ten agreed EcoQOs in a pilot project for the North Sea, including five pilot EcoQOs for eutrophication prepared by the OSPAR Eutrophication Committee. EcoQOs describe a desired level of Ecological Quality against which the effects of human activities can be judged, and against which the effectiveness of measures taken to achieve a healthy marine environment can be assessed. They can also be used as communication tools, since they provide the basis for establishing common understanding and agreements with the various stakeholders on long-term ecological objectives.

The development of EcoQOs with respect to nutrients and eutrophication effects is a target-oriented approach. It allows for an evaluation of the 50% nitrogen and phosphorus nutrient reduction target and an assessment of whether the general goal “to achieve by the year 2010 a healthy marine environment where eutrophication does not occur” is achieved, and for identifying the need for further action. These EcoQOs have been developed in parallel with harmonized assessment criteria established to assess and classify the eutrophication status of the maritime area, including their local areas.

### b) Objectives

The overall general ecological objective is to achieve by the year 2010 a healthy marine environment where eutrophication does not occur. It is part of the target-orientated approach in the OSPAR Eutrophication Strategy and is tightly linked to the source-orientated approach to reduce nitrogen and phosphorus inputs, in the order of 50% compared with 1985.

## **6. Implementation of the ICZM Approach (i.e. management, tools, resources)**

### **a) Management**

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the “OSPAR Convention”) entered into force in 1998. A Eutrophication Committee is specifically dealing with the eutrophication EcoQOs under the joint leadership of the Netherlands and Norway. The individual Member States are responsible for meeting the EcoQO programme.

### **b) ICZM tools**

The overall general ecological objective implies a situation where the OSPAR Convention area is classified as a “non-problem area” where eutrophication does not occur by the year 2010. The five specific EcoQOs for eutrophication are:

1. Winter dissolved inorganic nitrogen (nitrate, nitrite and ammonium) and/or dissolved inorganic phosphate should remain below a justified salinity-related and/or area-specific percentage deviation from background not exceeding 50%;
2. Maximum and mean chlorophyll a concentrations during the growing season should remain below a justified area-specific percentage deviation from background not exceeding 50%;
3. Region/area-specific phytoplankton eutrophication indicator species should remain below respective nuisance and/or toxic elevated levels (and there should be no increase in the duration of blooms);
4. Oxygen concentration, decreased as an indirect effect of nutrient enrichment, should remain above area specific oxygen assessment levels, ranging from 4-6 mg oxygen per litre;
5. There should be no kills in benthic animal species as a result of oxygen deficiency and/or toxic phytoplankton species.

These EcoQOs form an integrated set for nutrients and eutrophication effects and cannot be considered in isolation. They are, themselves, just one sub-set of the EcoQOs which collectively describe the overall ecological quality of the marine ecosystem. The items are strongly interlinked along a cause/effect chain from nutrient enrichment to direct effects (chlorophyll a and phytoplankton nuisance and toxic indicator species) and indirect effects (oxygen deficiency and benthos kills). They also have a clear link to human activities which result in increased inputs of nutrients to the marine environment. It provides the operational, specific framework for evaluating the 50% nutrient (nitrogen and phosphorus) reduction target and for assessing whether the overall general ecological goal with regard to eutrophication will be achieved by 2010.

## **7. Cost and resources**

No information is available.

## **8. Effectiveness (i.e. were the foreseen goals/objectives of the work reached?)**

An important feature of the EcoQOs for eutrophication is that they are area-specific and that the evaluation or assessment should be made on the integrated set. The reduction of nutrient discharges is being pursued from diffuse sources, point sources and atmospheric deposition and management measures have been decided upon. So far, target nitrogen reduction has not been achieved in many areas (generally about 30%) and additional attention has to be paid to the reduction of inputs from agriculture, industries, households, and sewage treatment plants. Although phosphorus reductions have been successful, nutrient enrichment is still relevant as a result of sediment releases. Alternative measures may be considered to reduce the impacts of nutrient releases, e.g. by creating marsh areas on the fresh-marine interface that store or process nutrients.

A first application resulted in an initial classification of marine areas with respect to their eutrophication status into two classes viz. non-problem areas (high/good under the WFD), which is the desired state, and problem areas (moderate/poor/bad under the WFD). There is a possibility to further discriminate water bodies which show an elevated level of nutrient enrichment but no or yet unknown levels of eutrophication effects as potential problem areas.

## 9. Success and Fail factors

The availability of an existing body or time-series of data to allow a realistic setting of objectives is one important factor. The risk of misinterpretation of the causes of direct and indirect effects is substantially reduced when all categories (nutrient enrichment, direct effects, and indirect effects) as well as supporting environmental information are monitored and assessed together. The OSPAR Eutrophication Monitoring Programme requires regular, coherent, integrated and mandatory monitoring of nutrients in conjunction with both direct and indirect effect parameters in estuaries, coastal and offshore areas. For some (sub)areas, spatial and temporal coverage needs to be improved. In problem areas and potential problem areas, monitoring should be every year but in non-problem areas only once per three years. Additional criteria could be developed into EcoQOs. A candidate is macrophytes, for which area specific assessment levels and criteria are in advanced progress (e.g. Danish waters).

## 10. Unforeseen outcomes

The EcoQOs for eutrophication have been evaluated taking account of advice on their use and implementation given by the International Council for the Exploration of the Sea. This evaluation showed that more work needs to be done to develop ecological quality elements into the eutrophication EcoQOs. This requires that area-specific background concentrations and assessment levels are established before new EcoQOs for eutrophication are developed. As a result of the evaluation, for example, the robustness of the range 4-6 mg oxygen per litre for the EcoQO on oxygen concentration needs to be explored further. So far, an EcoQO for changes in zoobenthos has proven to be premature but work will continue to this end, including identifying a list of area-specific (groups of) benthic indicator species in relation to long-term eutrophication.

## 11. Prepared by

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## 12. Verified by

It has not been possible to verify this case.

## 13. Sources

- Ecological Quality Objectives for the Greater North Sea with Regard to Nutrients and Eutrophication Effects (2005) OSPAR Commission
- Handbook for the application of Ecological Quality Objectives in the North Sea (2007) OSPAR Commission



North Sea-Eco QOs - 2005 paper (223.03 KB)  



North Sea-EcoQOs - 2007 paper (930.88 KB) 