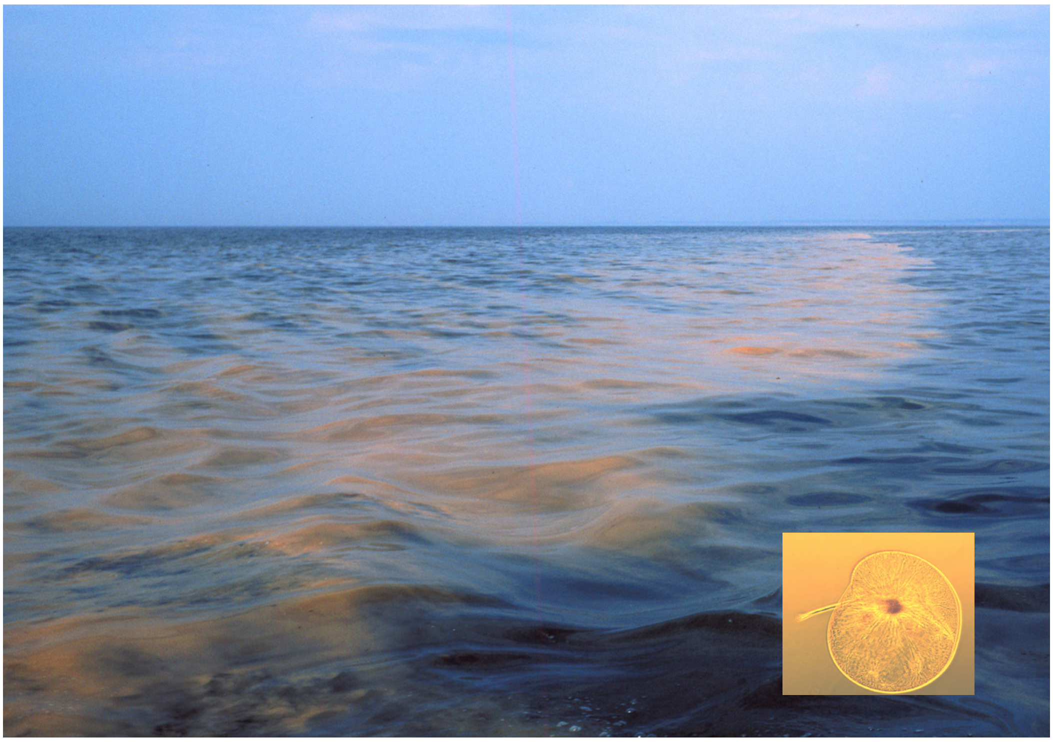
OSPAR COMMISSION

Eutrophication Status of the OSPAR Maritime Area

Second OSPAR Integrated Report



Eutrophication Series

2009

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Community and Spain.

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. La Convention a été ratifiée par l'Allemagne, la Belgique, le Danemark, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède et la Suisse et approuvée par la Communauté européenne et l'Espagne.

Electronic navigator to complementary QSR assessments and documentation

This report is a major contribution to the Qaulity Status Report 2010 and is supported by a serires of complementary assessments, which are part of the QSR 2010. The 2005 assessments of waterborne and atmospheric inputs of nitrogen, which contributed to this report, have been updated in 2009.

QSR assessments

- Towards the 50% reduction target for nutrients (OSPAR, 2008a)
- Nutrient reduction scenarios in the OSPAR Convention area (OSPAR, 2008b)
- Atmospheric nitrogen in the OSPAR Convention area (OSPAR, 2007)
- Trends in atmospheric concentrations and deposition (publication 447/2009)
- Trends in waterborne inputs (publication 448/2009)

Complementary documentation

- Assessment of data collected under the OSPAR Comprehensive Study on Riverine Inputs and Direct Discharges (OSPAR, 2005e)
- Assessment of trends in atmospheric concentration and deposition of pollutants to the OSPAR area (OSPAR, 2005f)
- Common Procedure for the identification of the eutrophication status of the OSPAR maritime area (agreement 2005-3)
- Eutrophication Monitoring Programme (agreement 2005-4)

Front page picture and acknowledgement: An accumulation of the heterotrophic dinoflagellate *Noctiluca sp.* observed in the Skagerrak off Lysekil in 2002. Photo: ©Mattias Sköld. The insert shows *Noctiluca scintillans* as seen in the microscope. Photo: ©Bengt Karlson.

contents

Executive Summary

Eutrophication is still a problem

The overall objective of the OSPAR Eutrophication Strategy to achieve a healthy marine environment where no eutrophication occurs will only be partially achieved by 2010. Eutrophication is still a problem in 106 defined areas of the North-East Atlantic. These are confined to the Greater North Sea (Region II) and to some small coastal embayments and estuaries within the Celtic Seas (Regions III) and the Bay of Biscay and Iberian Coast (Region IV). In those areas, anthropogenic nutrient enrichment of marine waters is still causing an increase in the accelerated growth of algae in the water column and higher forms of plants living on the bottom of the sea. This has resulted in a range of undesirable disturbances in the marine ecosystem. This includes shifts in the composition of the flora and fauna which affects habitats and biodiversity, and the depletion of oxygen, causing death of fish and other species.

Positive trends observed

In 2007/2008, Contracting Parties assessed 204 areas under the OSPAR Common Procedure for the Identification of the Eutrophication Status of the OSPAR maritime area (the "Common Procedure"). Of the 16 assessed offshore water bodies, three areas in the Skagerrak and the central North Sea which had previously been identified as problem areas with regard to eutrophication could now be classified as non-problem areas. Toxic phytoplankton indicator species with low biomasses have not been observed recently in some of those areas and/or are considered no longer related to eutrophication.

Changes in eutrophication status of estuaries and coastal areas are less explicit; only 9 problem areas improved to potential problem area or non-problem area status. Yet, some areas showed improving trends in individual assessment parameters since the last assessment under the Common Procedure in 2002/2003. These trends are not yet visible in the overall area classification.

For 24 areas the eutrophication status changed for the worse based on elevated chlorophyll concentrations, the occurrence of phytoplankton indicator species, seasonal oxygen depletion in the bottom water of stratified areas, and loss of macrophytes. For some areas the causal relationship between anthropogenic nutrient enrichment and the observed effects are still under investigation and their classification as potential problem area or problem area has been made on a precautionary basis.

The European Commission is currently unable to endorse the classification as 'Non Problem Area' or 'Potential Problem Area' of certain marine areas. This assessment is, therefore, without prejudice to any disputes that are ongoing or may arise between the European Commission and EU Member States regarding the classification of the eutrophication status of the OSPAR maritime area.

Significant nutrient input reductions took place

The improvement of the eutrophication status is largely dependent on reducing anthropogenic inputs of nitrogen and phosphorus into affected areas. In the period 1985 – 2005, most Contracting Parties achieved reductions in discharges, emissions and losses of phosphorus by 50% compared to input levels in 1985. Reductions for nitrogen were less consistent and explicit across OSPAR.

In the last years, extensive nutrient reduction measures have been put in place to prevent eutrophication. Yet, in many cases measures targeting point sources as well as agricultural sources were taken later than envisaged under OSPAR and/or relevant EU legislation. Another time lag can be observed between the implementation of such measures and a positive response from the ecosystem which can take many years. These experiences should be used to design and apply the most effective measures as early as possible.

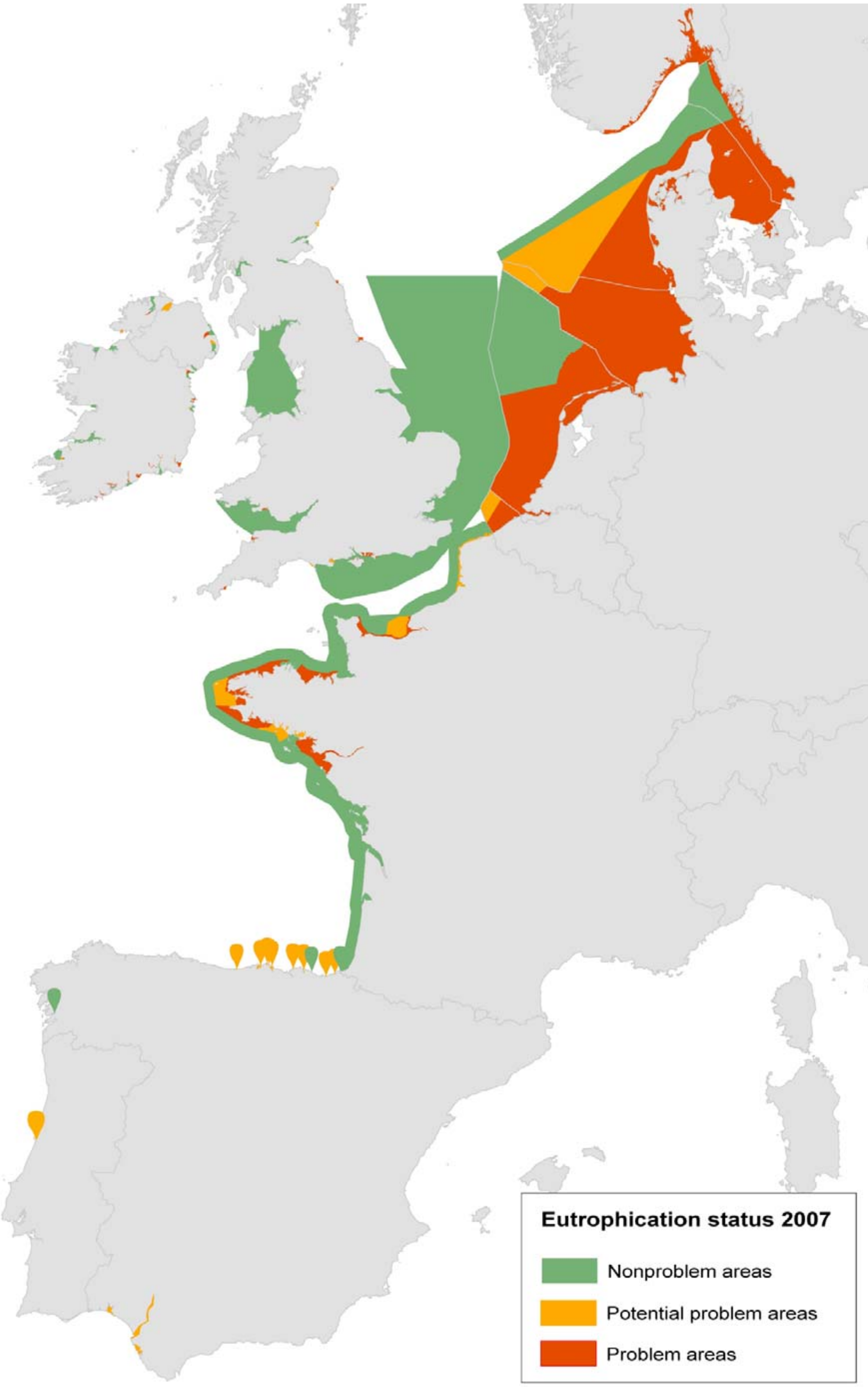
Further efforts are needed

Modelling studies estimate that nutrient input reductions beyond the current objective of the Eutrophication Strategy of 50% in relation to input levels in 1985 will be needed to convert all problem areas into non-problem areas. Thus there is still further effort needed to reduce nutrient inputs in particular for nitrogen into the marine environment.

Positive experience gained in applying the Common Procedure

The Common Procedure has proved a good operational tool for the assessment of the eutrophication status. The experience gained in its second application shows that the assessment methodology can be further refined and harmonised across OSPAR Contracting Parties, including any refinement with requirements for the implementation of the EC Water Framework Directive for transitional and coastal waters. It will also provide a useful tool for addressing in future the requirements of the Marine Strategy Framework Directive with regard to eutrophication.

A further application of the Common Procedure is necessary to follow up within OSPAR the effectiveness of reduction measures for the eutrophication status of the North-East Atlantic.


Eutrophication status 2007
Nonproblem areas
Potential problem areas
Problem areas

Récapitulatif

Eutrophisation – encore un problème

On ne parviendra que partiellement, en 2010, à l'objectif général de la Stratégie eutrophisation, à savoir parvenir à un milieu marin sain où les phénomènes d'eutrophisation ne se produisent pas. L'eutrophisation constitue encore un problème dans 106 zones définies de l'Atlantique du Nord-est. Elles se limitent à la mer du Nord au sens large (Région II) et à quelques baies côtières et estuaires dans les mers celtiques (Région III) et le Golfe de Gascogne et les côtes ibériques (Région IV). L'enrichissement anthropique en nutriments des eaux marines, dans ces régions, entraîne encore une augmentation de la croissance accélérée des algues dans la colonne d'eau et d'autres formes supérieures de plantes qui vivent au fond de la mer. Ceci a donné lieu à des perturbations indésirables de l'écosystème marin.

Tendances positives relevées

En 2007/2008, les Parties contractantes ont évalué 204 zones, dans le cadre de la Procédure commune de détermination de l'état d'eutrophisation de la zone maritime OSPAR ("la Procédure commune"). Trois zones, dans le Skagerrak et le centre de la mer du Nord, sur les seize masses d'eaux offshore évaluées, sont maintenant classées comme zones sans problème alors qu'elles avaient précédemment été déterminées comme zones à problème. On n'a pas récemment noté, dans certaines de ces régions, la présence d'espèces phytoplanctoniques indicatrices toxiques à faible biomasse et/ou celles-ci ne sont plus considérées comme étant liées à l'eutrophisation.

Les modifications de l'état d'eutrophisation des estuaires et des zones côtières sont moins explicites; seules neuf zones à problème ont montré une amélioration et sont maintenant classées comme zones à problème potentiel ou comme zones sans problème. Certaines zones révèlent cependant des tendances, pour les paramètres d'évaluation individuels, qui se sont améliorées depuis la dernière évaluation dans le cadre de la Procédure commune en 2002/2003. Ces tendances ne se retrouvent pas encore dans le classement d'ensemble de la zone.

L'état d'eutrophisation de vingt-quatre zones a empiré. Ceci est dû aux teneurs élevées de chlorophylle, à la présence d'espèces phytoplanctoniques indicatrices, à l'épuisement saisonnier en oxygène dans les eaux de fond des zones stratifiées et à la perte de macrophytes. Les rapports causaux entre l'enrichissement anthropique en nutriments et les effets observés sont en cours d'étude pour certaines zones. La classification de ces zones en tant que zones à problème potentiel ou zones à problème a été effectuée à titre préventif.

La Commission européenne n'est pas actuellement en mesure d'entériner la classification, en tant que "zone sans problème" ou "zone à problème potentiel", de certaines zones marines. Cette évaluation est donc sans préjudice des litiges éventuels en cours ou qui risquent de se produire entre la Commission européenne et les Etats membres de l'UE en ce qui concerne la classification de l'état d'eutrophisation de la zone maritime OSPAR.

Apports de nutriments – réductions significatives

L'amélioration de l'état d'eutrophisation dépend essentiellement des apports anthropiques d'azote et de phosphore dans les zones affectées. Entre 1985 et 2005, la plupart des Parties contractantes sont parvenues à réduire les rejets, émissions et pertes de phosphore de 50% par rapport à 1985. Les réductions d'azote sont moins cohérentes et explicites dans l'ensemble de la zone OSPAR.

Ces quelques dernières années, des mesures de réduction des nutriments considérables ont été mises en place pour empêcher l'eutrophisation. Dans de nombreux cas, cependant, les mesures ciblant les sources ponctuelles ainsi que les sources agricoles ont été prises plus tard que prévu dans le cadre d'OSPAR et/ou de la législation pertinente de l'UE. On relève un autre décalage entre la mise en œuvre de ces mesures et la réaction positive d'un écosystème, ce qui peut prendre de nombreuses années. On devrait se fonder sur ces expériences pour concevoir et appliquer les mesures les plus efficaces dès que possible.

Efforts supplémentaires nécessaires

Des études de modélisation estiment que des réductions des apports de nutriments allant au-delà de l'objectif de 50% de la Stratégie eutrophisation, par rapport à 1985, seront nécessaires pour transformer toutes les zones à problème en zones sans problème. Il est donc nécessaire de faire des efforts supplémentaires pour réduire les apports de nutriments, en particulier pour l'azote dans le milieu marin.

Application de la Procédure commune – expérience positive

La Procédure commune s'est avérée être un bon outil opérationnel d'évaluation de l'état d'eutrophisation. L'expérience acquise lors de sa deuxième application montre que l'on peut mieux affiner et harmoniser la méthodologie d'évaluation dans l'ensemble des Parties contractantes OSPAR. Il s'agit notamment d'affiner les exigences de la mise en œuvre de la Directive cadre sur l'eau de la CE pour les eaux de transition et les eaux côtières. Elle constituera également un outil utile pour aborder, à l'avenir, les exigences de la Directive cadre de stratégie marine en ce qui concerne l'eutrophisation.

Il est nécessaire d'effectuer une autre application de la Procédure commune afin d'assurer, au sein d'OSPAR, le suivi de l'efficacité des mesures de réduction pour l'état d'eutrophisation de l'Atlantique du Nord-est.

1. Introduction

This report is the second in a series of periodic assessments of the eutrophication status of the OSPAR maritime area under the Common Procedure for the Identification of the eutrophication status of the OSPAR maritime area (the "Common Procedure") (OSPAR, 2005a). It follows and builds on the results of the first application of the Comprehensive Procedure (OSPAR, 2003a) and underpins the overall assessment of the quality of the OSPAR maritime area and its regions in 2010. The purpose of this report is

- to assess the eutrophication status of the OSPAR maritime area and its regions based on data for the period 2001 - 2005;
- to evaluate progress made towards achieving the objectives of the Eutrophication Strategy;
- to consider the effectiveness of measures taken to combat eutrophication on the state of the marine environment, and;
- to identify priorities for future actions.

In addition, this report informs on progress made on the implementation of the integrated set of Ecological Quality Objectives for eutrophication as contribution to the evaluation by OSPAR in 2009 of the EcoQO system for the North Sea.

The European Commission is currently unable to endorse the classification as 'Non Problem Area' of certain marine areas as the provisions of the OSPAR Common Procedure for the Identification of the Eutrophication Status of the OSPAR maritime area have not been followed by all Contracting Parties. In addition, the assessment under the Nitrates Directive of waters affected or at risk from nitrate pollution and the designation of nitrate "vulnerable zones", and the identification under the Urban Wastewater Treatment Directive of "sensitive areas", may, for certain areas classified as 'Potential Problem Area', point to a more impaired status. This assessment is, therefore, without prejudice to any disputes that are ongoing or may arise between the European Commission and EU Member States regarding the classification of the eutrophication status of the OSPAR maritime area.

1.1 Eutrophication Strategy

The aim of the OSPAR Eutrophication Strategy (OSPAR, 2003b) is to make every effort to combat eutrophication in the OSPAR maritime area, in order to achieve and maintain, by 2010, a healthy marine environment, where eutrophication does not occur.

The OSPAR maritime area covers most of the North-East Atlantic. It embraces remote open sea areas as well as dense populated catchments where pressures from human activities are particularly high. For assessment purposes, the OSPAR maritime area is divided into five regions (Figure 1.1): Arctic Waters (Region I), the Greater North Sea (Region II), the Celtic Sea (Region III), the Bay of Biscay and Iberian Coast (Region IV), and the Wider Atlantic (Region V).

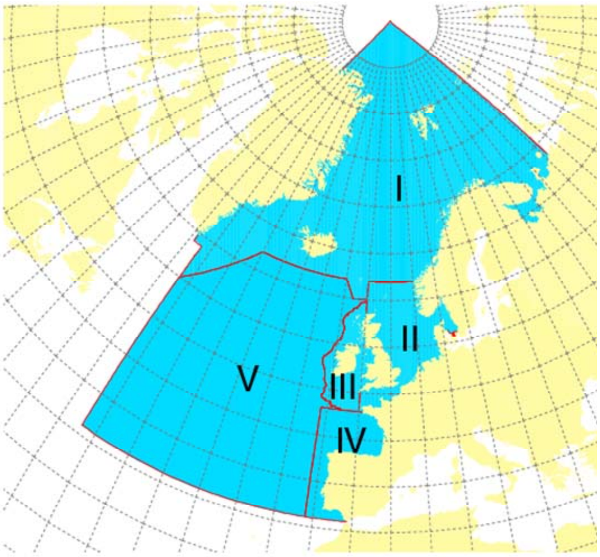


Figure 1.1 OSPAR maritime area and its Regions

Marine eutrophication is defined in the OSPAR Eutrophication Strategy as "the enrichment of water by nutrients causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned, and therefore refers to the undesirable effects resulting from anthropogenic enrichment by nutrients as described in the Common Procedure". This definition is similar to that adopted in European Community legislation relating to eutrophication. Primary production is often limited by the availability of light or nutrients. Nutrient enrichment may cause an increase in the growth of algae and higher forms of plant life but this depends on the availability of sufficient light and on the hydrodynamics of the water body. This in turn may lead to a range of undesirable disturbances in the marine ecosystem such as the oxygen depletion causing the death of fish and other species and significant shifts in the composition of the flora and fauna affecting habitats and biodiversity. A simplified schematic illustration of many of the issues associated with the eutrophication process is given in Figure 1.2.

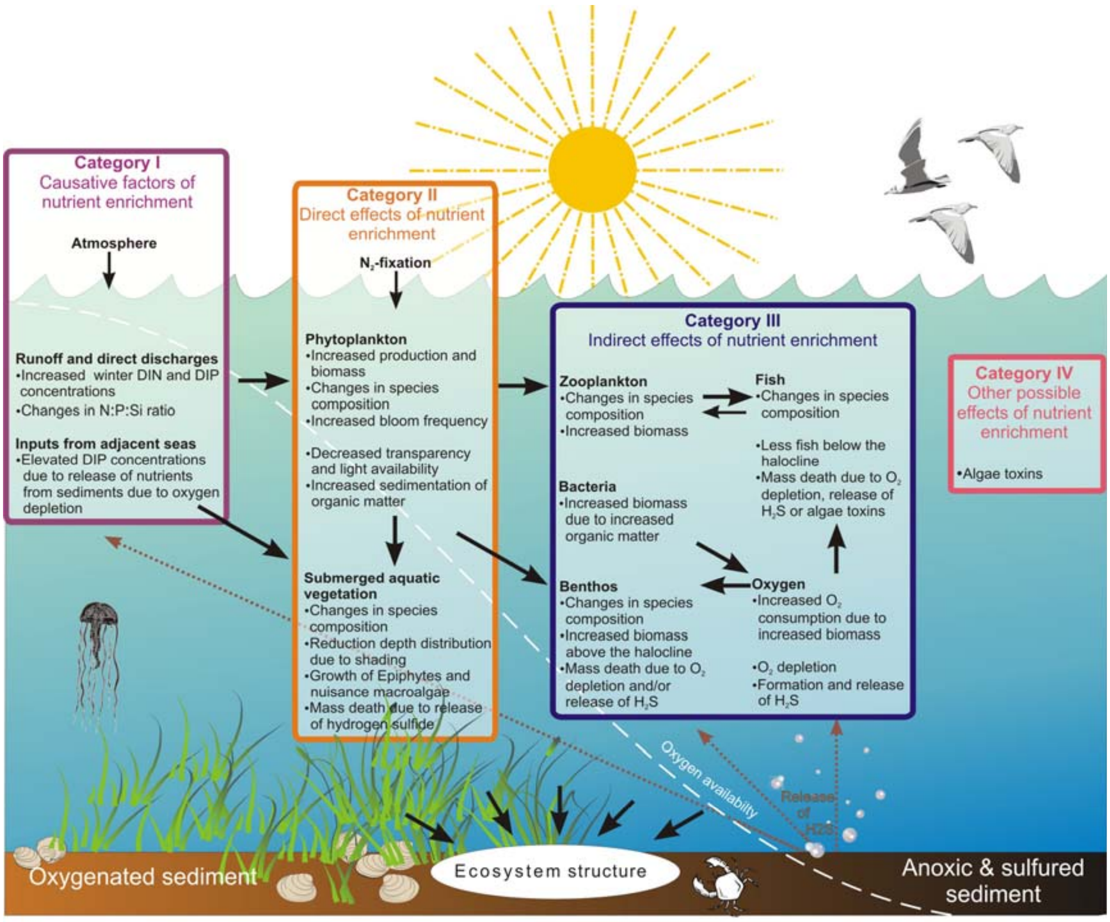


Figure 1.2 Simplified illustration of many of the issues associated with eutrophication. DIN and DIP stand for dissolved inorganic nitrogen and phosphorus respectively. N:P:Si is the ratio between nitrogen, phosphorus and silicate.

Human activities resulting in anthropogenic nutrient enrichment encompass inputs from point sources (e.g. sewage plants or industry) and from diffuse sources (e.g. agriculture, households not connected to sewerage, overflows, and atmospheric inputs). In combating human induced eutrophication, the Eutrophication Strategy builds on long-standing work of OSPAR. This includes the commitment of Contracting Parties to achieve a substantial reduction at source, in the order of 50% compared to 1985, in inputs of phosphorus and nitrogen into areas where these inputs are likely, directly or indirectly, to cause pollution.[1] These areas are defined as problem areas. To assist Contracting Parties in identifying those areas in a consistent way, OSPAR developed a common assessment framework: the Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area (the "Common Procedure"). Under the Common Procedure waters are classified as problem areas, potential problem areas and non-problem areas with regard to eutrophication.

It is the responsibility of Contracting Parties to apply the Common Procedure to their parts of the OSPAR maritime area. The results of the national assessments are reviewed by the OSPAR Commission. In cases, in which the final classification results in problem areas with regard to eutrophication, the Eutrophication Strategy requires the OSPAR Commission and Contracting Parties, individually or jointly, to take measures to reduce or to eliminate the anthropogenic causes of eutrophication and to assess, based on implementation reporting, the effectiveness of those measures on the state of the marine ecosystem. In the case of potential problem areas with regard to eutrophication, preventive measures shall be taken in accordance with the precautionary principle and monitoring and research shall be urgently implemented to

[1] PARCOM Recommendation 88/2 on the reduction in inputs of nutrients to the Paris Convention; PARCOM Recommendation 89/4 on a coordinated programme for the reduction of nutrients; and PARCOM Recommendation 92/7 on the reduction of nutrient inputs from agriculture into areas where these inputs are likely, directly or indirectly, to cause pollution.

enable a full assessment of the eutrophication status of each area concerned after five years of its classification.

The Common Procedure is supported under the eutrophication related part of the OSPAR Joint Assessment and Monitoring Programme (JAMP) by collective OSPAR monitoring. The Eutrophication Monitoring Programme (OSPAR, 2005b) is supplemented by monitoring guidelines, as part of the OSPAR Co-ordinated Environmental Monitoring Programme (CEMP). Under the JAMP, monitoring and periodic assessments of temporal trends of waterborne and atmospheric inputs of nutrients to the OSPAR maritime area under the OSPAR Comprehensive Study of Riverine Inputs and Direct Discharges (RID) and the OSPAR Comprehensive Atmospheric Monitoring Programme (CAMP) also inform the assessment of the eutrophication status.

The implementation of the Eutrophication Strategy takes place within the framework of the obligations of Contracting Parties in this field in other fora. This includes for example the Urban Waste Water Treatment Directive (91/271/EEC) and the Nitrates Directive (91/676/EEC) which require Member States of the European Community and the European Economic Area to identify “sensitive areas” and nitrate “vulnerable zones”, respectively, as basis for the implementation of targeted measures to reduce nutrient inputs to these areas. Under the Water Framework Directive (2000/60/EC) an assessment framework, closely linking to the conceptual approach of the Common Procedure, has been set up to assess, classify and monitor the ecological quality of a water body in transitional and coastal waters. It requires the adoption of measures and programmes to achieve good ecological status of those waters. The Marine Strategy Framework Directive (2008/56/EC) requires EU Member States to take the necessary measures to achieve or maintain good environmental status in the marine environment by the year 2020 at the latest. This includes the goal to minimise human-induced eutrophication, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.

1.2 EcoQO system for the North Sea

Based on commitments by North Sea Ministers in 1997 and OSPAR in 2003, OSPAR has developed a first set of Ecological Quality Objectives (EcoQOs) through a pilot project for the area of the Greater North Sea. EcoOQs are a tool to support the application of the ecosystem approach to the management of human activities affecting the marine environment and provide a means to define the desired quality of the marine environment.

The use of EcoQOs is similar to the environmental objectives for the quality elements under the Water Framework Directive (2000/60/EC) to assess the ecological quality of a water body (OSPAR, 2005c) and links to the concept of good environmental status of the Marine Strategy Framework Directive (2008/56/EC).

The Agreement on the Application of the EcoQO System (OSPAR, 2006) sets out the arrangements for testing out the various EcoOOs, with a view to having an evaluation of the robustness of the various EcoQOs by 2008 and an assessment of the results of the EcoQO system prepared by 2009 as a contribution to the OSPAR Quality Status Report 2010.

An integrated suite of eutrophication EcoQOs which consists of an overarching EcoQO for eutrophication and an integrated set of five specific EcoQOs has been developed (Box 1). The specific EcoQOs correspond to a selection of assessment parameters and their assessment levels as applied under the Common Procedure.

Box 1

OSPAR EcoQOs and its integrated set of EcoQOs for eutrophication:

All parts of the North Sea should have the status of non-problem areas with regard to eutrophication by 2010, as assessed under the OSPAR Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area:

- *Winter concentrations of dissolved inorganic nitrogen and phosphate should remain below a justified salinity-related and/or area-specific % deviation from background not exceeding 50%*
- *Maximum and mean phytoplankton chlorophyll a concentrations during the growing season should remain below a justified area-specific % deviation from background not exceeding 50%*
- *Area-specific phytoplankton species that are indicators of eutrophication should remain below respective nuisance and/or toxic elevated levels (and there should be no increase in the average duration of blooms)*
- *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 liter*
- *There should be no kills in benthic animal species as a result of oxygen deficiency and/or toxic phytoplankton species.*

The integrated set of EcoQOs has been tested through this second application of the Comprehensive Procedure and the experience of Contracting Parties in its application is given in section 4.2.

2. The Common Procedure

The definition of marine eutrophication, given by the Eutrophication Strategy (see section 1) in a generalised and qualitative way, is implemented and made operational through the Common Procedure for the Identification of the Eutrophication Status of the OSPAR maritime area (the "Common Procedure") which was first adopted in 1997 and revised in 2005 (OSPAR, 2005a).

The Common Procedure comprises two procedural phases:

The first phase, the one-off "Screening Procedure", was completed in 2001 and identified those areas of the OSPAR maritime area which are likely to be areas where eutrophication is not a problem. Those areas were classified as "non-problem areas" without further detailed assessment.

The screening resulted in the areas shown in Figure 2.1 which could not be set aside as obvious non-problem areas and which required a comprehensive assessment of their eutrophication status under the second phase, the "Comprehensive Procedure" of the Common Procedure. The Comprehensive Procedure is a reiterative process which was first applied by Contracting Parties to those areas in 2002 (OSPAR, 2003a).

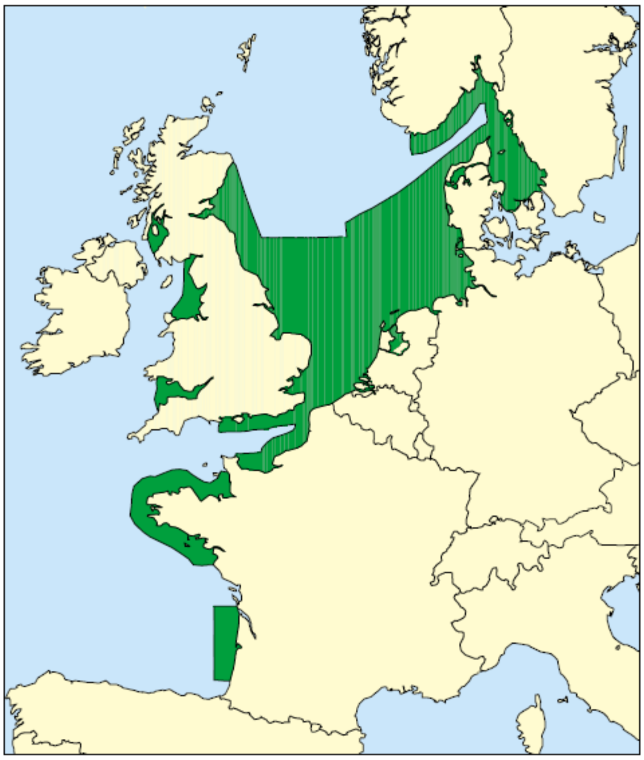


Figure 2.1 Areas agreed by OSPAR 2001 to be subject to the Comprehensive Procedure following the Screening Procedure (OSPAR, 2001). A number of Irish, Spanish and Portuguese estuaries are included but don't show at this scale and have therefore not been included.

The Comprehensive Procedure links qualitative criteria in a cause-effect scheme to form a holistic assessment of the eutrophication status of a given area (see figure 1 of the Common Procedure, OSPAR 2005).

From a list of assessment criteria, ten parameters have been selected for harmonised application by Contracting Parties in the eutrophication assessment (Table 2.1). For each parameter, area-specific assessment levels are derived in relation to the relevant background conditions. The assessment level may deviate from background conditions to reflect natural variability. For concentrations, the assessment level is generally defined as a justified area-specific % deviation from background conditions not exceeding 50%.

For an initial classification of an area (step 2 of the Comprehensive Procedure), the observed levels for each assessment parameter are scored and evaluated in relation to each other.

Areas showing elevated levels for each of the categories of assessment parameters have an initial classification of 'problem area' and where none of the categories have elevated levels the area will have an initial classification of 'non-problem area'. Section 5 of the Common Procedure provides a complete guide to the possible outcomes from scoring in the initial classification.

Following the initial classification, an overall appraisal can be made of all relevant information concerning the harmonised assessment parameters, their respective assessment levels and supporting environmental factors in the assessment framework, in order to achieve a final classification of the area concerned (step 3 of the Comprehensive Procedure). The purpose of this step in the assessment is to provide a sufficiently sound, transparent and verifiable account of the reasons for giving a particular status to an area. In Section 6, the Common Procedure provides guidance on the overall appraisal.

Table 2.1 OSPAR harmonized assessment parameters and associated elevated levels

Category I	**Degree of nutrient enrichment**	
	1	**Riverine inputs and direct discharges (area-specific)**
		Elevated inputs and/or increased trends of total N and total P (compared with previous years)
	2	**Nutrient concentrations (area-specific)**
		Elevated level(s) of winter DIN and/or DIP
	3	**N/P ratio (area-specific)**
		Elevated winter N/P ratio (Redfield N/P = 16)
Category II	**Direct effects of nutrient enrichment (during growing season)**	
	1	**Chlorophyll *a* concentration (area-specific)**
		Elevated maximum and mean level
	2	**Phytoplankton indicator species (area-specific)**
		Elevated levels of nuisance/toxic phytoplankton indicator species (and increased duration of blooms)
	3	**Macrophytes including macroalgae (area-specific)**
		Shift from long-lived to short-lived nuisance species (e.g. *Ulva*). Elevated levels (biomass or area covered) especially of opportunistic green macroalgae.
Category III	**Indirect effects of nutrient enrichment (during growing season)**	
	1	**Oxygen deficiency**
		Decreased levels (< 2 mg/l: acute toxicity; 4 - 6 mg/l: deficiency) and lowered % oxygen saturation
	2	**Zoobenthos and fish**
		Kills (in relation to oxygen deficiency and/or toxic algae) Long-term area-specific changes in zoobenthos biomass and species composition
	3	**Organic carbon/organic matter (area-specific)**
		Elevated levels (in relation to III.1) (relevant in sedimentation areas)
Category IV	**Other possible effects of nutrient enrichment (during growing season)**	
	1	**Algal toxins**
		Incidence of DSP/PSP mussel infection events (related to II.2)

In the assessment under the Comprehensive Procedure, Contracting Parties are encouraged to take into account supporting environmental factors which may have a bearing on eutrophication processes and their assessment (Box 2). The physicochemical and hydromorphological factors to be taken into account by Contracting Parties to determine the sensitivity of an area to eutrophication include salinity gradients and regimes, depth, mixing characteristics, transboundary fluxes, upwelling, sedimentation, residence and retention time, mean water temperature, turbidity (expressed in terms of suspended matter) and mean substrate composition (in terms of sediment types).

Box 2

How physicochemical and hydromorphological factors influence the eutrophication processes and their assessment

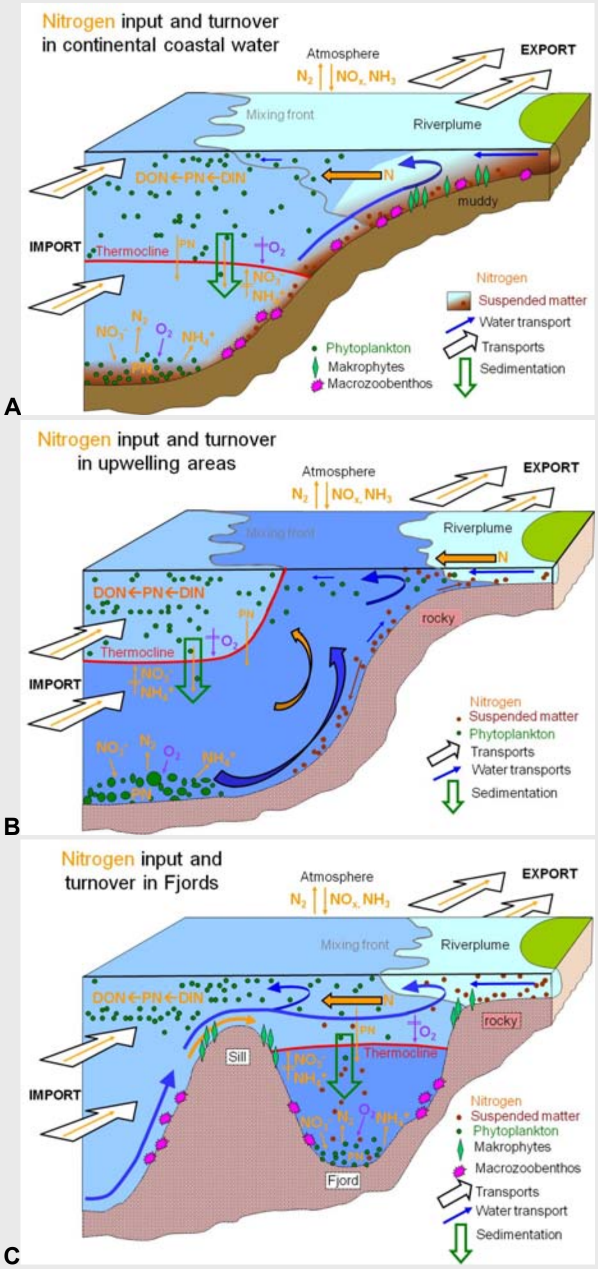


Figure 2.2 Nitrogen turnover in different water types (coastal waters, fjords and upwelling areas).

Eutrophication problems are related to enhanced and unbalanced nutrient conditions. In natural circumstances, the main limiting nutrients in the sea are nitrogen compounds. They play a central role in the control of primary production (phytoplankton, macroalgae and angiosperms). The excessive growth of these primary producers can cause eutrophication problems. Therefore, nitrogen is a key factor for understanding marine eutrophication. There are four sources supplying reactive nitrogen to the sea (in orange on the figures). The first pathway is riverine inputs and direct discharges of nitrogen from diffuse and point sources (e.g. sewage). The second source is the atmosphere. Nitrogen compounds are also supplied by remineralisation in the food chain and the sediment. However, re-imports from the bottom layer of stratified areas are blocked by stratification (red line). Finally, nutrients are imported into the system by transboundary coastal water currents (white arrows) and supplied into surface water layers by upwelling processes (blue arrows).

Figure 2.2 explains the main different scenarios for eutrophication encountered in the OSPAR region: the shallow sloped continental coastal waters of Belgium, Denmark, France, Germany, the Netherlands (A), the deep sloped Atlantic upwelling coasts off Portugal, Spain, and Ireland (C), and the fjords of Norway and Sweden with sills (B). Nutrient enrichment occurs in all these areas and results often in higher phytoplankton production, possibly succeeded by sedimentation (green arrows) and accumulation in bottom waters, oxygen depletion, fish kills and damage to zoobenthos.

Not only nutrient conditions but also physical conditions add to the complexity of eutrophication processes and may enhance or decrease the impacts. Import of nutrients applies especially to transition areas between high/low turbulence and short/long residence time, located at the fronts of river plumes, on the edge of fjords or upwelling areas.

Particulate matter, including particulate nutrients, entering areas with low turbulence and high residence time will sink fast and accumulate (e.g. in fjords and behind banks). Moderate turbulence may lead to longer availability of nutrients and enhanced eutrophication as long as light is not a limiting factor. Increasing turbulence caused by tides and waves or by long-shore currents provokes coastal and sediment erosion and as a result an increase in particulate matter in suspension. An increase in suspended particulate matter occurs also in the river plume of rivers discharging into the sea. This in turn causes decreasing light availability for primary producers and may decrease local eutrophication effects, but the nutrients may be transported to other areas.

The residence time of nutrients is related to water types. In continental coastal systems and in upwelling areas, residence time is short, while behind fjord sills residence time tends to be much longer because of the basin's structure that traps nutrients. Residence time is also naturally high under the thermocline (red line on figures). This imaginary line separates deep-water masses from upper ones with a different temperature. Stratification will enhance primary production by stabilisation of the upper part of the water column, allow sedimentation and cause finally the accumulation of particulate matter in the bottom water. If atmospheric oxygen supply is cut off, oxygen deficiency may occur. In upwelling areas, deep-water currents naturally bring nutrients to the surface of the sea (Figure 2.2 C) and may transport them over long distances. This natural enrichment should not be mixed up with enrichment caused by anthropogenic discharges.

3. Second Application of the Comprehensive Procedure

In 2007, Belgium, Denmark, France, Germany, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden and the UK applied for the second time the Comprehensive Procedure of the Common Procedure and its harmonised assessment parameters to their parts of the OSPAR maritime area for the period 2001 - 2005. Iceland has previously not identified any (potential) problem areas. Finland, Luxembourg and Switzerland have no coastline in the OSPAR maritime area.

The areas assessed in 2007 (Figure 3.1) include those that had been identified as problem areas or potential problem areas in the first application of the Comprehensive Procedure. In addition over 59 areas had been included in the second application of the Comprehensive Procedure by Denmark, Ireland, Spain and the UK together, which had not been previously assessed under the Comprehensive Procedure. Those additional areas are mostly local areas (estuaries) some of which are split into several water bodies. The additional areas have been included in the assessment by Contracting Parties in compliance with the Common Procedure either because of a concern that there has been a substantial increase in the anthropogenic nutrient load or because those areas have been designated as vulnerable zones under the Nitrates Directive (91/676/EEC) or as sensitive areas under the Urban Waste Water Directive (91/276/EEC).

Box 3

Navigator to summaries of national assessments at Annex 1 (click on flag)	
	BE
	DE
	DK
	ES
	FR
	IE
	NL
	NO
	PT
	SE
	UK

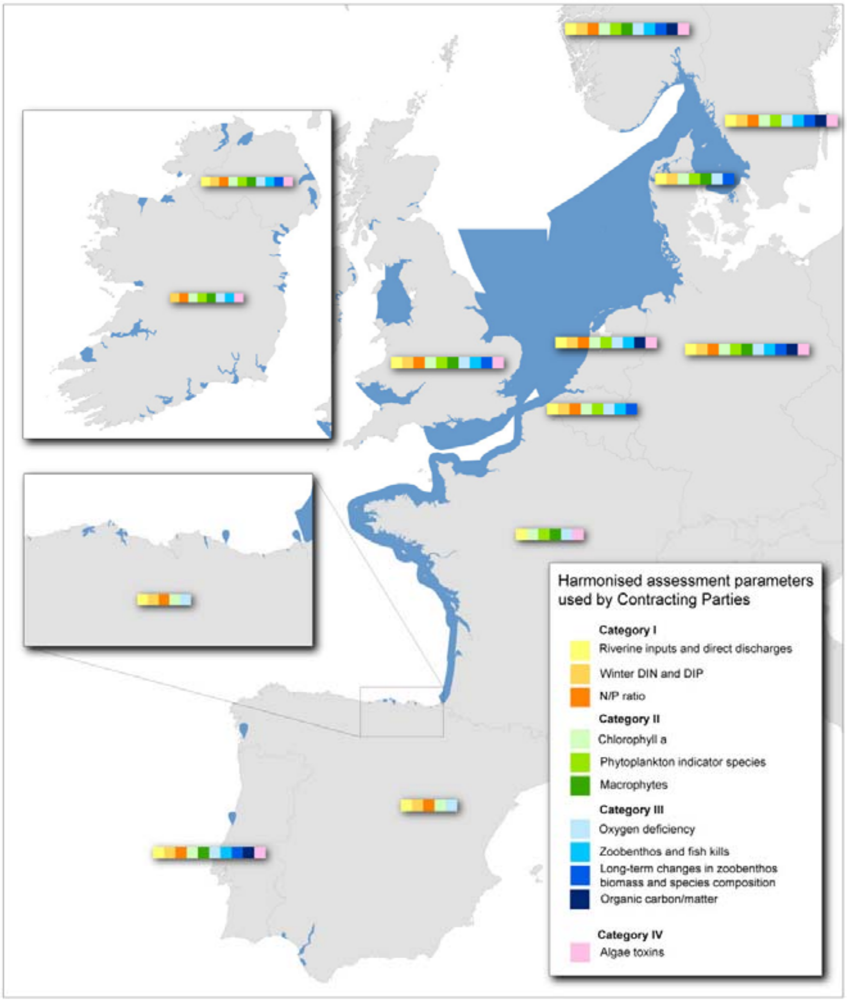


Figure 3.1 Areas assessed and assessment parameters used by Contracting Parties in the second application of the Comprehensive Procedure in 2007. Balloons indicate estuaries which are too small to show at the scale of the map.

In addition, Ireland and the UK reviewed wider coastal and offshore areas to confirm that their quality status with regard to eutrophication has not changed and does not give concern that would require subjecting them to an assessment under the Comprehensive Procedure.

Summaries of national assessments (Box 3) are reported at Annex 1 to this report and provide links to the full national assessment reports. A compilation of the assessment results for each assessed area is presented at Annex 2. An overview of the problem areas and potential problem areas identified in the first and this second application of the Comprehensive Procedure is presented at Annex 3 to this report.

Contracting Parties reported different experiences in the application of harmonised and added voluntary assessment parameters and in the area classification under the Comprehensive Procedure. This includes different classifications of adjacent sea areas. These experiences are summarised here to explain classification results and to indicate needs for further development of the assessment framework of the Common Procedure.

3.1 Characterisation of assessed areas

The water types assessed in the second application of the Comprehensive Procedure can be grouped into estuaries, including fjords, the Wadden Sea, coastal waters and offshore waters (Table 3.1). This differentiation is mainly related to salinity gradients (for example in the Greater North Sea: coastal waters < 34.5 and offshore waters ≥ 34.5), morphological structures (estuaries and fjords) and hydrodynamics (sedimentation, stratification). This characterisation is not always reflected in the national assessments.

Table 3.1 Number of areas per water type assessed by Contracting Parties in the second application of the Comprehensive Procedure in the OSPAR Regions/sub-regions

Water types covered per Region and Contracting Party	Greater North Sea (Region II)										Celtic Sea (Region III)		Bay of Biscay/Iberian Coast (Region IV)		
	Kattegat/Skagerrak			North Sea main body					Channel						
	NO	SE	DK	DK	NL	DE	BE	UK	FR	UK	UK	IE	FR	ES	PT
Estuaries & Fjords	7	0	5	2	2	3	0	7	3	12	12	40	4	14	1
Wadden Sea	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
Coastal waters	7	2	4	2	1	1	1	2	14	2	2	27	7	1	0
Offshore waters	0	2	4	1	3	1	1	2	0	1	1	3	0	0	0

The assessments by Denmark, Germany, the Netherlands, Sweden and the UK include a continuous coverage from the main estuaries to offshore waters. Belgium did not include estuaries in their assessment. Portugal, and Spain with the exception of the Bay of Cadiz, only assessed estuaries. Norway and France restricted their assessment to fjord systems and estuaries, respectively, including coastal strips. The assessed areas are characterised by different forms of aggregation, which makes a comparison difficult. For example, Denmark, Ireland, Norway, Spain and the UK defined different areas within some of their estuaries or fjord systems, while for example Germany, the Netherlands and Sweden used a territorial approach to the determination of water bodies and their classification status, covering wider areas.

In determining the areas for the assessment, Contracting Parties partly rearranged the assessment units used in the first application of the Comprehensive Procedure by grouping areas or splitting up previous assessment units into smaller areas. Details can be found in the national reports, and at Annex 3 which compares the eutrophication status of the areas in the first and the second application of the Comprehensive Procedure.

3.2 Use of assessment parameters

Table 3.2 reflects the parameters considered by Contracting Parties in the assessment. However, the parameters have not necessarily been applied in a harmonised way.

The agreed harmonised assessment parameters have not been applied by all Contracting Parties. In a number of instances, the parameters have been measured (in some cases this is reflected as "+" in Table 3.2) but the data were considered insufficient and not fit for the assessment. Other reasons for non-application of parameters in the assessment can be found in specific characteristics of the national areas assessed. This is for example the case for organic matter that is most relevant for sedimentation areas, or for macrophytes whose presence in deep areas is light limited. For winter nutrients and N/P ratios, one Contracting Party argued that the relationship between nutrients and eutrophication effects during growing season was too complex to take those parameters into account in the assessment. Practical issues like time and resource constraints were also given as reasons for not including some parameters in the assessment, especially those that require considerable monitoring effort, like kills in fish and long-term changes in zoobenthos. Finally, different weight assigned by Contracting Parties to phytoplankton indicator species and algal toxins as indicators for eutrophication has led to different approaches in their use.

Inorganic winter nutrients, chlorophyll and oxygen concentrations are the main parameters that have been considered in estuaries, including fjords, and in coastal waters. Offshore, mainly winter nutrients and chlorophyll have been used in the assessment. Overall, chlorophyll is the most applied effect parameter, followed by oxygen. The more complicated analyses of phytoplankton indicator species, macrophytes and zoobenthos were less often performed.

Contracting Parties were encouraged to voluntarily use additional parameters in the assessment. Of those, transboundary nutrient transport was the most applied parameter. Despite the importance of atmospheric nitrogen deposition, only some Contracting Parties included this parameter in the assessments.

Table 3.2 Agreed harmonised assessment parameters (shaded) and additional voluntary parameters (*) applied and reported by Contracting Parties in the second application of the Comprehensive.
In the electronic version of this report, national explanatory notes on the inclusion ✓ or non-inclusion (?) of parameters can be obtained by mousing over any cell showing (in the electronic version only) a tick-off or question mark.

Category	Parameter	BE	DE	DK	ES	FR	IE	NO	NL	PT	SE	UK[4]
Cat. I	**Riverine inputs and direct discharges**	+	+	+	✓	+	-	+	+	+	+	+
	Winter DIN and DIP concentrations	+	+	+	+	(?)	✓	+	+	+	+[3]	+
	N/P ratio	+	+	(?)	+	(?)	+	✓	+	✓	✓	+
	*Total nitrogen, total phosphorus	-	+	+	-	-	-	+	+	-	+	-
	*Transboundary nutrient transport	+	+	+	-	-	-	+	+	-	+	+
	*Atmospheric nitrogen deposition	-	+	-	-	-	-	-	+	-	+	-
	*Silicate (and Si ratios)	-	+	-	-	-	-	+[2]	-	-	+	-
Cat. II	**Chlorophyll *a***	+	+	+	+	+	+	+	+	✓	+	+
	Phytoplankton indicator species	✓	+	+	(?)	+	+	+	+	(?)	+	✓[5]
	Macrophytes including macroalgae	(?)	+	+	(?)	+	+	✓	-	+	(?)	+
Cat. III	**Oxygen deficiency and lowered % saturation**	+	+	+	+	+	+	+	+	+	+	+
	Kills in fish and zoobenthos	✓	+	-	-	(?)	+	+	✓	+	+	+
	Long-term changes in zoobenthos biomass and species composition[1]	✓	+	+	(?)	(?)	(?)	✓	(?)	+	+	+
	Organic carbon	(?)	+	(?)	(?)	(?)	(?)	✓	+	+	+	(?)
	*Secchi depth	-	+	-	-	-	-	+	-	-	+	-
Cat. IV	**Algal toxins**	(?)	+	(?)	(?)	+	+	+	+	+	+	✓

(*) additional voluntary assessment parameters;
(+) parameter included in the assessment
(-) parameter not included in the assessment

[1] Long-term changes in zoobenthos biomass and species composition is listed as harmonised assessment parameter in the Common Procedure and subject to monitoring under the Eutrophication Monitoring Programme. So far, OSPAR has not developed requirements for harmonised application of the parameter and stalled related work in the 2006/2007 cycle of meetings.

[2] Norway: Included in some instances, but not very often.

[3] Sweden: Winter N/P ratios have been assessed for offshore areas only.

[4] UK: No information for 18 of 33 estuaries.

[5] UK: Use of a phytoplankton index (see section on phytoplankton indicator species).

3.2.1 Developments with assessment levels

The background levels used in the first application of the Comprehensive Procedure had mainly been based on expert judgement. In the current assessment process, a number of Contracting Parties reviewed background levels based on recent knowledge. One driver for the review has been the need to harmonise with the Water Framework Directive in transitional and coastal waters. The review of background levels has led in some cases to the update and changes of assessment levels used in the first application of the Comprehensive Procedure. Still a number of Contracting Parties observed their need for reviewing background concentrations for the parameters of winter DIN and DIP and chlorophyll *a* with a view to improving future assessments and to harmonising with the Water Framework Directive.

In the first application of the Comprehensive Procedure, assessment levels had been derived from a default 50% deviation from background where natural variability (e.g. within inner estuaries) needed to be taken into account. The 2005 revision of the Common Procedure introduced a more flexible approach to setting assessment levels as justified area-specific % deviation from background which must not exceed 50%. In the current assessment, some Contracting Parties were able to refine their deviations for some parameters through knowledge gained. For example, Germany accepted smaller deviations from background of 15% for some parameters (oxygen depletion, Secchi depth) in open waters. An overview of the assessment levels used by Contracting Parties in the second application of the Comprehensive Procedure for winter DIN, winter DIP, chlorophyll *a*, oxygen and phytoplankton indicator species is given at Annex 4.

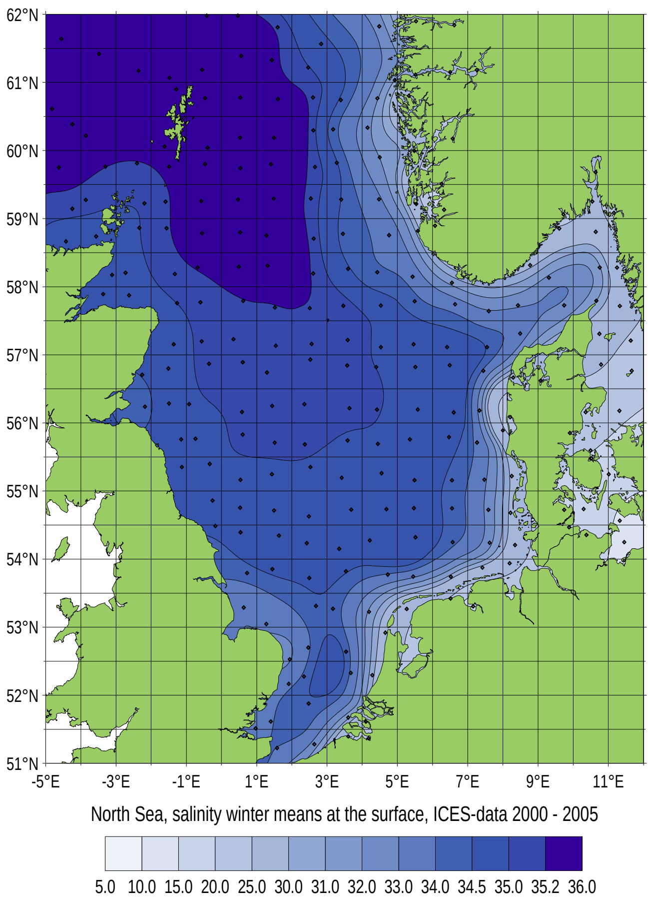


Figure 3.2 Salinity winter means at surface in the North Sea in 2001 – 2005. Source: ICES-data 2000 - 2005

3.2.2 Category I parameters: degree of nutrient enrichment

Most Contracting Parties assessed trends in nutrient inputs, but the basis used for estimation was not standardised. Details of reductions in nutrient inputs can be found in section 4.3.

The assessment levels used by Contracting Parties for winter nutrient concentrations are presented at Annex 4. In the North Sea, these are set in relation to salinity gradients (Figure 3.2). This is important because rivers discharge fresh water with nutrients in coastal waters, also in non-eutrophication conditions, resulting in a salinity gradient in coastal waters that is related to natural nutrient loads. This has to be taken into account in defining DIN background and assessment levels that differ along the salinity gradient. They will also differ between regions depending on the characteristics of individual rivers.

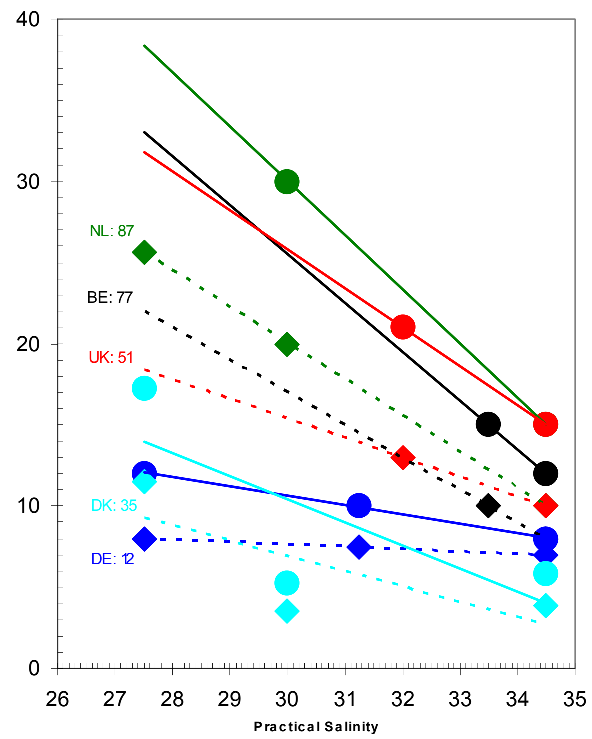


Figure 3.3 presents a comparison of

- DIN background levels (diamonds) chosen by BE, DE, DK, NL and UK for estuaries, and coastal and offshore waters.
- The DIN background levels are connected by a trendline along salinity (dotted lines) for each Contracting Party.
- The corresponding DIN background concentration in freshwater (salinity 0) is mentioned for each Contracting Party.
- DIN assessment levels (filled circles) chosen by BE, DE, DK, NL and UK for estuaries and coastal and offshore waters.
- The DIN assessment levels are connected by a trendline along salinity (full lines) for each Contracting Party.

The figure facilitates to assess if

- Contracting Parties have taken into account salinity gradients in a similar way;
- DIN background values are not too high (considering corresponding DIN value at salinity 0);
- chosen offshore DIN background levels are comparable enough;
- the relation between elevated levels and background levels is similar for the different Contracting Parties.

A number of Contracting Parties around the North Sea have assessed coastal and offshore waters for which the relationship between nutrients and salinity is relevant. The background and assessment levels for DIN used by Contracting Parties can be compared by drawing trend lines along these values in relation to salinity, and by assessing the acceptability of the freshwater end concentrations at salinity 0. The freshwater DIN background concentrations at salinity 0 ranges from 11 up to 87 µmol/l. Figure 3.3 shows that salinity has been satisfactorily taken into account in defining DIN background and assessment levels by Belgium, Denmark, Germany, the Netherlands and the UK.

The parameters Total Nitrogen (TN) and Total Phosphorus (TP) were used by Denmark, Germany, the Netherlands and Sweden. The relationships between TN and TP and winter DIN and DIP are regionally very different. In the German Bight area, significant correlations between chlorophyll *a* and TN were found. The added value of the parameters TN and TP in the assessment is that, if used in correlation with winter DIN and chlorophyll *a*, they can inform consistency in setting assessment levels across parameters.

3.2.3 Category II parameters: direct effects

Chlorophyll a

In compliance with the requirements of the Common Procedure, Contracting Parties assessed in the first application of the Comprehensive Procedure mean and maximum concentrations of chlorophyll *a*. Then, and in the current second application, a number of Contracting Parties observed difficulties in using maximum concentrations because of the high frequency of measurements needed to detect the maxima.

Instead of, or in addition to, mean and maximum concentrations, a number of Contracting Parties used the 90 percentile in their assessments of chlorophyll *a* (µg/l). One of the drivers for this is the Water Framework Directive (2000/60/EC) which uses this tool in its assessment framework. Where Contracting Parties used only the 90 percentile in their present assessments, it is not possible to compare the results directly with those of the assessment of mean and maximum concentrations in the first and the current second application of the Comprehensive Procedure. The experience of Contracting Parties shows, however, that the 90 percentile is a suitable analytical tool, provided that monitoring is carried out with the necessary frequency to allow robust conclusions. The 90 percentile could be used in future assessments under the Common Procedure in addition to mean concentrations. Figure 3.4 shows a satellite image expressing chlorophyll *a* as 90 percentile during the growing season March – October 2005.

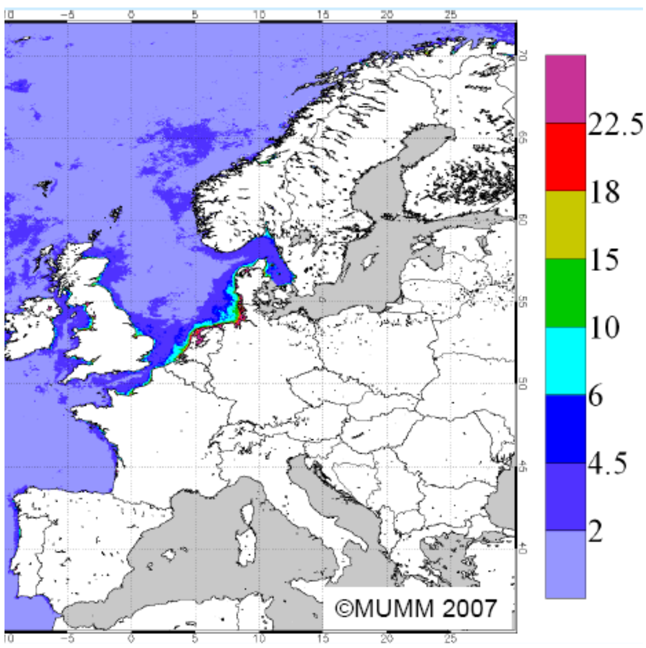


Figure 3.4 Chlorophyll *a* 90 percentile (µg/l) from March – October 2005. Seasonal means represent permanent smoothed chlorophyll gradients without any indication of elevated levels (cf. Figure 3.5). MERIS data. Source: MUMM 2007/MarCoast GMES services network

Comparison of the assessment of mean and maximum concentrations with the first application of the Comprehensive Procedure is hampered due to the use of different assessment levels. In the first application, Contracting Parties had used the same assessment level for mean and maximum concentrations, measured annually in the growing season. In the second application, a number of Contracting Parties were able to refine their assessment levels for the parameter and to harmonise them in the transitional and coastal waters with the requirements under the Water Framework Directive (2000/60/EC) (see Annex 4).

Some Contracting Parties have used measurements on light climate in turbid waters. Experience of Contracting Parties supports a need to link assessment levels for chlorophyll *a* in estuaries to the light climate in future.

Phytoplankton indicator species

The area-specific background concentrations and assessment levels for phytoplankton indicator species used by Contracting Parties are compiled in Annex 4. This includes area-specific indicator species reported by Norway, Spain and Sweden which had so far not been included in the list of indicator species in the Common Procedure.

In their assessments, a number of Contracting Parties measured *nuisance* phytoplankton species like the foam-forming species *Phaeocystis* or the dense surface algal blooms of *Noctiluca* as eutrophication indicators. To assess the duration of bloom of nuisance phytoplankton indicator species, the next step would be to assess the % number of months in the year for which blooms are above assessment levels of 10^6 cells per litre, taking into account the corresponding developments under the Water Framework Directive (2000/60/EC).

Several Contracting Parties questioned the application of *toxic* phytoplankton species as eutrophication indicators and expressed the need for more research for example through eco-physiological studies on the cause-effect relationship between their elevated occurrence and (pulses of) nutrient enrichment. The research should include further toxic species as there is some evidence of a causal relationship with increased nitrate fluxes in stratified waters and some evidence of a relationship with nutrient enrichment and elevated N/P ratios in some areas such as the Skagerrak, the Oyster Grounds and in the Frisian Front area during stratification.

However, since the introduction of the phytoplankton indicator species concept, the UK has continued to point out that it does not support the use of single species criteria and have already adopted an approach which looks at changes in the frequency and extent of occurrence of any phytoplankton bloom as part of the assessment. The UK did not assess phytoplankton indicator species individually, but used a phytoplankton index developed for classification under the Water Framework Directive (2000/60/EC) which combines four attributes of the phytoplankton community to come to a balanced view about the status of the phytoplankton.

Macrophytes

The assessment of macrophytes, and in particular the shift from long-lived to short-lived nuisance species like *Ulva*, is relevant for coastal areas. Extension of macrophytes (brown and red macroalgae and sea grasses) reflects the depth distribution which is often controlled by light climate (and hence by the concentrations of suspended matter, including phytoplankton). However, many other factors also influence the extension of macrophytes, especially turbulence, shear stress and substrate. Additionally, the monitoring of patchy growing macrophytes is difficult. For this reason, this parameter has not been applied by all Contracting Parties. Macroalgae, especially sugar kelp, formed a determining parameter in the assessment of certain Norwegian fjord systems. For areas, where macrophytes are relevant, the UK used a specific index, including the area covered by, and the biomass of, opportunistic macroalgal taxa, which is being considered for adoption by the intercalibration process for the Water Framework Directive (2000/60/EC). Methods for assessing shifts from long-lived macrophytes to short-lived opportunistic species, for example through use of indices, are still a field of research and development which would need to be followed. For the Wadden Sea area, harmonised methods are being developed under the Trilateral Monitoring and Assessment Programme for the Wadden Sea.

3.2.4 Category III parameters: indirect effects

Oxygen

Oxygen deficiency was mostly observed in stratified areas with extended residence time of bottom waters in fjords behind sills (Norway and Sweden) and in specific areas of the North Sea, exposed to long lasting supply of particulate organic matter (German Bight, Oysterground). Also in the shallow Wadden Sea (the Netherlands) and estuaries (Ireland, Germany) seasonal oxygen deficiency was observed.

The current assessment level for oxygen deficiency defined by OSPAR is 4-6 mg/l and marks the “threshold (range)” between problem and non-problem area. An overview of assessment levels used by Contracting Parties is given at Annex 4. This was based on field observations and literature studies. A further harmonisation of the assessment of oxygen should include the duration and spatial extent (area and depth) of oxygen deficiency.

Kills in fish and zoobenthos, and long-term changes in zoobenthos

The assessment of kills in zoobenthos and fish strongly depends on the monitoring strategy applied. Contracting Parties applied different indices developed in relation to the Water Framework Directive to assess zoobenthos communities.

Organic carbon

Organic carbon is an important assessment parameter in sedimentation areas but has relatively seldom been analysed. This could be a shortcoming, because anthropogenic impacts also include dissolved and particulate organic carbon which can significantly contribute to inshore eutrophication processes (e.g. by oxygen consumption during its decomposition). The organic river loads can also affect coastal waters during high discharge rates or long residence times.

3.2.5 Category IV parameters: other possible effects

Algal toxins

The incidence of diarrhetic or paralytic shellfish poisoning (DSP/PSP) mussel infection events has been used by most Contracting Parties. Some Contracting Parties do not use this parameter because the link between nutrient enrichment, the incidence of toxic producing algae and the infection of bivalve shellfish is uncertain.

Transboundary transport

A number of Contracting Parties (Belgium, Denmark, Germany, the Netherlands, Norway, and Sweden and the UK) addressed transboundary transport. The UK carried out an evaluation of the risks of its nutrient enriched waters scoring “+--“ to eutrophication problems elsewhere as suggested in the Comprehensive Procedure. It follows from the national assessments, that transboundary transport should also be taken into account e.g. if national measures are not or insufficiently improving the eutrophication status of the area under consideration.

Modelling tools are capable of calculating nutrient dynamics and their transport across boundaries, including the tracking of specific nutrients from specific rivers through the nutrient cycle to calculate the proportions of the nutrient budget in defined areas originating from specific rivers. OSPAR initiated work to further develop those model tools to support future conclusions on the eutrophication status in the OSPAR maritime area.

3.2.6 Monitoring

As indicated in the tabulated results of the national assessments at Annex 2, the monitoring of the parameters applied in the assessments was not always sufficient and lack of data weakened some assessments. This is valid, for example for offshore areas and many Norwegian fjords.

The assessment results depend on the representativeness in space and time of the data used. Events like plankton blooms or development of oxygen depletion are difficult to detect due to their transient occurrence, which is limited to weeks and sometimes to small areas. Therefore, a robust assessment based on those parameters requires data at sufficient temporal and spatial resolution. Although requested, information like data inventories, recent gradients or time series, which would inform about the temporal and spatial coverage of the data used in the national assessments, were hardly reported for the period 2001 – 2005. The approach taken by Contracting Parties to demonstrate quality and representativeness of data differs and includes for example a full set of data inventory, gradients and time series presented by Germany; data quality statements based on the national assessments (e.g. UK); maps of spatial distribution of sampling locations (e.g. the Netherlands, Spain and the UK); and data descriptions supplemented by links to further information (e.g. Sweden). For recent years remote sensing data have also been utilised.

In general, there is a need in many areas to improve the frequency and spatial coverage of monitoring with a focus on coherence in the monitoring of nutrient enrichment aspects and related direct and indirect effects, and weather conditions. Chlorophyll can now be estimated by remote sensing satellites which can support observations of its spatial and temporal distribution over large sections of the Convention Area (Figure 3.5).

Some Contracting Parties indicated the necessity to perform “event monitoring” complementary to routine monitoring to monitor the cause-effect parameters in conjunction with each other, e.g. oxygen deficiency and

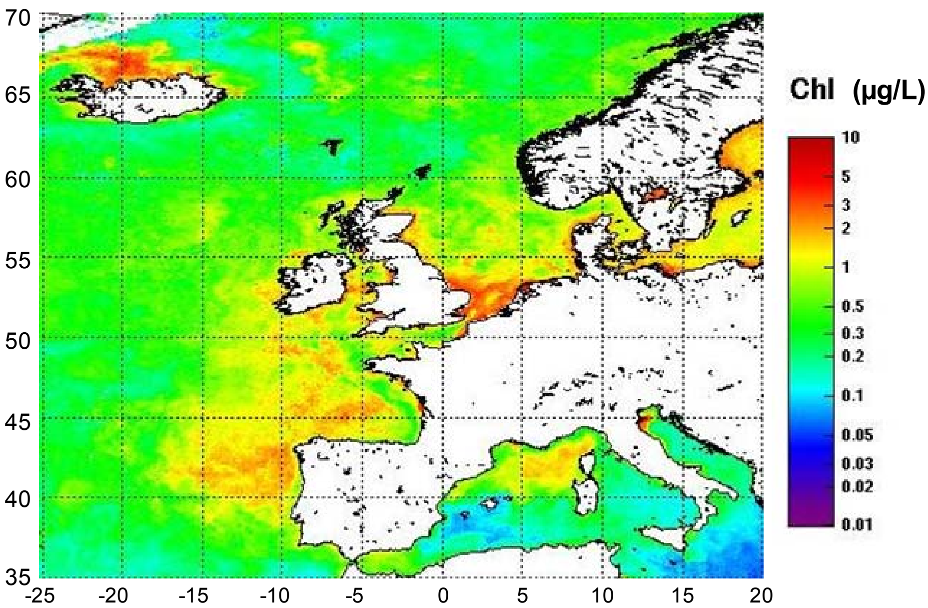


Figure 3.5 Chlorophyll *a*, April 2005 (Merged SeaWifs-Modis-Meris image). Monthly means (µg/L) reflect only roughly chlorophyll distributions, relevant for assessments, but indicate regional gradients. Acknowledgement: ACRI & the GlobColour team. GlobColour is funded by ESA with data from ESA, NASA and GeoEye.

kills in benthos underneath a surface algal bloom. This could help to make best use of available resources through targeted monitoring efforts*.* Joint early warning monitoring in the event of surface algal blooms could be achieved through airborne surveillance, for example in the context of the BONN Agreement, or satellite imaging and concomitant seatruth sampling for assessing the type of phytoplankton indicator species, and the indirect effects, such as oxygen deficiency and kills in zoobenthos. Some kind of warning system might be developed to trigger extensive survey activities. Complementary model tools should be considered.

3.3 Procedure for area classification

The assessment process used by Contracting Parties has generally followed the guidance of the Common Procedure (sections 5 and 6 of agreement 2005-3) which entails

a. the assignment of a score corresponding to the level of each assessment parameter which has been monitored;

b. an initial assessment based on a combination of these scores according to an agreed framework, and;

c. an overall final assessment of all relevant information relating to harmonised assessment parameters, their corresponding assessment levels and supporting environmental factors.

The results of the application of the assessment parameters and the initial and final classifications, using the reporting format of the Common Procedure are given in Annex 2. Contacting Parties have in general applied the assessment process according to the Comprehensive Procedure as described below.

The classification of areas was mainly based on elevated levels of nutrients, chlorophyll, phytoplankton indicator species and oxygen deficiency. Most Contracting Parties classified areas initially and finally to provide the same classification. Some Contracting Parties used only the final appraisal step for some areas (France, Spain).

Some Contracting Parties revised several of their initial area classifications using the final appraisal step (Table 3.3). A common reason for this was that the initial assessment as 'problem area' was modified in the overall step to 'potential problem area' or 'non-problem area' due to the fact that there were only local eutrophication effects, or the effects occurred only once within the five-year assessment period. The detailed reasons for these changes have been reported by Contracting Parties for each area concerned in Annex 2; the areas whose status changed in the overall appraisal (step 3) are highlighted in Annex 2 for easy reference.

Table 3.3 Summary of changes of the initial classification of the eutrophication status of areas in step 3 in the second application of the Comprehensive Procedure

Contracting Party	**Assessed areas**	**Number of changes of initial classifications in the overall area classification (step 3)**					
		PA to NPA	PA to PPA	PPA to NPA	PPA to PA	NPA to PA	NPA to PPA
Belgium	2	0	1	0	0	0	0
Denmark	19	1 partly + 1	1 partly	0	0	0	0
France	28	1	2	0	2	4	3
Germany	6	0	0	0	0	0	0
Ireland	70	2	1	7	2	1	0
Netherlands	7	2	0	0	0	0	0
Norway	14	0	0	0	4	0	0
Portugal	1	0	0	0	0	0	0
Spain	15	0	0	0	0	0	0
Sweden	4	0	0	0	0	0	0
UK	41	2	2	1	0	0	0
Total	**204**	**9**	**7**	**8**	**8**	**5**	**3**

Note: NPA = non-problem area; PA = problem area; PPA = potential problem area

Despite guidance on the scoring of individual annual assessment results for the years 2001 to 2005 and their synthesis for an initial area classification, a number of Contracting Parties based their scoring on calculated means for the entire assessment period 2001 – 2005. This hampers interpretation of scoring results for various parameters and consistency in the classification achieved by Contracting Parties.

Another aspect complicating evaluation of initial area classification is that some Contracting Parties did not use key parameters or agreed methods for those. One example interfering with the interpretation and comparability of the scoring the assessment results is the use of oxygen minima or 5 percentile while the Common Procedure requires scoring of mean and minimum concentration of oxygen as followed in the first application of the Comprehensive Procedure.

This problem is compounded by the fact that Contracting Parties with waters having common boundaries use different assessment levels to arrive at their classifications. An example of this is in the offshore southern North Sea where the Belgian offshore area, the UK Southern North Sea area, the Netherlands Southern Bight, and German offshore waters all conjoin, and the classification ranges from 'problem area' to 'non-problem area'. An examination of the rationale for classification, and relevant assessment levels used is given in Table 3.4.

Contracting Parties had different approaches dealing with the lack of data in the assessment. Spain for example classified a number of estuaries as 'potential problem areas' due to lack of data. Norway on the other hand classified a number of Norwegian fjords as 'problem areas' based only on one parameter (macrophytes). Despite the lack of data for direct effects parameters, some waters were classified as 'non-problem areas' (for example: Spain – Lea, Bidasoa, Pontevedra). In some cases direct effects parameters were scored to show no increasing trends or elevated levels or shifts/changes ("-") despite lack of data. In other cases, the assessment was based on the degree of confidence in the evidence of absence of undesirable disturbance. Finally, for some areas (e.g. Swedish offshore Skagerrak) it can be assumed that missing data (macrophytes) are not relevant or that organic carbon has only to be sampled if zoobenthos or oxygen were above assessment levels.

The robustness of the assessment depends on the representativeness in space and time of the data used (see section 3.2.6). Some Contracting Parties provided an expression of the confidence in their data and related assessment results.

Table 3.4 Comparison of reasons used for classification of status of offshore waters with common boundaries in the Southern North Sea

Areas by water types assessed by Contracting Parties		Final classi-fication	Appraisal of all relevant information (concerning the harmonized assessment parameters, their respective assessment levels and the supporting environmental factors (cf. Annex 2)	Assessment levels: Nutrient enrichment DIN (µM)	Nutrient enrichment DIP (µM)	Chlorophyll mean (µg/l)	Chlorophyll 90%ile (µg/l)	Phytoplankton indicator species nuisance (cells /l)	Phytoplankton indicator species toxic (cells /l)
Mixed waters	UK: Southern North Sea	NPA	There is no nutrient enrichment (high confidence) based upon extensive measurements from SmartBuoy time-series and spatial data. There is evidence of no accelerated growth (medium confidence). High intensity sampling has shown that since 2002 chlorophyll 90th percentiles in waters of >34.5 salinity were below the threshold. The evidence available suggests that there is no undesirable disturbance (medium confidence). Measurements show DO was consistently > 4 mg l-1, there was no detectable disturbance in the zoobenthos community and there was an absence of fish kills. The final classification of the Southern North Sea is as a Non-Problem Area (high confidence). The results show that there was no nutrient enrichment, accelerated growth or undesirable disturbance	15	-	-	10	Incoporated into phytoplanton index	-
Mixed waters	Belgium: Belgium Offshore	PPA	No change in status compared with previous years. Due to the lowering of chlorophyll *a* assessment levels from 15 to 8.4 µg/l it turned to a problem area, but the spatial extent of the monitoring offshore is still considered insufficient to provide a reliable assessment.	12	0.8	4.2	8.4	-	-
Mixed waters	Netherlands – Southern Bight offshore	PA	Problem area in 2001-2005, based on the assessment parameters chlorophyll-*a* and nuisance indicator species; no change in status compared with previous years (<1995-2000); averaged result is identical to 'per year' result, except chl-a in 2005. *Influenced by waters flowing from the Channel, NL, Belgium*	15	0.8	2.25	4.5	+	-
Stratified waters	Netherlands – Oyster Grounds	NPA	Initially a problem area in 2001-2005, but only based on elevated levels of toxic phytoplankton indicator species. Because of the uncertainty of a cause-effect relationship between nutrient availability and the elevated levels of these toxic species this area is finally classified as a non-problem area; averaged result is identical to 'per year' result, except chl-a in 2003. Change in status compared with previous years (<1995-2000). *Receiving waters from Atlantic Ocean and UK*	15	0.8	2.25	4.5	+	-
Stratified waters	Netherlands – Dogger Bank	NPA	Initially a problem area in 2001-2005, but only based on elevated levels of toxic phytoplankton indicator species. Because of the uncertainty of a cause-effect relationship between nutrient availability and the elevated levels of these toxic species this area is finally classified as a non-problem area; averaged result is identical to 'per year' result. No change in status compared with previous years (<1995-2000, see OSPAR 2003: the so-called Dutch utmost northern offshore waters). *Receiving waters from mainly Atlantic Ocean, and to a minor extent from UK*	15	0.8	2.25	4.5	+	-
Stratified waters	Germany – Offshore waters	PPA	Classification as PPA was based on occasional oxygen depletion in bottom waters (<70%) and insufficient monitoring. This area is affected by transboundary fluxes from adjacent waters.	8	0.6	2.3	-	-	-

'+' used in final classification; ' - ' not used in final classification
NPA = non-problem area; PA = problem area; PPA = potential problem area

(green)	Measurements below assessment level
(orange)	Measurements above assessment level

3.4 Links with the Water Framework Directive

OSPAR has the key objective of achieving, by 2010, a healthy marine environment where eutrophication does not occur. The Water Framework Directive (2000/60/EC) has the key objective achieving, by 2015, at least good chemical and ecological status for transitional and coastal waters.

The guidance for eutrophication assessment in the context of European water policies ("EC eutrophication guidance", EC, 2005), developed under the Water Framework Directive, closely relates to the assessment framework of the Common Procedure. There are considerable synergies in the biological parameters used by the Water Framework Directive and the assessment parameters of the Common Procedure (OSPAR, 2005d). The intercalibration process under the Water Framework Directive and the OSPAR assessment of coastal waters complement each other.

While for the classification of a 'non-problem area' or 'problem area', the Common Procedure and the integrated set of eutrophication EcoQOs relate to nutrient enrichment and eutrophication effects, the overall classification of the ecological status of a water body under the Water Framework Directive takes into account all human pressures. However, with respect to a eutrophication assessment the EC eutrophication guidance allows focus on this specific pressure exclusively. For the assessment of eutrophication problems, the boundary between a 'problem area' and a 'non-problem area' in the coastal region should align with the boundary between the 'good' and the 'moderate' ecological status under the Water Framework Directive (Figure 3.6).

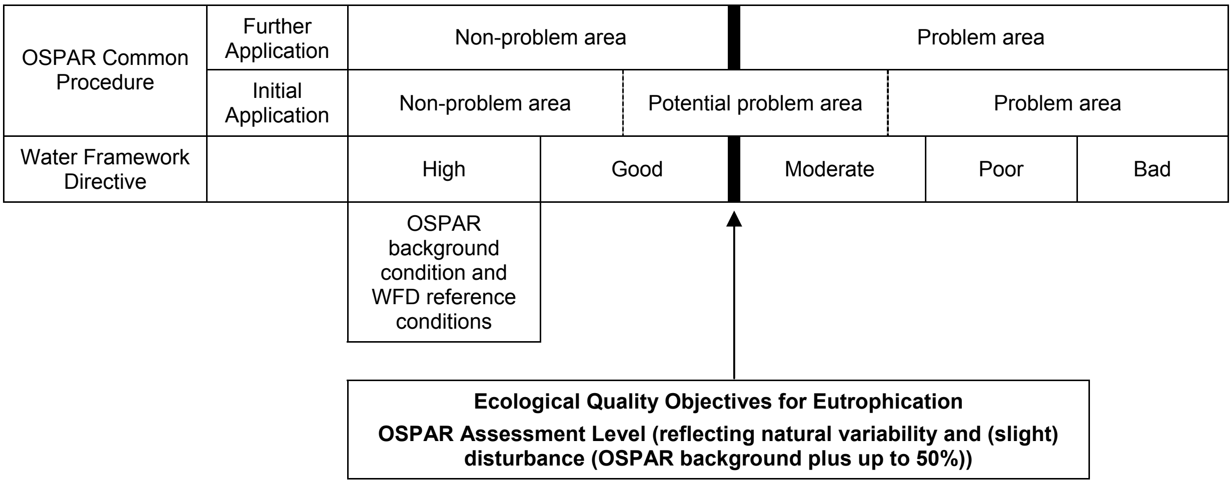


Figure 3.6 Relationship between the classification under the Common Procedure, the integrated set of OSPAR EcoQOs for eutrophication and the Water Framework Directive.

A comparison of the boundary setting procedure under the OSPAR Common Procedure and the Water Framework Directive in relation to eutrophication is shown in Table 3.5. Under the Common Procedure reference conditions and boundaries are set by each individual Member State based on a common guideline. Under the Water Framework Directive reference conditions and legally binding boundaries are developed in the intercalibration process facilitated by the EU Commission. In the intercalibration process, national assessment systems are compared, and the process results in a number of type specific boundaries for high/good and good/moderate ecological status.

The results of the intercalibration process have only recently become available and have therefore only been used to some extent in the second application of the OSPAR Comprehensive Procedure. The results of the OSPAR eutrophication assessment can therefore not be expected to be completely comparable with an assessment using the results of the intercalibration exercise. In future assessments of the eutrophication status, more harmonised assessment systems for the coastal waters will be available.

OSPAR addresses estuaries, fjords, coastal and offshore waters and is therefore bridging inshore and offshore related activities. By this, OSPAR is able to bridge activities in the implementation of the Water Framework Directive and the Marine Strategy Framework Directive (2008/56/EC).

Table 3.5 Comparison of the boundary setting procedure under the OSPAR Common Procedure and the Water Framework Directive.

	OSPAR Common Procedure (all marine areas, including estuaries)	**Water Framework Directive (coastal areas and transitional waters)**
Assessed areas	Regional marine areas defined by each Contracting Party based on national specifications.	Type specific. Type description based on common physical characteristics.
Parameters	Four categories (see Table 2.1)	Biological quality elements: ▪ Composition, abundance and biomass of phytoplankton ▪ Composition and abundance of other aquatic flora ▪ Composition and abundance of benthic invertebrate fauna. Physicochemical parameters supporting interpretation of biological data (such as nutrient and oxygenation conditions)
Background conditions and reference conditions	National area-specific criteria. Partly harmonised.	Reference conditions for the biological quality elements partly developed in the common intercalibration exercise based on national assessment systems.
Boundary setting	The OSPAR area-specific assessment level reflecting natural variability and slight disturbance is OSPAR background values plus a justified area-specific % deviation not exceeding 50% for category I and II parameters and organic carbon/organic matter (category III).	Harmonised boundaries for the ecological quality elements are developed in the common intercalibration exercise based on national assessment systems and a common boundary setting protocol. Deviation from reference condition is expressed as an ecological quality ratio (EQR), defined as a number between 0 and 1 and calculated as a ratio between the boundary value and the reference value. Values close to 1 represent high ecological status and values close to 0 represent bad ecological status.

4. Eutrophication status of the OSPAR maritime area and its Regions

4.1 Quality status

This chapter summarises the results of the second application of the Comprehensive Procedure to identify the eutrophication status of the OSPAR maritime area on the basis of national assessments conducted by Contracting Parties. A compilation of summaries of these national assessments is given at Annex 1 including links to the detailed national reports.

In most areas assessed by Contracting Parties, the dominating nutrient source are still river discharges, often resulting in problem areas in connected estuaries, fjords and bights, and areas affected by river plumes. Some areas are especially sensitive to eutrophication processes and respond with enhanced primary production in stable mixed layers (e.g. in coastal currents) or accumulation of particulate organic material (e.g in estuaries, fjords and in the Wadden Sea). One effect of land-borne nutrient inputs is reflected by high chlorophyll concentrations spreading along many coasts of the North Sea and in the stratified Norwegian coastal current (cf. Figures 3.4 and 3.5).

Generally, high nutrient inputs might result in eutrophication effects which lead to a classification result under the Comprehensive Procedure as problem area. In other cases, the gradual uncoupling of higher nutrient inputs and their effects due to light limitation by turbid waters or vertical mixing can result in the status non-problem area.

Eutrophication cannot be considered as a local problem, e.g. occurring at or near high nutrient inputs because water masses from different regions of the OSPAR area interact with each other permanently, and nutrients are being transported from one place to another. These transboundary transports underline the importance of common efforts to face eutrophication problems.

In general, a larger number of inshore waters (68), some coastal areas (32) and only few but large scale offshore waters (6) are still classified as problem areas (PA). Insufficient data resulted in uncertainties in the classification and in 20 inshore waters, 3 coastal waters and 2 offshore areas being identified as potential problem area (PPA). 32 inshore waters could be classified as non-problem areas (NPA), as well as 33 coastal and 8 offshore areas (Table 4.1).

The number of problem, potential problem and non-problem areas identified for the OSPAR maritime area have been compiled in Figure 4.1 for a general overview. This indicates the high pressure on the Greater North Sea and Celtic Seas in relation to eutrophication effects. It has to be recognized that Contracting Parties have used different geographical scales for identifying individual assessment areas ranging from small individual fjords to large coastal strips.

Table 4.1 Number of assessed areas in the OSPAR Regions II, III and IV classified in terms of problem areas (PA), potential problem areas (PPA) and non-problem areas (NPA)

Water types	Greater North Sea (93) (Region II)			Celtic Seas (84) (Region III)			Bay of Biscay & Iberian Coast (27) (Region IV)		
	PA	PPA	NPA	PA	PPA	NPA	PA	PPA	NPA
fjords, bays, estuaries	41	3	7	25	4	21	2	13	4
coastal waters	24	0	6	5	1	24	3	2	3
offshore waters	6	2	4	0	0	4	0	0	0
total (204)	71	5	17	30	5	49	5	15	7

The size of the assessment areas is decreasing from offshore to inshore waters (estuaries, bights, fjords). For this reason the high bars of classified inshore waters in Figure 4.1 do not reflect more extended problem areas than in coastal or offshore waters. The high level of problem and potential problem areas in Figure 4.1 for Irish and UK estuaries is due to the fact that the coastlines of these countries have many small estuaries and embayments which are shallow and where poor circulation can be conducive to eutrophication.

In comparing the first and second application of the Comprehensive Procedure, the results of national assessments for the recent assessment for the period 2001 – 2005 suggest little changes to the classification results. Changes mainly relate to small local areas (estuaries) since the first application of the Comprehensive Procedure, which roughly covered the years 1990 – 2000 (Annex 3). Nevertheless, it is important to note that in the meantime some substantial improvements have been made in nutrient reduction, reflected in presented time series, but they did not cause an improvement of the overall eutrophication status yet for two main reasons:

- only improvements of eutrophication effects (reflected by direct/indirect effects parameters like chlorophyll concentrations, abundance of phytoplankton indicator species, oxygen depletion) will result in a better classification,
- the response of these parameters to nutrient reduction is slow due to annual maximum river discharges during phytoplankton spring blooms, high efficiency of nutrient recycling, and nutrient supply from transboundary fluxes as well as from sediments by remobilisation of trapped nutrients.

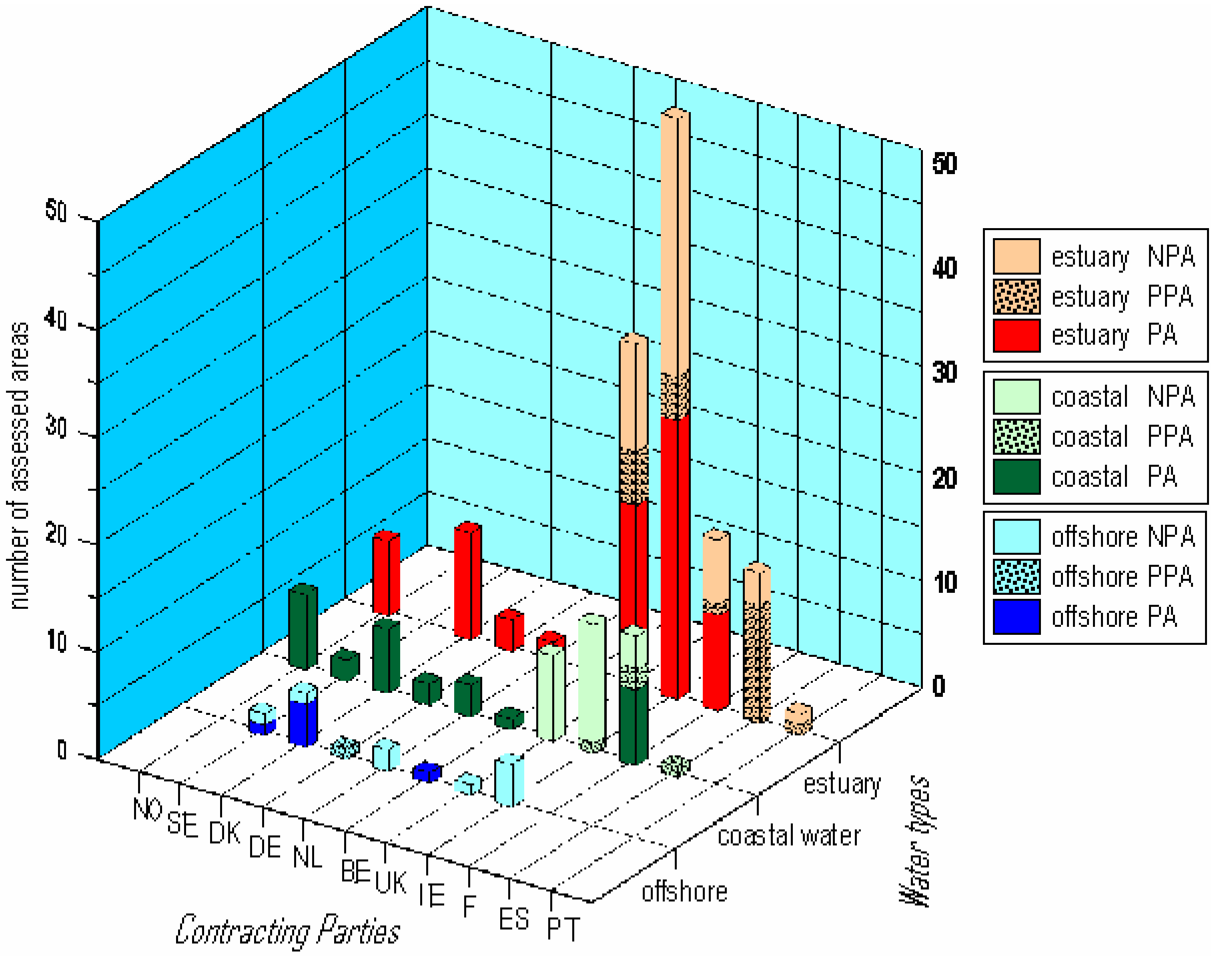


Figure 4.1 Number of problem areas (PA), potential problem areas (PPA) and non-problem areas (NPA) identified by each Contracting Party per assessed water type in the second application of the Comprehensive Procedure.

Greater North Sea

The Greater North Sea remains the most problematic region in the North-East Atlantic related to the extension of identified problem areas (Figure 4.2, Table 4.2). Reasons for that are high population densities as well as intensive agricultural activities and related high nutrient inputs, mostly by the rivers. Atmospheric nitrogen deposition can for certain areas be an important input pathway. A generalised compilation of riverine and atmospheric nitrogen inputs to the Greater North Sea based on data collected by OSPAR under its Riverine Inputs and Direct Discharges Programme (RID) and model calculations provided by the Co-operative Programme for Monitoring and Evaluation of the Long-range Transmissions of Air Pollutants in Europe (EMEP) shows that the contribution of atmospheric nitrogen inputs to total inputs range from 25 % to 39 % in 1990 - 2004 in Region II (see Table 4.5).

In relation to the other OSPAR Regions or subregions, eutrophication effects in the Greater North Sea often range over wider areas. The shallowness causes frequent exchange between the water column and sediments, remobilising sedimented material including nutrients (e.g. phosphorus). The shallow character of the shelf sea and its hydrodynamics enhance eutrophication processes.

The eutrophication status in the Greater North Sea (2001 – 2005) has not changed significantly, compared to the first application of the Comprehensive Procedure (OSPAR, 2003a). Especially in this Region, some trends can be observed in parameters which indicate a slight improvement but this is not yet visible in the final area classification. Decreasing trends for nutrient concentrations have been reported for estuaries, the Wadden Sea and some coastal waters. However, for organic matter and chlorophyll still no trends have been observed.

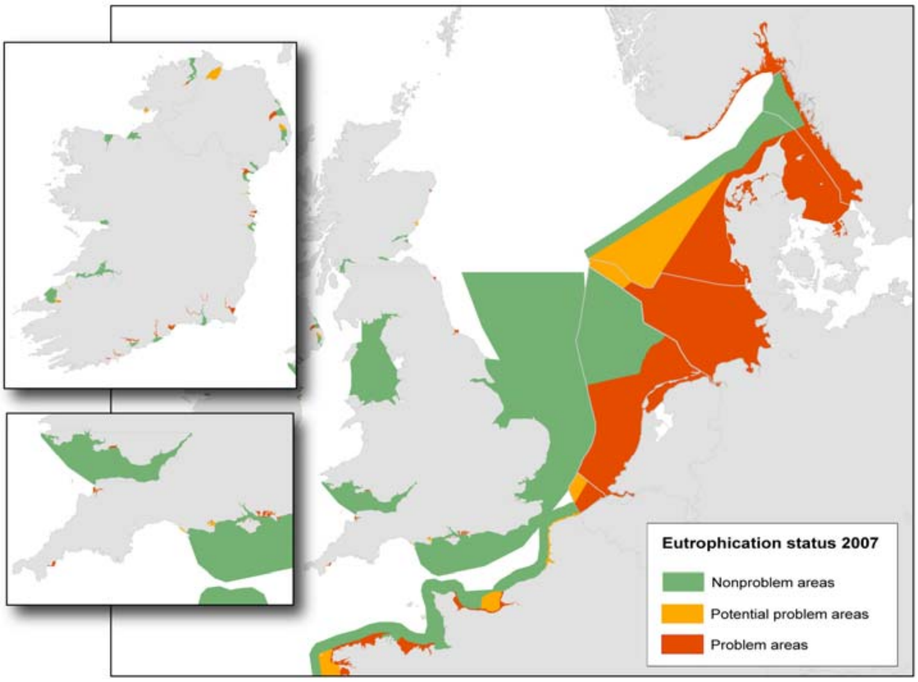


Figure 4.2 Eutrophication status of the Greater North Sea (Region II) and the Celtic Seas (Region III) identified in the second application of the Comprehensive Procedure in terms of problem areas, potential problem aeras and non-problem areas.

Changes in the eutrophication status since the first application of the Comprehensive Procedure were observed for southern Norwegian fjords which changed from potential problem area to problem area, mainly based on eutrophication effects on macrophytes and oxygen depletion. The Skagerrak offshore areas and the Dutch northern offshore area Oystergrounds changed status from problem area to non-problem area. For the Dutch area this is because of the uncertainty of a cause-effect relationship between nutrient availability and elevated levels of toxic species.

A high number of estuaries, fjords, coastal waters and parts of the offshore waters mainly at the continental coast, the Skaggerak and the Kattegat have still been classified as problem areas. These are either shallow areas with restricted mixing or stratified environments. These conditions keep the phytoplankton seasonally within the euphotic zone and allow an extended utilisation of supplied nutrients (for example in the Norwegian coastal current which is fed by the Baltic outflow). Reasons for the classification of these open waters as problem areas are elevated chlorophyll concentrations, the occurrence of phytoplankton indicator species and seasonal oxygen depletion in the bottom water of stratified areas. Fjords and estuaries are often classified as problem area due to restricted occurrence of macrophytes (Table 4.2).

As shown by some budget calculations, transboundary transports of nutrients and organic matter can be significant, if not dominating in some coastal areas and fjords. This prevents local reduction measures to show effects. Additionally, the share of atmospheric nitrogen inputs and the respective deposition can contribute to nitrogen budgets, especially along the main shipping lanes. Nitrogen inputs from shipping can level atmospheric deposition originating from surrounding countries. The significance of inputs via transboundary water and air transport underline the need for continued harmonised reduction measures as also required by EC legislation (for example Water Framework Directive (2000/60/EC), Nitrates Directive (91/676/EEC), Urban Waste Water Treatment Directive (91/271/EEC), National Emission Ceilings Directive (2001/81/EC).

Table 4.2 Number of assessed areas in the Greater North Sea (Region II) classified in terms of problem areas (PA), potential problem areas (PPA) and non-problem areas (NPA)

Water types (number of assessed areas)	Kattegat (15)			Skagerrak (18)			Central North Sea (32)			Channel (28)		
	PA	PPA	NPA	PA	PPA	NPA	PA	PPA	NPA	PA	PPA	NPA
fjords, bays, estuaries	7	0	0	7	0	0	11	1	3	16	2	4
Wadden Sea	0	0	0	0	0	0	3	0	0	0	0	0
coastal waters	4	0	0	9	0	0	5	0	3	3	0	3
offshore waters	4	0	0	0	0	2	2	2	2	0	0	0
Total (93)	15	0	0	16	0	2	21	3	8	19	2	7

Celtic Seas

In the Celtic Seas, eutrophication was mostly observed along the Irish coast with 26 inshore problem areas, based mainly on analyses of chlorophyll and oxygen (Figure 4.2, Table 4.3). Some PA have also been identified at inshore sites of UK and North Ireland. The relation between the number of classified PAs and NPAs is nearly balanced.

Anthropogenic induced eutrophication of the Celtic Sea is mainly restricted to inshore waters like bays, estuaries and fjords. Generally there were no significant changes in classifications in comparison to 2003, on the one hand only four inshore waters were shifted from PA or PPA to NPA and on the other hand 4 NPA waters were now classified as PA. Most of the identified PPA and PA fall under the regime of the WFD.

Table 4.3 Number of assessed areas in the Celtic Seas (Region III) classified in terms of problem areas (PA), potential problem areas (PPA) and non-problem areas (NPA)

Water types (number of assessed areas)	Ireland (70)			Northern Ireland (6)			Celtic Coast of Scotland, Wales and England (8)		
	PA	PPA	NPA	PA	PPA	NPA	PA	PPA	NPA
fjords, bays, estuaries	21	4	15	3	0	3	1	0	3
coastal waters	5	1	21	0	0	0	0	0	3
offshore waters	0	0	3	0	0	0	0	0	1
total (84)	26	5	39	3	0	3	1	0	7

Bay of Biscay and Iberian Coast

The Bay of Biscay and the Iberian coast are mostly less affected by eutrophication processes because the hydrographic conditions at the edge of the open ocean (e.g. fast dilution) inhibit the conversion of riverine nutrient discharges to extended phytoplankton blooms (Figure 4.3).

Along the French coast, the identified problem areas or potential problem areas (Table 4.4) are, *inter alia*, affected by the coastal current. In comparison to the first application of the Comprehensive Procedure, in some of these areas eutrophication effects increased, consequently leading to a classification as problem area. The classification of estuaries and coastal waters are mainly based on chlorophyll, phyto-plankton indicator species and macrophytes.

The Iberian coast is characterised by steep slopes on a narrow shelf (12 km) and frequent upwelling processes which occasionally lift nutrient rich water to the surface. Therefore, detection of anthro-pogenic eutrophication processes is restricted to estuaries and bays with low flushing. This further implies that only significant effects can be observed.

In Spain only few parameters gave clear assessment results due to insufficient monitoring. Conse-quently, 12 out of 15 assessed areas have been classified as potential problem areas (Table 4.4). The assessment of these 15 estuaries is in line with the application of the Urban Waste Water Treatment Directive (91/271/EEC) by Spain.

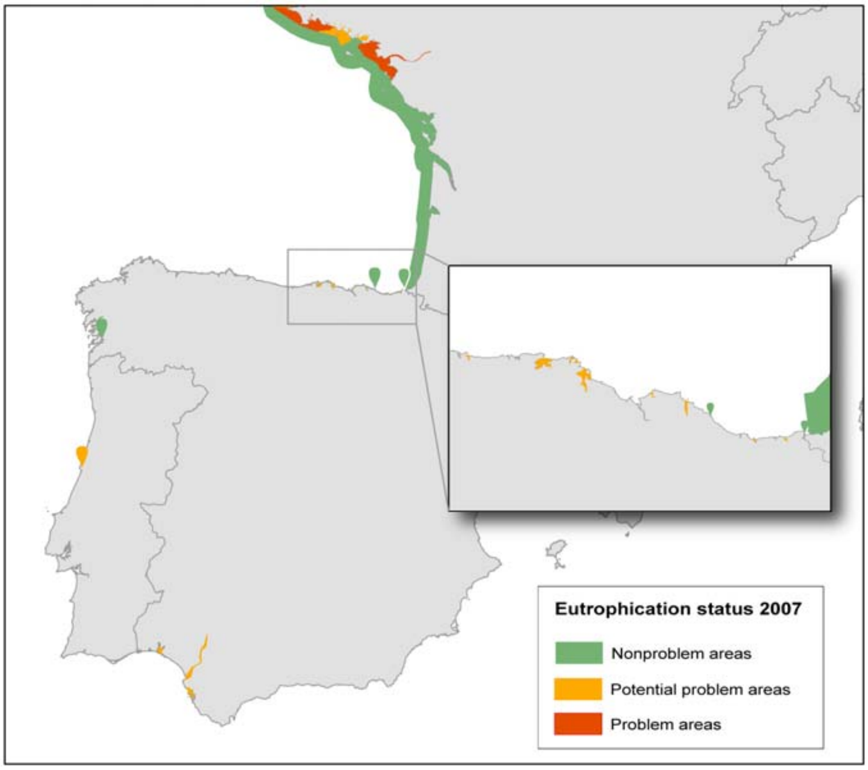


Figure 4.3 Eutrophication status of the Bay of Biscay and the Iberian Coast (Region IV) identified in the second application of the Comprehensive Procedure in terms of problem areas, potential problem areas and non-problem areas.

During the recent assessment in Portugal only the Mondego estuary was assessed and classified as potential problem area. In the previous application of the Comprehensive Procedure the estuaries of the rivers Tejo and Sado had been classified as non-problem areas.

Table 4.4 Number of assessed areas in the Bay of Biscay and Iberian Coast (Region IV) classified in terms of problem areas (PA), potential problem areas (PPA) and non-problem areas (NPA)

Water types (number of assessed areas)	French Coast (11)			North Iberian Coast & Galicia (12)			Portugal (1)			Andalusia (3)		
	PA	PPA	NPA	PA	PPA	NPA	PA	PPA	NPA	PA	PPA	NPA
fjords, bays, estuaries	2	1	1	0	9	3	0	1	0	0	2	0
coastal waters	3	1	3	0	0	0	0	0	0	0	1	0
offshore waters	0	0	0	0	0	0	0	0	0	0	0	0
total (27)	5	2	4	0	9	3	0	1	0	0	3	0

4.2 Experience of Contracting Parties with the integrated set of EcoQOs for eutrophication

The Agreement on the Application of the EcoQO System (OSPAR, 2006) sets out the arrangements for testing out the various Ecological Quality Objectives (EcoOOs), with a view to having an evaluation of their robustness by 2008 and an assessment of the results of the EcoQO system prepared by 2009 as a contribution to the OSPAR Quality Status Report 2010.

For eutrophication, the EcoQO system for the North Sea currently includes an overarching EcoQO to achieve the status of non-problem area with regard to eutrophication and an integrated set of five specific EcoQOs for eutrophication (Box 1). The set of specific EcoQOs (winter nutrients, phytoplankton indicator species, chlorophyll *a*, oxygen and benthos) correspond to a selection of the cause-effect related assessment parameters and their assessment levels as applied under the Comprehensive Procedure of the Common Procedure for assessing the eutrophication status of an area.

The elaboration of work on eutrophication EcoQOs has been tested out in the second application of the OSPAR Comprehensive Procedure. Contracting Parties were required, in their national assessment reports, to apply the overall and the set of specific EcoQOs with a view to testing whether they were fit for purpose and suitable to function as objectives. Table 4.5 provides a summary of the results from the national assessment reports (cf. Annex 1).

The result of the application of the eutrophication EcoQOs through the Comprehensive Procedure shows that the overarching objective is not met in several parts of the OSPAR maritime area. For the North Sea, a number of, in particular, coastal waters off Belgium, Denmark, France, Germany, the Netherlands, Norway, Sweden and the UK (estuaries) are classified as problem areas with regard to eutrophication.

Almost all Contracting Parties have responded on their experience with the implementation of the integrated set of EcoQOs for eutrophication (Table 4.5). Ireland, Portugal and Spain reported their experience on the voluntary use of the overarching EcoQO for eutrophication and its set of specific EcoQOs for the Celtic Sea and the Iberian Coast, respectively. It was indicated by a number of Contracting Parties that they have gained positive experience and see the advantage of this approach. However, the evaluation of the EcoQOs as objectives has not been thoroughly addressed in this first reporting on the application of the EcoQOs.

With respect to the Marine Strategy Framework Directive (2008/56/EC), the qualitative descriptor of good environmental status covering eutrophication is that “human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters”.

Already, the overarching EcoQO, which is identical to the outcome of the application of the Comprehensive Procedure, is able to provide a good overview of the eutrophication status of the North-East Atlantic and can provide an indication, supplemented with other information collected by OSPAR on discharges, emissions and losses of nutrients, of the environmental quality status which takes account of nutrient inputs and eutrophication effects in deciding whether an area is subject to eutrophication problems.

It is recognised that, if the integrated set of the specific EcoQOs is to be made operational, a considerable amount of further work within the OSPAR Eutrophication Committee would be required by a number of Contracting Parties (e.g. for agreeing area-specific background and assessment levels and developing guidelines for their region-specific application).

The classification system of the Water Framework Directive (2000/60/EC) characterises non-problem areas in terms of high or good ecological status, and problem areas in terms of moderate, poor or bad ecological quality with respect to eutrophication. A number of Contracting Parties are using the classification framework of the Water Framework Directive when examining the eutrophication status of their estuarine and coastal waters. The relationship between the integrated set of EcoQOs, the Common Procedure and the Water Framework Directive is described in Figure 3.6 (OSPAR, 2005d).

Table 4.5 Experience with the evaluation of the integrated set of EcoQOs for eutrophciation by Contracting Parties through the OSPAR Comprehensive Procedure

Contracting Party	**Status of implementation Source: national reports (cf. Annex 1) and observations**	**Score based on information provided on the trial application of the overarching and the set of specific EcoQOs for eutrophication taken from national reports (cf. Annex 1) indicating their suitability to function as objectives** "+" means evaluated. "-" means not evaluated due to lack of spatial/temporal coverage, lack of sufficient data or for other reasons					
		Overaching EcoQO	**Winter DIN/DIP**	**Chloro-phyll *a***	**Phyto-plankton species**	**Oxygen concen-tration**	**Benthic kills**
Belgium	Partial implementation	+	+	+	+[1]	+	-
Denmark	Uses HELCOM HEAT assessment which is aligned with Water Frame-work Directive quality elements	+	+	+	+	+	No observations registered
France	Not addressed	-	-	-	-	-	-
Germany	Has set assessment levels for the specific EcoQOs for various water types. (Implementation not explicit)	+	+	+	+	+	+
Netherlands	Implemented in the context of the Common Procedure	+	+	+	+	+	+
Norway	Overarching objective evaluated	+ (suitable but not enough to assess the eutrophication status with adequate confidence)	-	-	-	-	-
Sweden	Overarching objective and some of the specific EcoQOs evaluated	+ (suitable)	-	+ (not suitabale)	+ (not suitable)	+ (suitable)	+ (suitable but further development of indicator needed)
United Kingdom	Prefers overall assessment provided by Common Procedure as indicator of ecosystem health	-	-	-	-	-	-

[1] Not fully implemented with long-term monitoring but information on alternative assessment options is given.

4.3 Effectiveness of measures and progress made towards the Strategy's objective

Strategy objective and relevant measures

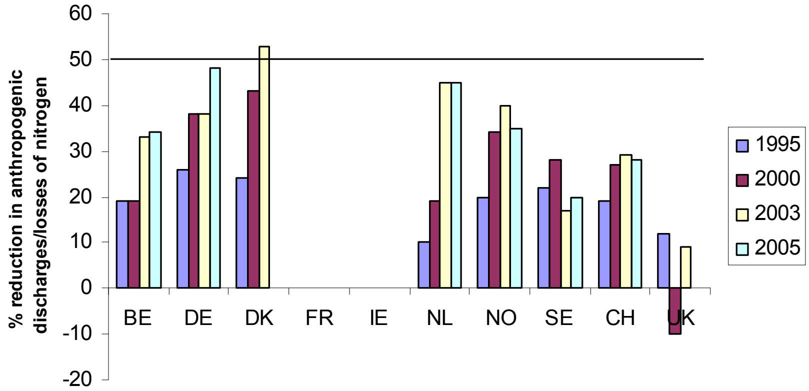
Contracting Parties have implemented a range of nutrient reduction measures over the last years to combat eutrophication in the OSPAR maritime area in order to progress towards the Eutrophication Strategy's objective to achieve and maintain a healthy marine environment, where eutrophication does not occur, by 2010.

The key OSPAR driver for national actions are PARCOM Recommendations 88/2, 89/4 and 92/7 which aim to achieve a substantial reduction of 50%, compared to input levels in 1985, in inputs of phosphorus and nitrogen into waters where these inputs are likely, directly or indirectly, to cause pollution. In addition, EC legislation also contributes towards the fulfilment of the OSPAR 50% reduction target. Relevant EC legislation includes the Urban Waste Water Treatment Directive (91/271/EEC), the Nitrates Directive (91/676/EEC) and the Water Framework Directive (2000/60/EC), all of which require EU and EEA Member States to take measures in order to reduce nutrient releases (see latest EC implementation synthesis reports EC, 2007a; EC, 2007b).

Degree to which the 50% reduction target has been achieved

All Contracting Parties that have identified problem areas with regard to eutrophication are committed to report on the implementation of the 50% reduction target for nutrients under PARCOM Recommendation 88/2.

In the latest reporting round for the year 2005, most Contracting Parties reported that they have achieved the 50% reduction target for phosphorus. With the exception of Denmark, the 50% reduction has not been met for nitrogen (Figure 4.4) (OSPAR, 2008a).



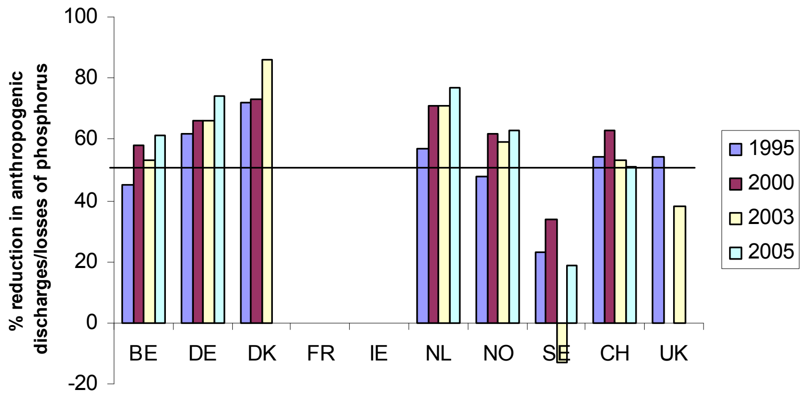


Figure 4.4 Percentage reductions in anthropogenic discharges/losses of nitrogen and phosphorus achieved by Contracting Parties between 1985 – 1995, 1985 – 2000, 1985-2003, and 1985 – 2005. No data have been reported by France. No baseline (1985) data are available for Ireland to calculate % reduction for the reported discharge/loss levels. (OSPAR, 2008a)

Supporting information on trends in waterborne and atmospheric inputs of nutrients to the sea

The most recent assessments of the data reported annually by Contracting Parties to OSPAR under the OSPAR Comprehensive Study on riverine inputs and direct discharges (RID) on waterborne nutrient inputs, including discharges from sewage treatment works and industrial inputs, and under the OSPAR Comprehensive Atmospheric Monitoring Programme (CAMP) on concentrations of nitrogen species in air and precipitation, have been performed in 2005.

For the Greater North Sea (Region II) a total reduction of riverine inputs and direct discharges of nitrogen of 12% was observed for the period 1990 – 2001 (OSPAR, 2005e). In the same period, there was a substantial reduction of 33% in total direct discharges of phosphorus in Region II, but the riverine inputs did not show a statistically significant trend. For smaller areas of the Greater North Sea, the situation varies considerably with some significant upward trends in riverine inputs and/or direct discharges of nitrogen and of phosphorus, which still need to be confirmed and their reasons established. While CAMP data showed no significant change for the period 1990 – 2002 (OSPAR, 2005f), recent EMEP model results suggest a total reduction of 16% in the deposition of nitrogen to Region II in the period 1990 – 2005 (OSPAR, 2007). However, there is indication that nitrogen deposition increased regionally by emissions from growing ship traffic. Based on EMEP model calculations, atmospheric nitrogen deposition is estimated to amount to one third of all nitrogen inputs to the Greater North Sea (Table 4.6).

Table 4.6 EMEP modeled atmospheric inputs and unadjusted summary nitrogen load data of riverine inputs and direct discharges reported under the OSPAR RID Study for the Greater North Sea (OSPAR, 2007)

Year	Waterborne inputs[1]			Atmospheric inputs			Total N inputs (water and atmos-phere)	% Contribution of atmospheric inputs to total N inputs		
	Direct	Riverine	Total water-borne N	Oxidised N	Reduced N	Total atmos-perhic N		Oxidised N	Reduced N	Total atmos-pheric N
1990	109	907	1016	326	221	547	1563	21 %	14 %	35 %
1995	86	1382	1467	289	210	499	1966	15 %	11 %	25 %
1996	78	856	935	341	241	582	1517	22 %	16 %	38%
1997	79	836	914	299	225	524	1438	21 %	16 %	36 %
1998	74	1037	1111	310	235	545	1656	19 %	14 %	33 %
1999	73	1053	1126	281	221	502	1628	17 %	14 %	31 %
2000	78	1203	1282	320	252	572	1854	17 %	14 %	31 %
2001	79	1021	1100	284	218	502	1602	18 %	14 %	32 %
2002	70	1111	1181	278	216	494	1675	17 %	13 %	30 %
2003	79	666	745	262	207	469	1214	22 %	17 %	39 %
2004	60	747	807	253	204	457	1264	20 %	16 %	36 %

[1] These are summary nitrogen load data for the OSPAR maritime area reported by Contracting Parties under the OSPAR Comprehensive Study on Riverine Inputs and Direct Discharges (RID)

In the Celtic Seas (Region III), atmospheric deposition of nitrogen is also estimated to provide about one-third of all inputs of nitrogen. EMEP model calculations indicate a reduction of 23% for oxidized and 2% for reduced nitrogen deposition to the Celtic Seas in the period 1990 – 2005 (total nitrogen reduction of 13%) (OSPAR, 2007). There are, however, no statistically significant trends in inputs of nitrogen from riverine inputs or direct discharges. Still, total waterborne inputs of nitrogen can be considered to be lower in 2002 compared to 1990. In the same period, there was a statistically significant reduction of 33% of total riverine inputs and direct discharges of phosphorus (OSPAR, 2005d).

For the Bay of Biscay and the Iberian Coast (Region IV) no trend assessment of nitrogen and phosphorus inputs is available due to limited data. EMEP modeled atmospheric inputs indicate that depositions of reduced nitrogen in Region IV were 10% higher in 2004 than in 1990; depositions of total nitrogen in that Region were 3% higher in 2004 than in 1990 (OSPAR, 2007).

Actions taken or planned to achieve reductions in nutrient inputs.

Specific actions have been mentioned with respect to aquaculture, sewage, industry, agriculture, atmospheric deposition (traffic), and forestry. Most Contracting Parties have reported on specific measures they have taken to restrict nitrogen and/or phosphorus inputs from sewage treatment works and to prevent the run-off of nutrients into surface water from agriculture, either for whole territories, or for particular eutrophication problem areas (cf. Annex 1). Most Contracting Parties have indicated that the introduction of such measures has been largely driven by the Urban Waste Water Treatment Directive (91/271/EEC) and the Nitrates Directives (91/676/EEC).

There is also a growing consensus that the River Basin Management Plans required under the Water Framework Directive (2000/60/EC) will need to address the reduction of nutrient inputs, particularly from agriculture, other diffuse sources and smaller sewage plants not covered by the Urban Waste Water Treatment Directive, and that additional measures may be needed to meet the Directive’s requirements for achieving good chemical and ecological status in transitional and coastal waters by 2015.

A number of other measures to prevent eutrophication are mentioned in the national reports, including the introduction of mussel farms into estuaries to harvest nitrogen (Sweden), an initiative to reduce inputs of nitrogen from shipping by the Baltic Contracting Parties highlighted in the Baltic Sea Action Plan, and improving the hydrodynamic flow in the Mondego estuary (Portugal).

However, a number of Contracting Parties point out that national efforts alone cannot solve the problem due to the fact that transboundary transport of nutrients can contribute to eutrophication problems in their waters. For example, Norway points out that further improvements along the Norwegian South Coast are dependent on a decrease in long-range transport. Sweden points out that the eutrophication status of the Kattegat and inshore Skaggerak are dependent on transboundary fluxes from the Baltic Sea, the German Bight and emissions and sources from Denmark, Norway and Sweden.

5. Outlook

Bearing in mind that prediction is rarely an accurate science, this section makes an attempt to estimate the future eutrophication status of the OSPAR maritime area and discusses some of the factors which are likely to be involved (e.g. the effects of climate change). It is based largely on what Contracting Parties have reported in the "outlook" sections of their national reports (cf. Annex 1), comparing the eutrophication status in 2003 with that in 2007, and the results of the modelling initiative carried out under the OSPAR Eutrophication Committee.

Predicted status of offshore waters

A large proportion of the offshore waters of the OSPAR maritime area has already been recognized as having non-problem area status through the application of the Screening Procedure (OSPAR, 2001). For these, the situation is likely to remain the same unless climate change brings about significant changes in the supporting environmental factors in these areas. For those offshore waters which have been included in the assessment, a number have retained their non-problem area status, and there have also been several improvements since the first application of the Comprehensive Procedure (OSPAR, 2003a). The Swedish "offshore Skagerrak" and the Danish offshore "Skaggerak Open Area" have both moved from problem area to non-problem area as well as the Dutch "Offshore Oyster Grounds". The remaining problem areas and potential problem areas in offshore waters will either need further investigation or will need to wait for nutrient reduction measures to achieve non-problem status.

Predicted status of coastal waters and estuaries

The large majority of areas assessed under the Comprehensive Procedure are in transitional and coastal waters which contain most of the problem areas and potential problem areas. They are generally localized, and occur adjacent to, estuaries and coastal towns or are in areas with special environmental conditions (e.g. Dutch coast, Wadden Sea, the German Bight and the Kattegat). A significant number of areas identified as potential problem areas in the first application of the Comprehensive Procedure have been confirmed as problem areas in the current assessment. Generally, Contracting Parties are not confident that their Problem Areas in coastal and transitional waters will move to non-problem area status in the near future. One of the main reasons given is the fact that there is a long time lag between the implementation of nutrient reduction measures and seeing a significant improvement in eutrophication status. This is due to the fact that nutrients from previous use form reservoirs in sediments and soils and leach out only slowly over long periods of time. Germany estimates this time lag to be between 10 and 30 years. However, there are some positive signals, and several countries report that nutrient reduction measures are starting to result in lower concentrations of nitrogen and phosphorus in problem area waters, particularly in estuaries (Germany, Sweden).

Reduction of nutrient inputs needed to achieve non-problem area status

In their national reports, Belgium, Denmark and Germany have pointed out that they do not assume that the 50% reduction target will be sufficient to turn some of their problem areas into non-problem areas. Belgium estimates that a 90% reduction of nitrogen will be needed.

The OSPAR Eutrophication Committee has undertaken work to improve clarity on this issue through the application of mathematical models which use historic data on nutrients, chlorophyll and other eutrophication-related parameters combined with hydrodynamic information on the North Sea, to simulate eutrophication status in targeted areas and forecast what it might be in the future. Although different models have been used, and have produced varying results in the test scenarios which have been run so far, there is an emerging consensus that reducing anthropogenic riverine nutrient inputs leads to improvements in the levels of eutrophication-related parameters with consequences for the eutrophication status of targeted areas (OSPAR, 2008b).

These models cannot reliably simulate all of the eutrophication related parameters and so cannot reproduce the Comprehensive Procedure in its entirety. Nevertheless, the results from the eutrophication modeling work show that a strong response can be expected in category I assessment variables (nutrient enrichment). Ambient nutrient concentrations decline in target areas in response to nutrient reductions with a near-linear response in coastal areas. Direct effect indicators (Category II assessment parameters) also show a positive correlation with anthropogenic nutrients but with a weaker response, which is independent of the area location (offshore or coastal). Finally, the indirect effect assessment parameters (category III) show the weakest response to the nutrient reduction scenarios, with offshore areas being more responsive than coastal ones (OSPAR, 2008b).

Thus, results from the modelling exercise confirm the response observed by some Contracting Parties regarding decreasing concentrations of nitrogen and phosphorus in their national waters resulting from the implementation of nutrient reduction measures, but warn that an equally strong response in other eutrophication indicators is unlikely. The model predictions further showed that even in a scenario of 70% reduction of nutrient loads compared to 1985 some eutrophication-related variables remained above assessment levels and would therefore contribute towards an unfavorable classification.

The impact of climate change on eutrophication status

A number of key variables affecting eutrophication are associated with climate. For example, rainfall patterns affect the amount of run-off of nutrients into rivers and discharged to the sea. Sea temperature has a direct effect on the phytoplankton and also affects the extent of seasonal stratification of parts of the sea with consequential changes to the availability of nutrients in the summer, the extent of growth and the types of phytoplankton expected in those waters. Increasing duration and frequency of storms can affect the turbidity and mixing of the sea, which also influences the light climate to which phytoplankton is exposed, and may decrease overall growth in shallow areas. These factors may also affect the growth of macrophytes (Box 4). It is important to be able to distinguish between changes due to climate and changes induced by anthropogenic nutrient inputs to the sea.

Increasing carbon dioxide (CO_2) emissions to the atmosphere leads to increasing acidity (pH) of seawater through absorption of the CO_2. This may affect the productivity of phytoplankton and algae and makes it more difficult for some marine organisms to construct mineral carbonate shells.

Already in the 1990ies, Contracting Parties were reporting climate-related effects on eutrophication. The Netherlands noted a large increase in the toxic species *Dinophysis* following an unusually wet year, and Denmark noted a significant decrease in nutrient inputs and chlorophyll levels caused by a number of uncharacteristically dry years. In their recent national reports a number of Contracting Parties have pointed out that the impacts of climate change could have a significant effect on the eutrophication status of their waters in the future.

Norway points out that the likely impact of climatic changes on wind systems in Scandinavia will favour the current system in the Skagerrak that brings nutrients from the southern North Sea (German Bight) to the Norwegian Skagerrak Coast. As northerly winter winds also determine the strength of the water renewal below sill depth in the Norwegian fjords, the wind change can weaken this process, extending the residence time and further reduce the oxygen concentration.

Models simulating climate change over a number of decades also predict changes in the freshwater run-off to the Norwegian Skagerrak coast. The models predict a moderate decline in the annual run-off, but due to higher winter temperature the freshwater run-off during winter will increase (Beldring *et al*., 2006). With higher temperature the nitrogen leakage from agricultural, forests and mountainous areas is expected to increase.

Germany points out that increasing temperature by climate change is likely to intensify seasonal thermohaline stratification and by this accumulation of organic matter in bottom layers, causing oxygen depletion. Increased stratification will also enhance the development of flagellates, utilising nutrients from deep layers. Higher temperatures will also affect seasonal cycling of nutrient elements e.g. by top-down control of phytoplankton spring blooms by zooplankton, the latter surviving during winter. Alien species from southern areas would be enhanced by increasing temperatures and might influence or change phytoplankton composition.

The UK points out that increased run-off into rivers will increase riverine sediment loads, in particular in rivers without flow regulation, which would lead to increased turbidity in estuarine and marine waters in the vicinity of the river mouth at times of high run-off. Increased storminess is likely to increase rates of coastal erosion, increasing turbidity in the affected coastal waters during and after storms. Moreover, increased storminess may increase erosion of the sea bed, and increase the size of affected areas, again leading to increased levels of turbidity during and after storms in shallow seas. However, it is likely that both increased runoff and storminess would need to be substantial to have wide-spread impact.

Box 4

Eutrophication and the status of the sugar kelp on the south coast of Norway

Surveys on the sugar kelp forest (*Saccharina latissima*) in 1996 – 2006 by the Norwegian Institute for Water Research (NIVA) have uncovered a dramatic decline in the abundance of the sugar kelp forest along the southern coasts of Norway. The losses of sugar kelp at the Norwegian West and Skagerrak coasts are estimated at 50% and 90%, respectively (Figure 5.1). The decline in sugar kelp abundance is most pronounced in sheltered waters, where the kelp forest in large areas has been replaced by a silty turf community dominated by filamentous algae.

The shift in vegetation is most probably a result of long time eutrophication (long-range transported nutrients as well as local nutrient input) combined with recent climatic events causing increased sea temperature. The high nitrate concentration continued throughout the 1990ies causing eutrophication with increased growth of filamentous algae and green algae that altered the competition between long-lived, slow-growing algae and fast-growing, opportunistic algae. Highly elevated summer sea surface temperatures in 1997 and 2002 may have caused a major loss of sugar kelp due to heat stress, and thus induced a shift in the sublittoral vegetation that for a long time had been stressed by eutrophication.

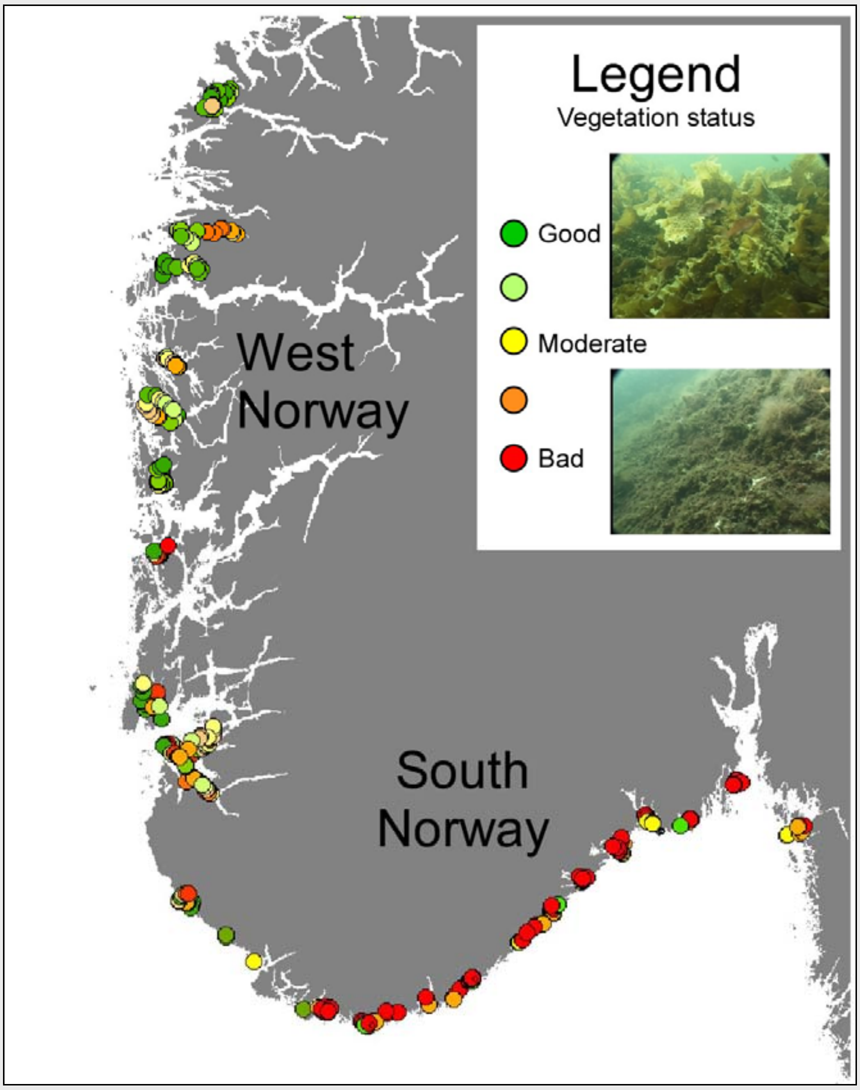


Figure 5.1 Vegetation status based on the abundance of sugar kelp (*Saccharina latissima*) and filamentous algae on tentative sugar kelp locations along the sheltered South Coast of Norway. Source: Moy *et al*., 2007.

The kelp forests are highly productive and diverse communities, providing habitat for many associated organisms and are important feeding and nursery areas for many species of fish. Contrary, the turf communities of short-lived and mainly summer seasonal species provide less food and shelter for juveniles. The ecological consequences of these changes in the coastal zone vegetation are still unknown.

6. Conclusions and Recommendations

6.1 What is the eutrophication status?

On the basis of their assessment and area classification, Contracting Parties concluded on the status of their waters in terms of problem, potential problem and non-problem areas (see Figure 3.6). Of the 204 assessed areas, 73 are non-problem areas, 25 potential problem areas and 106 problem areas. In general, a larger number of inshore waters (68), some coastal areas (32) and only few but large scale offshore waters (6) are still assessed as problem areas; eight offshore areas are non-problem areas. Compared with the results from the first application of the Comprehensive Procedure, three offshore problem areas could now be classified as non-problem areas and some areas show trends in the good direction with respect to eutrophication but these trends are not yet visible in their overall area classification.

Compared to the first application of the Comprehensive Procedure, the revision of the Common Procedure and its application by Contracting Parties resulted in a more harmonised approach in the assessment process. Still some discrepancies exist which limit comparability of classification results to inform measures to combat eutrophication and assess their effectiveness. The experience of Contracting Parties in the second application of the Comprehensive Procedure indicated a need for a further development of assessment methods to enhance robustness of the assessment, the comparability of national assessment results across borders and, for transitional and coastal waters, further harmonisation with the Water Framework Directive (2000/60/EC).

The national reports generally follow the guidance given and provide a reasonable and transparent overview of how the Comprehensive Procedure has been applied.

6.2 What do we need to improve?

For a holistic assessment of the eutrophication status of the North-East Atlantic, the Comprehensive Procedure takes into account a number of parameters grouped in categories for causes and direct/indirect effects of eutrophication:

Category I: Nutrient enrichment

With the exception of one Contracting Party, all Contracting Parties applied the harmonised nutrient enrichment parameters.

Nutrient inputs

Within the recent Comprehensive Procedure riverine nutrient inputs are taken into account but they are not assessed in the same way as the harmonised assessment parameters.

Recommendation:

It would be a further step forward if riverine nutrient input would be included in the harmonised set of assessment parameters. For this purpose respective background and assessment levels would need to be developed.

Winter dissolved inorganic nitrogen (DIN) and phosphorus (DIP)

Improvements have been made in defining winter DIN background and assessment levels for some Contracting Parties. Further harmonisation is required, especially for offshore waters.

Recommendation:

The definition and derivation of area-specific background levels still need to be improved, especially for offshore waters by building on recent knowledge, including that gained under the Water Framework Directive for coastal waters.

Category II: Direct effects of nutrient enrichment

Chlorophyll *a*

Harmonisation of assessment levels: It has to be acknowledged that Contracting Parties address monitoring and assessment of chlorophyll in different ways. This has led to different classifications in similar waters. There is scope for further harmonisation of area-specific background and assessment levels.

Recommendation:

Contracting Parties with adjoining assessment areas should work together over the coming year to see if further agreement on a common threshold is possible.

Improvement of methodology: There has been consensus among Contracting Parties that the 90 percentile value gives a good option for reporting on chlorophyll *a* during the growing season as this is in line with the Water Framework Directive methodology in coastal waters.

Recommendation:

In future assessments, the 90 percentile method in addition to the "mean" approach of OSPAR should replace measurement of chlorophyll maximum in order to address difficulties in monitoring the chlorophyll maximum and to enhance comparability with assessments under the Water Framework Directive. OSPAR should also seek further harmonisation in methodological aspects of chlorophyll measurements.

Phytoplankton indicator species

Not all Contracting Parties used phytoplankton indicator species in their assessment. Those who did, applied them in accordance with the harmonised assessment parameter under the Common Procedure, except for one Contracting Party who used a different assessment tool.

Nuisance species: In those areas where this has been studied, there is confidence that area-specific nuisance phytoplankton species forming high biomass blooms (like *Phaeocystis*) can be used as indicator for eutrophication.

Toxin Producing Algae: There is an emerging consensus that the link between nutrient enrichment and specific abundances of toxin producing algae forming low biomass blooms is not sufficiently robust for this parameter to be used in the Comprehensive Procedure assessment.

Recommendation:

There is a need for more research to justify confidence in toxin producing algae as indicator for eutrophication, taking into account, *inter alia*, the ecophysiological knowledge on these species and the hydrographical conditions (e.g. sedimentation area, stratified waters) of the areas to be assessed.

Macrophytes

With respect to the region-specific macrophytes, methods for assessing shifts from long-lived macrophytes to short-lived opportunistic macrophyte species, for example through use of indices, have been developed during the implementation process of the Water Framework Directive.

Recommendation:

There is a need to follow the work on intercalibration within the Water Framework Directive and for harmonisation between Contracting Parties with common boundaries.

Categories III and IV: Indirect/other possible effects of nutrient enrichment

Oxygen deficiency

Degree of oxygen deficiency is a significant aspect of eutrophication and the assessment parameter has been used by all Contracting Parties depending on its relevance with regard to the zone concerned.

Recommendation:

Harmonisation of oxygen assessment should include the duration and spatial extent (area and depth) of oxygen deficiency.

Additional assessment parameters

Total nitrogen and total phosphorous

The parameters Total Nitrogen (TN) and Total Phosphorus (TP) were assessed by several countries (Denmark, Germany, the Netherlands, Norway and Sweden). Total Nitrogen has, *inter alia*, been used in correlation with chlorophyll *a*. Total Nitrogen and Total Phosphorous are also needed for budget calculations to assess transboundary fluxes.

Recommendation:

TN and TP should be included in eutrophication monitoring where this is required.

Transboundary transport

The impact and significance of transboundary nutrients on eutrophication status have been mentioned in the national reports of several Contracting Parties (Belgium, Denmark, Germany, Netherlands, Norway, Sweden and the UK), mainly from the perspective of the impacts of transboundary nutrients from other countries on their waters.

Recommendation:

OSPAR should endorse ongoing work on modelling of transboundary transport (e.g. nutrients, organic matter, chlorophyll) because it will help distinguish between local inputs and inputs from transboundary transport. Such work can also help distinguish between natural and anthropogenic sources of nutrients.

Atmospheric deposition

Although several Contracting Parties are aware that atmospheric nitrogen deposition is relevant for their assessments only some Contracting Parties used this parameter for the current assessment. They took it into account in regional budgets based on data provided by EMEP. This parameter can play an important role for nutrient inputs (see Table 4.6).

Recommendation:

This parameter should be considered in more depth for future assessments. An assessment should be made on whether improved resolution of the EMEP data provided to OSPAR might help in this respect.

Supporting environmental parameter

Light climate (e.g. Secchi depth)

Secchi depth has been applied as supporting parameter by some Contracting Parties to characterise the regional light climate controlling phytoplankton growth, depth distribution and corresponding regional extension of macrophytes which both have been assessed as effect parameters.

Recommendation:

To explain the level of occurrence of chlorophyll e.g. in estuaries and macrophytes distribution in hydrodynamically active, highly turbid and shallow waters, an estimation of light climate (e.g. by measuring Secchi depth) should complement chlorophyll measurements for validation purposes.

Modelling

During the second application of the Comprehensive Procedure, Contracting Parties have drawn valuable information from modelling work.

Recommendation:

OSPAR should continue to draw benefits from modelling to improve the understanding of changes that are likely to occur in the marine environment and to address transboundary input of nutrients which have not been and could not be sufficiently addressed so far.

Monitoring

The limitation of spatial and temporal coverage of monitoring data remained a concern in the second application of the Comprehensive Procedure. OSPAR recognises that the robustness and the confidence that can be attached to the assessment result depend on the quality of the data.

Recommendation:

The coverage of monitoring of eutrophication-related parameters should be maintained to safeguard OSPAR's ability to assess the eutrophication status of the OSPAR maritime area and should be improved where gaps have been identified. Especially for parameters which are dependent on episodic events (e.g. algal bloom, oxygen deficiency), additional observation methods (e.g. event monitoring in connection with remote sensing etc.) should be considered to improve the data available for the assessments.

Integrated set of EcoQOs for eutrophication for the North Sea

Experience was gained with the first implementation of the integrated set of eutrophication EcoQOs by Contracting Parties through this second application of the OSPAR Comprehensive Procedure.

Recommendation:

In order to have the full integrated set of EcoQOs operational, further work and more rigorous evaluation in the OSPAR Eutrophication Committee would be required, e.g. for agreeing assessment levels and taking into account their region-specific aspects.

6.3 What is the policy message?

The objective of the OSPAR Eutrophication Strategy will be partially achieved by 2010 and consequently eutrophication problems will still persist in a number of areas.

The main result of the second application of the Comprehensive Procedure is that Contracting Parties concluded that several of their coastal areas (including fjords and estuaries) and some offshore areas are identified as problem areas or potential problem areas while a number of offshore areas are classified as non-problem areas. Compared with the results of the first application of the Comprehensive Procedure some areas show improving trends in the assessment parameters.

Extensive nutrient reduction measures have been put in place to prevent eutrophication. It must also be noted that measures to reduce nutrient inputs from point as well as agricultural sources have in many cases been taken later than envisaged under OSPAR and/or relevant EU legislation. Another time lag can be observed between putting measures in place and a positive response from the ecosystem which can take many years. These experiences should be used to design and apply the most effective measures as early as possible.

Further efforts are necessary to completely achieve the objective of the Eutrophication Strategy. Modelling studies estimate that nutrient input reductions larger than the agreed 50 % nutrient reduction target will be needed to convert all problem areas into non-problem areas (see PARCOM Recommendation 88/2 on the reduction of nutrient inputs to the Paris Convention Area).

The Comprehensive Procedure forms a good international operational tool for the assessment of the eutrophication status of the North-East Atlantic and a useful instrument for addressing the requirements of the Marine Strategy Framework Directive (2008/56/EC), but some aspects still need further development. For this reason, the Comprehensive Procedure should further be developed and adapted to the new requirements accordingly.

In order to follow-up within OSPAR the effectiveness of reduction measures for the eutrophication status of the marine environment, a further application of the Comprehensive Procedure is required. OSPAR will continue further synchronisation and harmonisation with the Water Framework Directive (2000/60/EC).

A further application of the Comprehensive Procedure is necessary to enable OSPAR to assess whether the overall goal of the Eutrophication Strategy “to achieve and maintain a healthy marine environment where eutrophication does not occur” has been achieved by 2010, to inform the ‘initial assessment’ required under the Marine Strategy Framework Directive, and to address other issues indicated above.

7. References[2]

Beldring *et al.*, 2006. Beldring, S., Andréasson, J., Bergström, S., Engen-Skaugen, T., Førland, E.J., Jónsdóttir, J.F., Roald, L.A., Rosberg, J., Suomalainen, M., Tonning, T., Vehviläinen, B. & Veijalainen, N., 2006. Hydrological climate change maps of the Nordic countries based on RegClim HIRHAM and Rossby Centre RCAO regional climate model results. Norwegian Water Resources and Energy Directorate (NVE), Report No. 4.

EC, 2005. European Community, 2005. Eutrophication guidance (Eutrophication assessment in the context of European water policies), version 11 of November 2005, developed under the "Eutrophication Activity" of the Common Implementation Strategy of the EC Water Framework Directive.

EC, 2007a. European Community, 2007. Report from the Commission to the Council and the European Parliament on implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources for the period 2000-2003. Commission Communication COM(2007) 120 final. Commission of the European Communities, Brussels.

EC, 2007b. European Community, 2007. 4th Commission Report on the Implementation of the Urban Waste Water Treatment Directive (March 2007). Published as an Annex to the Commission Communication "Towards Sustainable Water Management in Europe". Commission Staff Working Document SEC(2007) 363. Commission of the European Communities, Brussels.

Marine Strategy Framework Directive (2008/56/EC). Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (OJ L 164, 25.6.2008, p. 19-40) (for Directive, status August 2008, click here)

Moy *et al.,* 2007. Moy, F., Alve, E., Christie, H., Helland, A., Magnusson, J., Steen, H., Tveiten, L., Åsen, P.A., 2007. Statusrapport nr.2 fra Sukkertareprosjektet. Status report no. 2 from the Sugar Kelp Project. TA-2232/2007, 60p. Norwegian Pollution Control Authority, Oslo. (in Norwegian)

National Emissions Ceiling Directive (2001/81/EC). Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (OJ L 309, 27.11.2001, p. 22-30) (for Directive, status August 2008, click here)

Nitrates Directive (91/676/EEC). Council Directive 91/676/EC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (OJ L 375, 31.12.1991, p. 1) (for Directive, status August 2008, click here)

OSPAR, 2001. OSPAR Commission, 2001. Agreement on those parts of the OSPAR maritime area to which the Comprehensive Procedure will be applied. Agreement 2001-5. OSPAR Commission, London.

OSPAR, 2003a. OSPAR Commission, 2003. OSPAR integrated report 2003 on the eutrophication status of the OSPAR maritime area based upon the first application of the Comprehensive Procedure. OSPAR Eutrophication Series, publication 189/2003. OSPAR Commission, London.

OSPAR, 2003b. OSPAR Commission, 2003. 2003 Strategies of the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic. Agreement 2003-21. OSPAR Commission, London.

OSPAR, 2005a. OSPAR Commission, 2005. Common procedure for the identification of the eutrophication status of the OSPAR maritime area. Agreement 2005-3. OSPAR Commission, London.

OSPAR, 2005b. OSPAR Commission, 2005. Eutrophication Monitoring Programme. Agreement 2005-4. OSPAR Commission, London.

OSPAR, 2005c. OSPAR Commission, 2005. Synergies in assessment and monitoring between OSPAR and the European Union, Volume I. OSPAR Assessment and Monitoring Series, publication 230/2005. OSPAR Commission, London.

OSPAR, 2005d. OSPAR Commission, 2005. Synergies between the OSPAR Comprehensive Procedure, the integrated set of OSAPR Ecological Quality Objectives (EcoQOs) for eutrophication and the EC Water Framework Directive. OSPAR Eutrophication Series, publication 231/2005. OSPAR Commission, London.

[2] All OSPAR publications and measures can be downloaded from the 'publication' and 'programmes and measures' sections, respectively, of the OSPAR website http://www.ospar.org. All European Community legislation, Commission Communications (COM) and Staff Working Documents (SEC) documents can be downloaded from the Eurlex website of the European Community http://eur-lex.europa.eu/en/index.htm; EC publications can be searched at http://circa.europa.eu

OSPAR, 2005e. OSPAR Commission, 2005. 2005 assessment of data collected under the OSPAR Comprehensive Study on Riverine Inputs and Direct Discharges for the period 1990 – 2002. OSPAR Assessment and Monitoring Series, publication 233/2005. OSPAR Commission, London.

OSPAR, 2005f. OSPAR Commission, 2005. Assessment of trends in atmospheric concentration and deposition of hazardous pollutants to the OSPAR maritime area. OSPAR Assessment and Monitoring Series, publication 234/2005. OSPAR Commission, London.

OSPAR, 2006. OSPAR Commission, 2006. Agreement on the application of the EcoQO system. Agreement 2006-4. OSPAR Commission, London.

OSPAR, 2007. Bartnicki, J., and Fagerli, H. Atmospheric nitrogen in the OSPAR Convention Area in the period 1990 – 2004. EMEP/MSC-W Technical report 4/2006. OSPAR Eutrophication Series, publication 344/2007. OSPAR Commission, London.

OSPAR, 2008a. OSPAR Commission, 2008. Nutrients in the Convention area. Assessment of implementation of PARRCOM Recommendations 88/2 and 89/4. OSPAR Eutrophication Series, publication 310/2008. OSPAR Commission, London.

OSPAR, 2008b. OSPAR Commission, 2008. Nutrient reduction scenarios for the North Sea. Environmental consequences for problem areas with regard to eutrophication following nutrient reductions in model scenarios. OSPAR Eutrophication Series, publication 374/2008. OSPAR Commission, London.

PARCOM Recommendation 88/2. Paris Commision, 1988. Recommendation 88/2 of 17 June 1988 on the reduction in inputs of nutrients to the Paris Convention area. OSPAR Commission, London.

PARCOM Recommendation 89/4. Paris Commission, 1988. Recommendation 89/4 of 22 June 1989 on a coordinated programme for the reduction of nutrients. OSPAR Commission, London.

PARCOM Recommendation 92/7. Paris Commission, 1992. Recommendation on the reduction of nutrient inputs from agriculture into areas where these inputs are likely, directly or indirectly, to cause pollution. OSPAR Commission, London.

Urban Waste Water Treatment Directive (91/271/EEC). Council Directive 91/271/EEC of 12 May 1991 concerning urban waste water treatment (OJ L 135, 30.5.1991, p. 40), as amended (for consolidated version, status August 2008, click here)

Water Framework Directive (2000/60/EC). Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1), as amended (for consolidated version, status August 2008, click here)

8. Glossary and abbreviations

angiosperms	Flowering plants.
anthropogenic	Caused or produced by human activities.
assessment level	Under the OSPAR Common Procedure, assessment levels have been set for each of the harmonised assessment parameters based on levels of increased concentrations and trends as well as on shifts, changes or occurrence. For concentrations, for example, assessment levels are defined by the Common Procedure as justified area-specific % deviation from background not exceeding 50%.
background level	Under the OSPAR Common Procedure, background levels are defined as salinity-related and/or specific to a particular area, and which had been derived from data relating to a particular (usually offshore) area or from historic data. Background levels serve as basis for setting assessment levels.
CAMP	Comprehensive Atmospheric Monitoring Programme. OSPAR agreement 2001-7.
CEMP	Coordinated Environmental Monitoring Programme. OSPAR agreement 2008-8 (latest update).
climate	The long-term average conditions of the atmosphere and/or ocean.
Common Procedure	Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area. OSPAR agreement 2005-3.
Comprehensive Procedure	The second phase of the Common Procedure which follows the one-off Screening Procedure and provides guidance for periodic comprehensive assessments of maritime areas in a three-step approach to classify their trophic status.
continental shelf	The shallowest part of the continental margin between the shoreline and the continental slope; not usually deeper than 200 m.
continental slope	The steeply sloping seabed from the outer edge of the continental shelf to the contental rise.
DIN	Dissolved Inorganic Nitrogen.
DIP	Dissolved Inorganic Phosphorus.
DSP	Diarrhetic Shellfish Poisoning.
EC	European Community.
EcoQO(s)	Ecological Quality Objective(s). The desired level of ecological quality for an individual aspect of the overall ecological quality.
EEA	European Economic Area. The EEA Agreement associates the EFTA States Iceland, Liechtenstein and Norway with the European Community to participate in the Internal Market on the basis of the application of the relevant EC legislation.
EEC	European Economic Community.
EMEP	Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe. Set up under the UN-ECE Convention on Long-Range Transboundary Air Pollution (http://www.emep.int).
EQR	Ecological Quality Ratio. Terminology under Water Framework Directive (2000/60/EC).
EU	European Union.
euphotic	Refers to the surface layer of the ocean that receives enough sunlight for photosynthesis.
eutrophication	For the purpose of the OSPAR Eutrophication Strategy, eutrophication means “the enrichment of water by nutrients causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned, and therefore refers to the undesirable effects resulting from anthropogenic enrichment by nutrients as described in the Common Procedure”. (Appendix 1 to the OSPAR Convention).
Eutrophication Strategy	OSPAR thematic strategy to address eutrophication. Adopted by OSPAR 1998 and revised in 2003 as part of the revised Strategies of the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic. OSPAR agreement 2003-21.

flagellate	Single-celled type of algae with one or more flagella, a whip-like organelle often used for propulsion.
HEAT	HELCOM Eutrophication Assessment Tool.
harmful algae bloom	Blooms of phytoplankton that result in harmful effects such as the production of toxins that can affect human health, oxygen depletion and kills of fish and invertebrates, and harm to fish and invertebrates, e.g. by damaging or clogging gills.
JAMP	Strategy for a Joint Assessment and Monitoring Programme. OSPAR agreement 2003-22.
macrophytes	Higher aquatic plants large enough to be seen with unaided eye .
NEA GIG	North East Atlantic Geographic Intercalibration Group. Set up under the Water Framework Directive Common Implementation Strategy.
N/P ratio	Ratio of the concentrations of Nitrogen and Phosphorus.
NIVA	Norwegian Institute for Water Research.
non-problem area	Non-problem areas with regard to eutrophication are defined by OSPAR for the purpose of the Eutrophication Strategy as "those areas for which there are no grounds for concern that anthropogenic enrichment by nutrients has disturbed or may in the future disturb the marine ecosystem" (Appendix 1 to agreement 2003-21). The characterisation of waters as non-problem areas is done through the methods and procedures described by the Common Procedure.
nutrients	Dissolved phosphorus, nitrogen and silica compounds.
OSPAR Commission	Forum set up by the OSPAR Convention through which OSPAR Contracting Parties co-operate, supported by six main committees (for each OSPAR Strategy) and their working groups. The Eutrophication Committee set up for the Eutrophication Strategy is one of the main committees.
OSPAR Contracting Parties	Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom of Great Britain and Northern Ireland, and the European Community.
OSPAR Convention	Convention for the Protection of the Marine Environment of the North-East Atlantic opened for signature at the Ministerial Meeting of the Oslo and Paris Commissions, Paris, 21-22 September 1992; entered into force on 25 March 1998.
OSPAR maritime area	The maritime area consisting of the internal waters and the territorial seas of the OSPAR Contracting Parties, the sea beyond and adjacent to the territorial sea under the jurisdiction of the coastal state to the extent recognised by international law, and the high seas, including the bed of all those waters and its sub-soil, situated within the following limits: (1) those parts of the Atlantic and Arctic Oceans and their dependent seas which lie north of 36 north latitude and between 42 west longitude and 51 east longitude, but excluding: (a) the Baltic Sea and the Belts lying to the south and east of lines drawn from Hasenore Head to Gniben Point, from Korshage to Spodsbjerg and from Gilbjerg Head to Kullen, (b) the Mediterranean Sea and its dependent seas as far as the point of intersection of the parallel of 36 north latitude and the meridian of 5 36' west longitude; (2) that part of the Atlantic Ocean north of 59 north latitude and between 44 west longitude and 42 west longitude.
PARCOM	Paris Commission. Set up under the 1974 Paris Convention for the Prevention of marine Pollution from Land-Based Sources and succeeded by the OSPAR Commission. Measures and programmes adopted by PARCOM remained applicable by virtue of Article 31(2) of the OSPAR Convention.
percentile	The percent of observations in a sample that have a value less than or equal a given score. In this report, the term 90 percentile is used in relation to chlorophyll and a variety of percentile are mentioned for oxygen (Annex 4).
phytoplankton	Microscopically small plants which float or swim weakly in water.
potential problem area	Potential problem areas with regard to eutrophication are defined by OSPAR for the purpose of the Eutrophication Strategy as "those areas for which there are reasonable grounds for concern that the anthropogenic contribution of nutrients may be causing or may lead in time to an undesirable disturbance to the marine ecosystem due to elevated levels, trends and/or fluxes in such nutrients" (Appendix 1 to agreement 2003-21). The characterisation of waters as potential problem areas is done through the methods and procedures described by the Common Procedure.

problem area	Problem areas with regard to eutrophication are defined by OSPAR for the purpose of the Eutrophication Strategy as "those areas for which there is evidence of an undesirable disturbance to the marine ecosystem due to anthropogenic enrichment by nutrients" (Appendix 1 to agreement 2003-21). The characterisation of waters as problem areas is done through the methods and procedures described by the Common Procedure.
PSP	Paralytic Shellfish Poisoning.
remineralisation	Biochemical transformation of organic mollecules into inorganic forms, typically mediated by biological activity.
remote sensing	Collective term for techniques to derive information or measurements of sea areas from distance, i.e. without physical contact (e.g. satellite imaging, aerial photography and open path measurements).
RID	Comprehensive Study on Riverine Inputs and Direct Discharges. OSPAR agreement 1998-5.
river plume	The area where river water mixes with seawater at or near the mouth of the river.
run off	The part of precipitation, snow melt, or irrigation water that runs off the land into surface water.
salinity	A measure of the total amount of dissolved salts in sea water. Salinity is expressed without unit.
Secchi depth	Average depth at which a standard black and white ('Secchi') disk disappears and reappears when viewed from the water surface as it is lowered. The parameter is used to determine the clarity of surface water.
sedimentation	Process in which suspended particles in the water settle to the bottom.
sensitive area	Water areas designated under Article 5 of the Urban Waste Water Treatment Directive (91/271/EEC) which are found to be eutrophic or which in the near future may become eutrophic if protective action is not taken.
SmartBuoy	Technically equiped buoys set out in the water to provide continuous measurements and observations of selected parameters which can be transmitted in real-time.
stratification	Separation of water masses of different salinity and temperature into layers which act as barriers to water mixing.
thermocline	A boundary region in the sea between two layers of water of different temperature, in which temperature drops sharply with depth.
thermohaline	Refers to ocean circulation processes caused by differences in density between water masses, which is itself determined primarily by water temperature.
TN	Total Nitrogen.
toxin	A poison produced by the action of living organisms, for example toxic algae species.
TP	Total Phosphorus.
trophic	Pertaining to nutrition.
upwelling	Wind-driven upward movement of cold, nutrient-rich water from ocean depths; this occurs near coasts where winds persistently drive water seawards and in the open ocean where surface currents are divergent.
nitrate vulnerable zone	Areas designated under Article 3 (2) of the Nitrates Directive (91/676/EEC), concerning all known areas of land in the territories of EU Member States which drain into the waters which have been identified to be affected by pollution and could be affected by pollution if no action is taken.
zoobenthos	Animals attached to, living on or in the seabed.

Annex 1 Summaries of national assessments

The first application of the Comprehensive Procedure of the Common Procedure (OSPAR, 2003a) identified a considerable number of problem areas and potential problem areas with regard to eutrophication in the OSPAR maritime area (Figure 0.1). Five years on, Contracting Parties applied the Comprehensive Procedure (OSPAR, 2005a) for a second time for the period 2001 – 2005 to reassess the status of areas identified as problem or potential problem areas with regard to eutrophication, or non-problem area where there were grounds for concern that there had been a substantial increase in the anthropogenic nutrient load.

In the following, national summaries of the national assessments are given. The full national reports are accessible through links in the Table below.

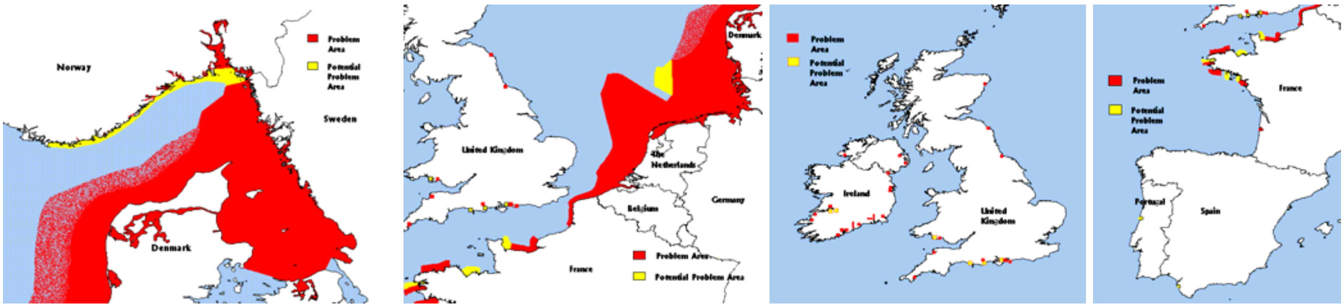


Figure 0.1 Problem areas and potential problem areas identified by Contracting Parties in the first application of the Comprehensive Procedure in 2002/2003 (OSPAR, 2003a).

National summary by Contracting Party	National assessments
Belgium	*Bonne W. et al.*, OSPAR Report on the second application of the Comprehensive Procedure for the Belgian marine waters. Marine Environment Service, Brussels. June 2008. Click here for the report
Denmark	*DHI,* Danish assessment of eutrophication status in the North Sea, Skaggerak and Kattegat: OSPAR Common Procedure 2001 – 2005. The Danish Spatial and Environmental Planning Agency, Hørsholm. March 2008. Click here for the report
France	*Anonymus*, Application of the Common Procedure for the identification of the eutrophication status of the OSPAR maritime area in France – 2007 revision of the OSPAR procedure. Syntheses report. Click here for the report
Germany	*Brockmann U. et al.*, Assessment of the eutrophication status of the German Bight according to the OSPAR Comprehensive Procedure. June 2007. Click here for the report
Ireland	*Irish Environmental Protection Agency and Marine Institute*, National eutrophication assessment report under the Common Procedure – Ireland. Final Report on the Second Application of the Comprehensive Procedure. March 2008. Click here for the report
Netherlands	*Baretta-Bekker H. et al.,* Report on the Second Application of the OSPAR Comprehensive Procedure to the Dutch Marine Waters, Den Hague. May 2007. Click here for the report
Norway	*Molvær J. et al.*, Common Procedure for Identification of the Eutrophication Status of the Maritime Area of the OSPAR Convention – Report on the Eutrophication Status for the Norwegian Skagerrak Coast, Norwegian Pollution Control Authority, Norwegian Institute for Water Research (NIVA), Oslo. April 2007. Click here for the report
Portugal	*Maretec*, OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic – 2nd Application of Comprehensive Procedure: Mondego Estuary – Portugal, Lisbon. May 2008. (Click here for the report)
Spain	*Ministerio de Medio Ambiente*, OSPAR Convention – National Report on the Eutrophication Status in the OSPAR Maritime Area Corresponding to the Spanish Territorial Waters (Region IV), Madrid. June 2007. Click here for the report
Sweden	*SMHI,* Swedish National Report on Eutrophication Status in the Kattegat and Skagerrak – OSPAR Assessment 2007, Reports Oceanography No. 36/2007, Göteborg. April 2007. Click here for report
United Kingdom	*Anonymus,* Common Procedure for the Identification of the Eutrophication Status of the OSPAR maritime area – UK national report, London. April 2008. Click here for national report

1. Belgium

Despite the reduction in 1985 – 2005 by 34% and 61% of nitrogen and phosphorus discharges and emssions respectively, the Belgian coastal zone is still characterised as a problem area with regard to eutrophication. The offshore area is characterised as a non-problem area. These results of the 2007 eutrophication assessment conform with the first application of the Comprehensive Procedure by Belgium, which concluded that in almost all investigated years in the assessment period 1995 to 2000 winter DIN and DIP were above the assessment levels and, therefore, chlorophyll *a* concentration was determinant in the distribution of problem areas. Generally problem areas appeared near the coast with an increasing gradient towards the north-east (Scheldt and Rhine/Meuse river plumes). This is still valid for the second application of the Comprehensive Procedure for the period 2001 – 2005. The following is a summary of the second Belgian eutrophication assessment in 2007 (for the full report click here).

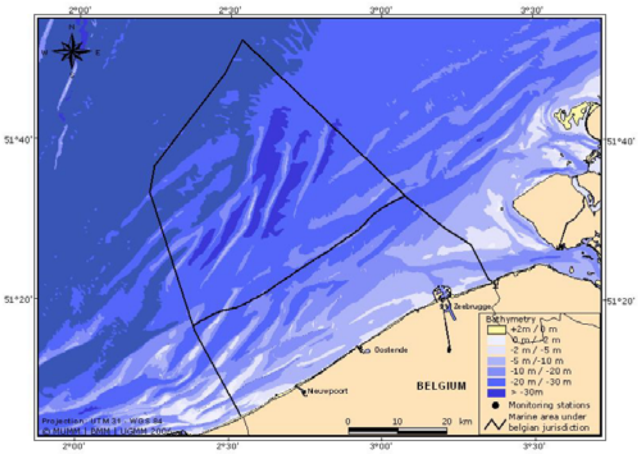


Figure 1.1 Belgian Exclusive Economic Zone, delineated by solid black lines and by the bathymetry

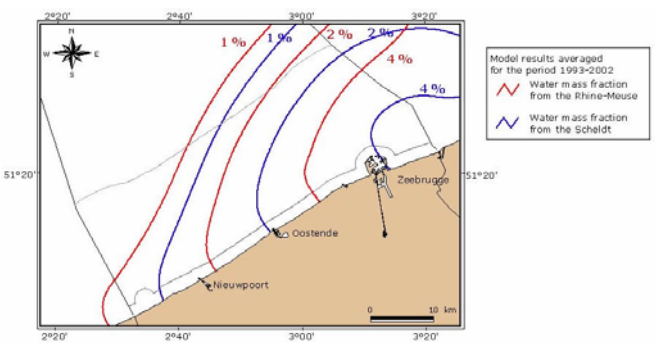


Figure 1.2 Delimitation of the fraction of the water masses originating from the Rhine/Meuse (blue) and the Scheldt (red). A fraction of 1% means that 1% of the water on that specific location is originating from the respective river district.

The eutrophication assessment for 2001 – 2005 covers the Belgian Exclusive Economic Zone (Figure 1.1). The area is characterised by shallow waters, submerged sandbanks, strong, mainly semi-diurnal tides, frequent wind-mixing, strong horizontal advection from tide- and wind-driven currents, high turbidity, and high concentrations of suspended particulate matter.

The water masses that impact the region originate from the Channel, which supplies high salinity and low nutrient water, and from the continental coastal rivers. Although nutrient loads from the Channel are not negligible, it is the loads from the rivers Scheldt and Rhine/Meuse which are responsible for the high concentrations in the coastal waters (Figure 1.2). The Seine contributes significantly to nutrient concentrations further offshore. Transboundary nutrient inputs (and outputs) are thought to be very significant for the Belgian waters from the adjacent French and Dutch waters. There are some preliminary indications of transboundary fluxes from research models, but their detailed and reliable quantification is not yet available.

The assessment is based on riverine total nitrogen and phosphorus inputs (Scheldt), winter DIN and DIP concentrations, the N/P ratio, and mean and maximum chlorophyll *a* concentrations. Other assessment parameters were not applied but the estimated distribution of *Phaeocystis* blooms has led to the overall area classification of the Belgian coast from the French border to the Dutch border, extending offshore from about 10 km in the West to about 30 km in the East, as eutrophication problem area.

Winter dissolved inorganic nitrogen (DIN) and dissolved inorganic phosphorus (DIP) are analysed as spatial maps of the 2001 – 2005 average and as time series where the DIN and DIP values corresponding to the reference salinity of 33.5 are deduced from the salinity-nutrient mixing diagrams for each year. The spatial distributions of both nutrients are clearly determined by the influence of freshwater discharges. The DIN at the reference salinity exceeds the assessment level for all five years; the corresponding DIP exceeds the assessment level for three out of the five assessment years. No temporal trends can be deduced from these analyses although longer-term analysis suggest a previous decrease in the riverine discharge of DIP.

Chlorophyll *a* concentrations are analysed as spatial maps both the mean and the 90 percentile value over the growing season for the period 2001 – 2005, where all years are considered together. The maximum value over this period has been rejected for assessment because of the strong dependency of this parameter on the sampling frequency. Satellite chlorophyll *a* imagery has been used to demonstrate the sufficiency of the spatial coverage monitoring network. The area where the 90 percentile chlorophyll *a* concentration exceeded the elevated level is situated along the Belgian coast from Oostende to the Belgian/Dutch border and extends offshore from about 20 km at Oostende to about 30 km in the East (Dutch border).

Given the characteristics of the Belgian waters, macrophytes/macroalgae which occur only very rarely, and oxygen deficiency are not relevant parameters in the eutrophication assessment. Although locally some transient oxygen depletion could occur, the prevailing hydrodynamic conditions ensure continuous oxygen replenishment.

Monitoring for area-specific phytoplankton indicator species and changes/kills in zoobenthos and fish mortality is not yet part of the Belgian monitoring programme. Based on different scientific research projects, it became clear that benthos shows a gradient in the Belgian waters which is related to the eutrophication gradient and that eutrophication can have an indirect effect on the benthos of the Belgian waters. It is planned to start monitoring in the context of the Water Framework Directive and to include these parameters in future assessments.

Algal toxins have not been coherently monitored in Belgian waters in the period 2001 – 2005 but monitoring has started in 2006 because of the development of mussel aquaculture in Belgian waters. The first analyses show that no DSP/PSP toxin producing species exceeded the action limit in that year.

Areas for improvement of the assessment concern the need

- to investigate into improved background levels for DIN, DIP and chlorophyll *a* for example by using coastal ecosystem models with coupled river basin models to simulate historic “pristine” conditions*;*
- to improve sampling for chlorophyll *a,* especially in time to determine interannual variability, making use of continuously measuring moored instruments (e.g. “ships of opportunity”) and satellite chlorophyll *a* imagery;
- to develop methods to remove interannual and long-term variability from meteorological factors in relation to chlorophyll *a* and phytoplankton species composition for example by using ecosystem models.

2. Denmark

The Danish parts of the North Sea, Skagerrak and Kattegat contain a number of unique and fragile ecosystems. Unfortunately, most parts of these areas are considered to be 'eutrophication problem areas'.

Danish marine waters are mostly shallow (< 30 m). The deepest parts are in the central Skagerrak (> 100 m), the most western part of the Danish North Sea (30 – 50 m) and the north-eastern Kattegat (> 50 m).

The salinities vary from above 34 in the central North Sea to around 20 in the southern Kattegat. In the fjords, there is a salinity gradient typically from < 10 to >20 depending on inflow of fresh water and the salinity in the area outside the fjord. Along the Danish North Sea Coast water is transported from south to north in the Jutland Coastal Current. The northward extension of the current varies. In the south the current is heavily influenced by the run-off to the German Bight. The salinity increases northwards along the Danish coast as the water in the current mixes with water from the central North Sea. The following is a summary of the second Danish eutrophication assessment in 2007; for the full report click here.

The eutrophication status in the Danish parts of the OSPAR Convention Area has been assessed in a two step procedure. Firstly, data on reference conditions and current status (2001 – 2005) has been gathered and quality assured, and acceptable deviation from reference condition has been set according to the OSPAR Comprehensive Procedure or Danish Governmental positions in regard to the Water Framework Directive (2000/60/EC) intercalibration process, e.g. the NEA GIG. Information on reference conditions, acceptable deviation and current status have been combined and used for an interim assessment according to the OSPAR Comprehensive Procedure. Areas have been classified as either 'eutrophication non-problem area' or 'eutrophication problem areas'.

Secondly, the interim assessment has been subject to a succeeding assessment in accordance with the requirements of the EU Water Framework Directive, e.g. use of the 'one out – all out' principle, calculation of ecological quality ratio (EQR), and classification in five classes (high, good, poor, moderate, poor and bad, where high and good are similar to 'eutrophication non-problem area' and vice versa). The second step, which has used the draft HELCOM Eutrophication Assessment Tool (HEAT), has also built-in an accuracy assessment in order to get a provisional perceptive of the robustness and quality of the outcome of the classifications.

The conclusions of the assessment are as illustrated in Figure 2.1:

All Danish fjords and estuaries located within the OSPAR Convention Area are classified as 'eutrophication problem areas'.

All coastal areas are classified as 'eutrophication problem areas'.

The open parts of the Skagerrak are together with a strip in the northern parts of the North Sea classified as 'eutrophication non problem areas'.

An area in the North Sea located in between (a) the 'non-problem area' strip mentioned above and (b) the coastal waters being classified as 'eutrophication problem areas' has been classified as a 'potential problem area'.

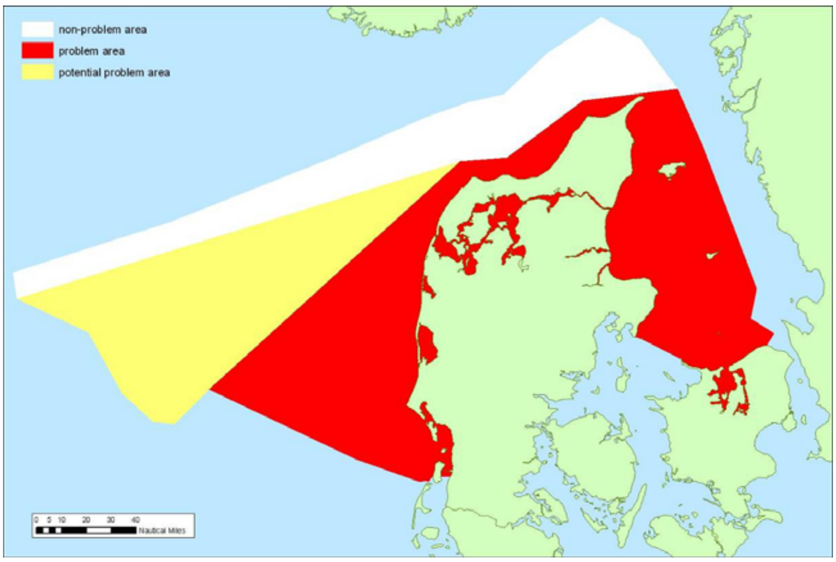


Figure 2.1 Map showing areas classified as "eutrophication problem areas" (red), "potential problem areas" (yellow); and "non problem areas" (white) in the Danish parts of the North Sea, Skagerrak, and Kattegat, 2001-2005.

The first Danish application of the OSPAR Common Procedure concluded that eutrophication effects have been documented in all Danish marine waters every year since the beginning of the 1980ies. Most of the areas assessed were classified as "eutrophication problem areas". Only a few areas either located in the open parts of the North Sea or in the Skagerrak, were classified as "non-problems areas".

This second application of the OSPAR Common Procedure confirms that most of the Danish waters in the North Sea, Skagerrak and Kattegat are “eutrophication problem areas”. It also confirms that the open parts of the North Sea and Skagerrak are “non-problem areas”. However, the present assessment suggests that the coastal waters of the Skagerrak should be classified as an “eutrophication problem areas” and the central parts of the North Sea should be classified as “potential problem areas”.

3. France

The main difficulty encountered in the 2007 revision of the 2002 Common Procedure application was the definition of the assessment units of the French parts of the OSPAR maritime area. For the application of the 2002 Procedure, the French coast was divided into sites based on those used in the national monitoring programmes for environmental quality (chemicals, phytoplankton and phycotoxins, microbiology) for geographic reference for the data management in the national Quadrige database. The implementation of the Water Framework Directive, creating homogeneous water masses and a new sampling plan, has led to the reorganization of all the coastal monitoring programmes. This reorganization was done when the OSPAR procedure was reviewed. In order to help OSPAR and Water Framework Directive operations to converge as desired, it was decided to integrate this Water Framework Directive concept of water masses into the definition of the French OSPAR areas. The lateral boundaries of OSPAR 2002 sites were revised so that each site contains a coherent Water Framework Directive water mass. Each OSPAR 2007 area has lateral boundaries that coincide with a Water Framework Directive water mass limit. After this revision, the number of sites changed from 35 to 28.

But the very coastal coverage of the Water Framework Directive water masses (1 nautical mile beyond the baseline) only partially corresponds to the definition of the 2002 OSPAR areas in their offshore range. The offshore boundaries of the 2002 sites were the boundaries of the territorial waters (baseline + 12 nautical miles), given that all maritime waters beyond that boundary were considered as non-problem areas.

Thus the status of the sector between the boundary of the Water Framework Directive water masses and the boundary of the territorial waters was specifically examined. The experts drew the following conclusions (for the full national report click here):

- The sector from the Pays Basque to the Vendée, and to the west of the Cotentin and Cherbourg can be considered as a non-problem area, for the same reasons as the water masses beyond the territorial waters.
- The presence of islands around Brittany (from the Loire to Mont St Michel) extends the area covered by the Water Framework Directive water masses to almost all the areas potentially involved in eutrophication. Thus the sector between the boundary of the WFD water masses and the boundary of the territorial waters can be considered as a non-problem area.
- The Water Framework Directive water masses of the sites from the Pays de Caux to Dunkirk and Calais represent this area fairly accurately. Thus the sector between the boundary of the Water Framework Directive water masses and the boundary of the territorial waters can be considered as a non-problem area.

The application of the OSPAR common procedure (see full report) lead to the following classification of the 28 areas (Figure 3.1):

- 10 non problem areas (NPA)
- 6 potential problem areas (PPA)
- 12 problem areas (PA)

With regard to eutrophication, the situation along the French coastline is very slowly improving. The main concerns are situated in the region of the Baie de Seine, which river has a highly industrialized and populated basin, and around Britanny, where the conjunction of restricted bays and agricultural practices causes various forms of eutrophication effects.

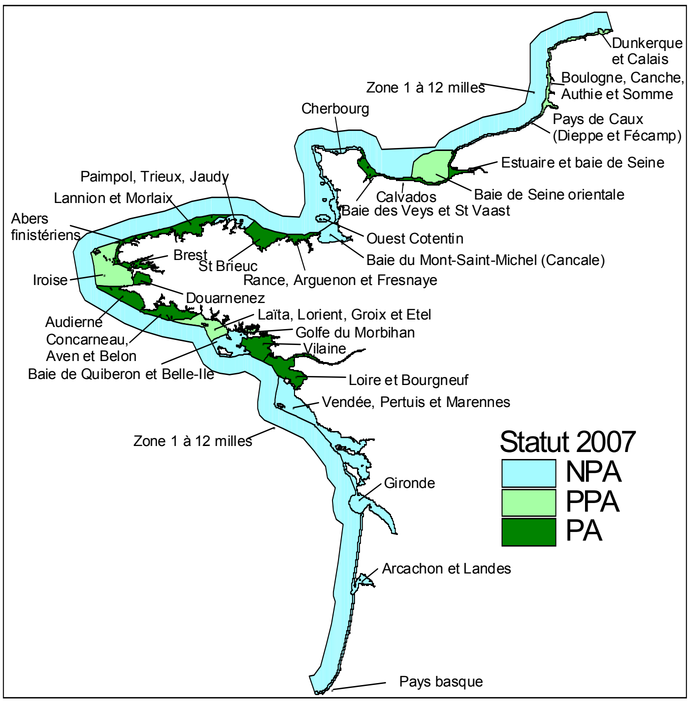


Figure 3.1 Eutrophication status of the French OSPAR areas

4. Germany

Most parts of the German Bight, including coastal waters, are classified as problem area with regard to eutrophication (Figure 3.4a). This assessment can already be based on chlorophyll gradients for inner coastal waters. However, long time changes can be observed for many parameters, indicating a certain reduction of the level of eutrophication. Emissions, discharges and losses of phosphorus and nitrogen into surface waters have been reduced by 65% and 39% respectively since 1985 (based on 2000 data). For reasons of precaution, the offshore area is preliminarily classified as potential problem area. This is based on occasional oxygen deficiency in bottom waters (< 70 %) and insufficient monitoring. The results of the 2007 assessment mean no change in area classification compared to the first application of the Comprehensive Procedure which covered the period 1985 – 1998. The following is a summary of the second German eutrophication assessment in 2007 (for the full report click here).

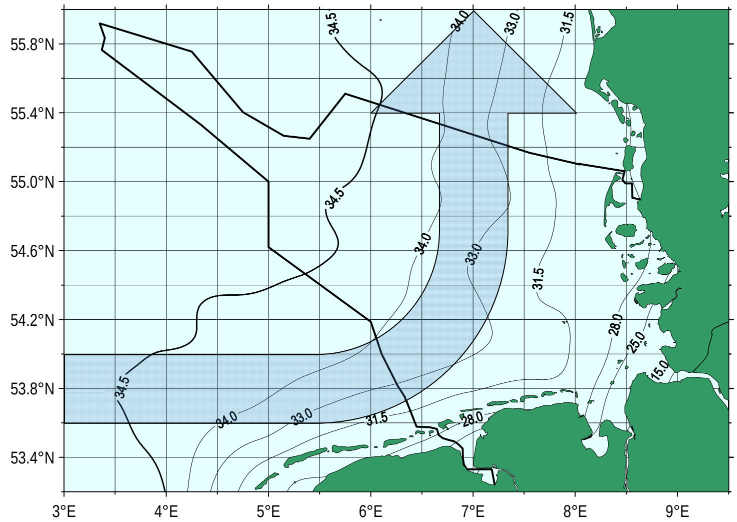


Figure 4.1 The residual current in the German Bight and the German territorial waters and the exclusive economic zone with salinity contour lines (all season means 2001 – 2005)

The eutrophication assessment for 2001 – 2005 covers the German Bight and the German Exclusive Economic Zone. The German Bight is surrounded by a highly industrialised area and affected by large local riverine nutrient inputs (Elbe, Weser, Ems) and long distance imports of nutrients (e.g. Rhine and Meuse) within the belt of continental coastal water. This is characterised by low salinity, propagating within a residual coastal current system from the West to the North. The shallow tidal flats of the Wadden Sea, sheltered by a belt of islands, form a main part of the coastline. The salinity varies from > 34 in the outer coastal waters to < 20 towards the estuaries modified by changing discharges and wind pressure controlling the extension and shape of river plumes. Different frontal systems enhance the formation of steep gradients. The most prominent fronts are the river plume fronts. For assessment purposes, the German Bight has been divided into estuaries, the Wadden Sea, coastal waters and offshore waters.

The assessment is based on all harmonised assessment parameters of the Comprehensive Procedure except N/P ratios and long-term changes in zoobenthos biomass and species composition.

The winter concentrations of the nutrients DIN and phosphate are still elevated in most parts of the coastal waters, including the Wadden Sea and estuaries. Chlorophyll gradients and time series show an ongoing eutrophication problem with high coastal concentrations. Chlorophyll measurements in the coastal and offshore waters have been supplemented by remote sensing data. Different phytoplankton indicator species occurred every year above elevated levels at changing locations. Green algae as eutrophication indicators are still abundant in the Wadden Sea. Seagrass occurrence is restricted to smaller areas than possible at natural conditions but showing increasing tendencies. Particulate carbon is an important indicator, but data are very limited. Oxygen deficiency was observed in the estuaries and mostly in northern coastal water and offshore waters during cruises in 2002 – 2005. The non-linear relationships between eutrophication and macrozoobenthos biomass, besides other interfering processes, make a clear assessment still difficult, but eutrophication problems are also indicated by this parameter. Nutrient budgets show that the German Bight area with its long residence time is strongly affected by nutrient imports which are, to the same extent exported (transboundary transport).

The assessment presents, as specific examples, budget calculations and long time series for nutrients (Table 4.1).

Table 4.1 Rough mean annual budget of recent and natural background concentrations of TN (kt/a) and TP (kt/a) in the German Bight (between 55° N and 06° 20' E)

Q km^3/a	2001	2002	2003	2004	2005	Mean	Nat. background
Transboundary import	4526	4462	3551	5243	3991	4355	--
River discharges	38	66	39	34	41	44	--
Transboundary export	4553	4529	3569	5242	4052	4389	--
Balance	+11	-1	+21	+35	-20	+10	--
TN kt/a							
Transboundary import	2123	1612	1337	1923	1520	1703	677
River discharges	179	261	169	159	174	188	10.6
Atmospheric deposition	33	29	26	26	(26)	28	2.4
Transboundary export	1740	1782	1359	2106	2167	1831	682
Balance	+595	+120	+173	+2	-447	+88	+2.6
TP kt/a							
Transboundary import	198	184	146	187	166	176	97
River discharges	8.3	11.3	6.1	6.5	7.5	7.9	0.56
Transboundary export	154	180	121	193	158	161	98
Balance	+52.3	+15.3	+31.1	+0.5	+15.5	+22.9	+0.4

Note: (+) remaining in the German Bight; (-) exported from the German Bight

Generally, significant parts of total nitrogen (TN) as well as total phosphorus (TP) are retained in the German Bight, by retention at the sediment and by denitrification. As a mean, 88 kt/a TN have been trapped between 2001 and 2005. This would correspond to a denitrification rate of 3.6 g/m^2a or 29 $\mu M/m^2h$ which is in the range of published rates.

The high interannual variability and imbalance of annual budgets, which are in the order of annual riverine inputs, can be related to variability of transported water masses and of available nutrient data from annual cruises too. These budget calculations still include several uncertainties but indicate the order of magnitude of different nutrient sources, affecting the eutrophication processes in the German Bight area.

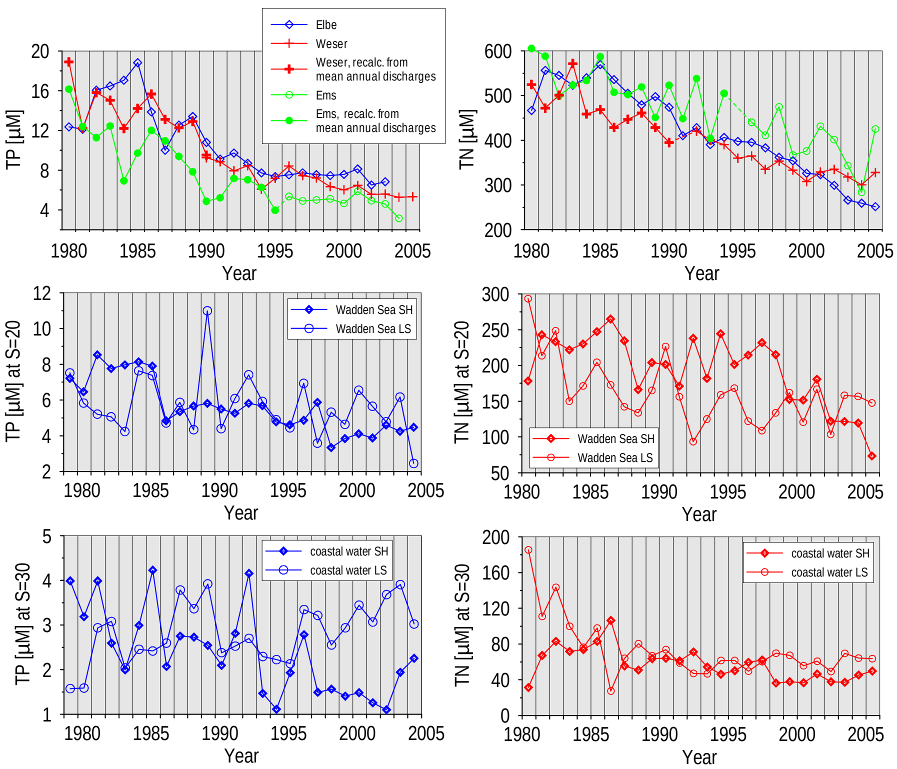


Figure 4.2 Time series of TN and TP for the main rivers, the Wadden Sea and coastal waters, related to fixed salinities (rivers = 0). SH = Schleswig Holsten, LS = Lower Saxonia

By comparison of recent data and estimates for reference conditions, it is evident that current transboundary transports for TN and TP are about two to three times the natural background values. This surplus is a manifold of recent river discharges and must be considered by measures improving the eutrophication processes.

Time series of TN and TP reflect decreasing trends in the rivers and the Wadden Sea but do so only partly in the adjacent coastal waters (Figure 4.2).

Areas for improvement of the assessment concern

- insufficiency of monitoring (spatial and temporal coverage);
- the need for further advanced assessment methods to quantify causal relationships between different eutrophication parameters.

5. Ireland

The second application of the Comprehensive Procedure shows that waters classed as problem areas with regard to eutrophication are entirely restricted to estuarine waters and the nearshore coastal zone. The number of problem areas has changed little since the first application of Comprehensive Procedure covering the years up to 2000. It is clear, though, that improvements have been observed in some estuaries including reductions in chlorophyll and nutrient concentrations and improved oxygenation conditions (e.g. Liffey estuary, Co. Dublin). The following is a summary of Ireland's second application of the Comprehensive Procedure, which was primarily based on data collected between 2001 and 2005; for the full report click here.

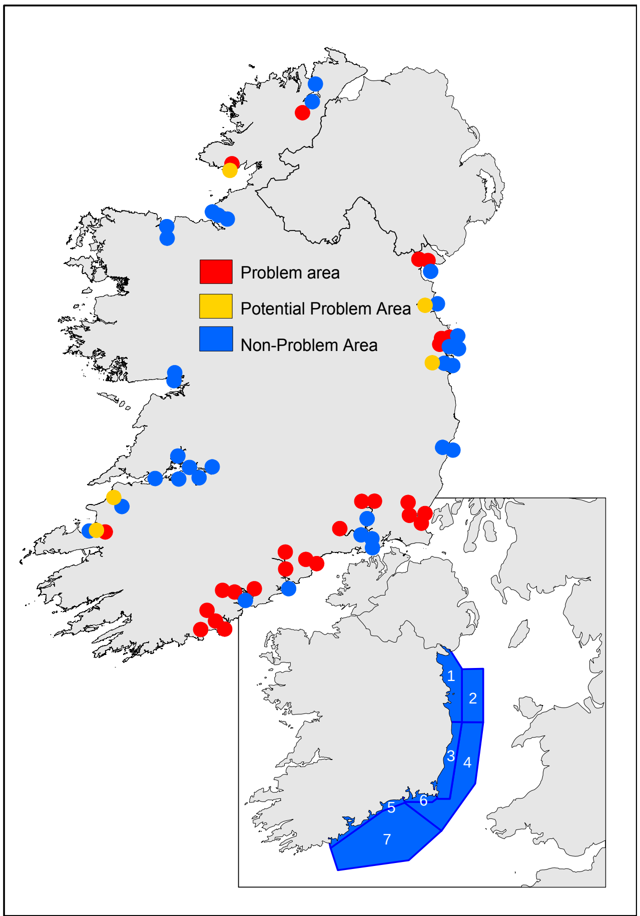


Figure 5.1 Map of the areas assessed as problem area, potential problem area and non-problem area for the period 2001 – 2005.

The Comprehensive Procedure was applied to 21 estuarine and coastal areas around Ireland (sub-divided into a total of 63 assessment units), with the majority of these located along the eastern, southeastern and southern coasts. These areas represent a wide range of different physical types that include tidal freshwater stretches, partially mixed and stratified estuaries and mixed and stratified coastal waters. In addition to these areas, a number of larger coastal and offshore waters of the western Irish Sea and eastern Celtic Sea were subjected to the initial OSPAR screening procedure as part of this assessment. While the broader sea areas of the Irish and Celtic Seas were identified as non-problem areas in 2000, the division of these areas into more meaningful assessment blocks allowed a more detailed assessment of any possible influence from adjoining inshore areas and transboundary pollution sources.

The assessment is based on winter and summer nutrient concentrations (DIN and DIP), summer levels of chlorophyll and oxygen undersaturation and supersaturation conditions. Information was also included on the abundance and composition of macroalgae from certain estuarine areas. Levels of Total N and Total P arising from direct and riverine inputs was not used and while N:P ratios were applied in the current assessment to offshore and coastal waters, they were not applied to estuarine waters influenced by freshwater input. Information on shellfish biotoxins and potential toxic phytoplankton species was taken into account in the initial assessment but was not considered in the overall assessment (step 3). There is little evidence from Irish waters that the occurrence of these blooms, or associated toxicity in shellfish, is related to nutrient enrichment or other forms of anthropogenic pollution.

Elevated levels of DIN were apparent in the majority of estuaries in the south and southeast. DIP concentrations were mostly below the assessment level with the exception of a small number of estuaries in the northeast and the tributary estuaries of the Shannon Estuary. Elevated chlorophyll levels were most frequently observed along the northeastern and southern coasts and noticeably in a single estuary (Upper Swilly) in the north of Ireland. Oxygen depletion occurred in a number of estuaries but was mostly greater than 60 per cent saturation (or approx. 5.5 mg/l O_2), a level considered adequate to support aquatic life. The lowest oxygen saturation values of between 34-51 percent (or approx 3.3 – 4.2 mg/l O_2) were observed in the upper reaches of a small number of estuaries. No anoxic or hypoxic conditions (i.e., oxygen levels < 2.0 mg/l O_2) were observed in any of the water bodies surveyed.

Winter dissolved nutrient concentrations (DIN and DIP) in the coastal and offshore areas were consistently below their respective assessment levels, indicating the absence of nutrient enrichment. Nutrient ratios for offshore waters were generally below the OSPAR default thresholds. These areas were designated as non-problem areas according to methodology of the OSPAR Common Procedure. The confidence in this assessment was high due to the comprehensive nature of the dataset and other supporting data.

Areas for improvement include:

- the use of phytoplankton species directly indicative of eutrophication rather than those that are included because of their potential undesirable impact;
- further recognition that different chlorophyll extraction techniques can result in substantial differences in chlorophyll values;
- further development and use of opportunistic macroalgae as an indicator of nutrient enrichment. The use of a macroalgae assessment tool, although only used in a limited basis during this assessment period, has shown good potential as an indicator of eutrophic conditions.

6. Netherlands

Despite a reduction of riverine inputs of phosphate (40 to 50 %) and nitrogen (20 to 30 %) and of emissions at source of 45% for nitrogen and 78% for phosphorus in the Netherlands during the past 30 years, five out of seven sub-areas of the Dutch continental shelf are classified as a problem area with regard to eutrophication. Two offshore ares in the northern part, namely Oyster Grounds and Doggerbank, are considered to be initially problem areas during stratification, but are finally classified as non-problem areas. Except for the Oysterground area, this is no change to the area classification in the first application of the Comprehensive Procedure covering the period 1996 – 2000. The following is a summary of the second Dutch eutrophication assessment in 2007 (for the full report click here).

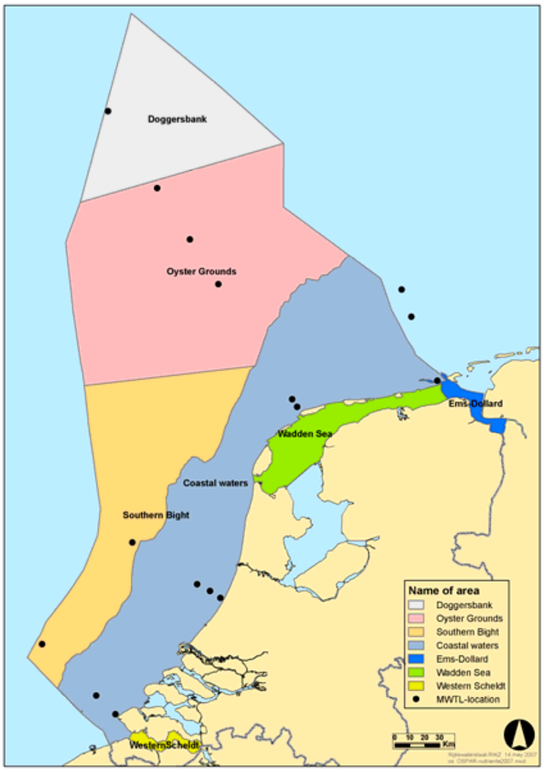


Figure 6.1 The Dutch continental shelf with the seven sub areas: Coastal waters (the border of the Coastal waters is the decadal average 34.5 isohaline.), Wadden Sea, Western Scheldt, Ems Dollard estuary, and Offshore waters (salinity > 34.5) divided into: Southern Bight, Oyster Grounds and Doggerbank. Sampling stations in the Coastal and Offshore waters are indicated.

The eutrophication assessment for the period 2001 – 2005 covers the Dutch continental shelf (Figure 6.1). The area is characterised by different water types whose sediments are mostly (fine) sands and silt: Shallow areas include the coastal waters, the estuaries and the Wadden Sea with channels, gullies and tidal flats. Estuaries are the Western Scheldt, an area with well mixed waters and high tidal range which is highly influenced by industrial and shipping activities and dense population, and Ems Dollard with tidal mudflats and salt marshes. The offshore waters have been divided into three water bodies (not two as in the first application of the Comprehensive Procedure): the well mixed and not very deep Southern Bight, the deeper and periodically (summer) stratified sedimentation area Oyster Ground and the mostly non-stratified Doggerbank.

The water masses that impact the region include freshwater in the coastal areas and estuaries, with Rhine, Meuse, Scheldt and Ems as the main river systems and Lake Ijssel. Catchments of numerous small streams feeding into larger tributaries affect the Western Scheldt area. The Offshore areas are influenced by nutrients carried from Belgium, the Channel, France, the Netherlands, the UK and (in the northern part) the Atlantic Ocean.

The assessment is, in general, based on nutrient loads, DIN/DIP, N/P ratio, oxygen (including both deficiency and saturation) and phytoplankton indicator species. Macroalgae are not relevant in the Dutch marine waters and have therefore not been assessed. They have been abundant in the Dutch Wadden Sea until the 1930s when a virus disease extirpated them. They have never recovered, probably also due to hydromorphological changes in that area. Changes or kills in zoobenthos and fish mortality and algal toxins are not routinely monitored (but some data are available from incident monitoring). The additional parameters organic carbon and total N and total P have been used.

In the coastal waters, the Wadden Sea, the Western Scheldt and the Ems-Dollard estuary winter DIN and DIP concentrations were above elevated level, but in some areas, in particular in the Wadden Sea, a decline could be observed in the last few years. In all near coastal waters a decreasing trend for chlorophyll can be seen, but with the exception of the Ems Dollard estuary, the level remained above elevated level.

The offshore waters showed a different picture. Here the winter nutrient concentrations were below assessment levels, indicating no nutrient enrichment. The classification of southern offshore waters as problem area is merely based on the direct effects of eutrophication. In the Southern Bight chlorophyll concentrations and nuisance phytoplankton indicator species were above the assessment levels, probably caused by transboundary transport. In the Oyster Grounds and the Doggerbank chlorophyll concentrations were below the assessment level. However, the abundance of three (toxic) indicator species, being toxic already at low cell concentrations and therefore not contributing so much to the amount of chlorophyll *a*, resulted initially as problem areas, but finally in the classification as non-problem areas.

At the moment there is an ongoing discussion about the causal relations between the occurrence and abundance of toxic phytoplankton indicator species used in the holistic list of the Comprehensive Procedure and nutrient enrichment. It is recommended to further elaborate work on these relations to justify a correct classification of the eutrophication status of marine waters, through cause-effect eco-physiological studies.

Areas for improvement of the assessment concern

- the use of the frequency of months with *Phaeocystis* blooms above the assessment level as indicator, instead of their maximum number in cells/litre. This approach would require, however, sufficient frequency of monitoring.
- the need for an assessment level range for N/P ratio to adjust to the natural range.

7. Norway

The second Norwegian eutrophication assessment focuses on inshore waters along the Norwegian Skagerrak coast from Lindesnes to the Swedish border (Figure 7.1). Since 1985, discharges/losses of phosphate and nitrogen have been reduced by 63% and 32%, respectively. Yet, the inshore waters show little improvement with regard to nutrient enrichment, and the area is classified as a problem area. The following is a summary of the second Norwegian eutrophication assessment, covering results from the period 2001-2005 (for the full report click here).

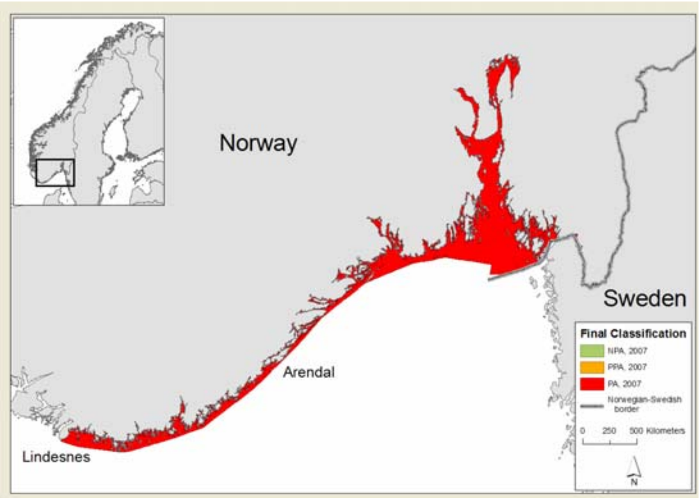


Figure 7.1 Overall view showing the Norwegian Skagerrak coast from Lindesnes to the Swedish border, subjected to the Comprehensive procedure in the period 2001-2005.

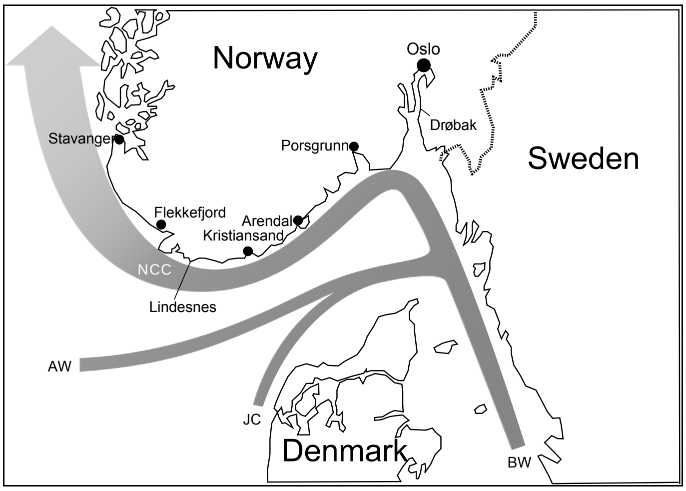


Figure 7.2 Dominating current pattern in the coastal area of southern Norway. The width of the arrows is not directly related to the current volume transport (AW: Atlantic Water, BW: Baltic Water, JC: Jutland Current, NCC: Norwegian Coastal Current. Source: Anonymus, 2007; see Norwegian national report).

Norway's waters pertain to different regions of the OSPAR maritime area with the Barents Sea and the Norwegian Sea in Region I (Arctic Waters) and the main body of the North Sea and the Skagerrak in Region II (Greater North Sea). The present eutrophication assessment focuses on the inshore waters along the Norwegian Skagerrak coast, and in particular on areas which was classified as Potential Problem Areas in the first application of the Comprehensive Procedure by Norway in 2002 (Figure 7.1). The coastline is divided into 14 sub-areas, compared to 44 sub-areas in the first application of the Comprehensive Procedure. The coastline includes fjords with estuaries, as well as archipelagos with different characteristics ranging from (partly extreme) sill fjords (for example the Drammensfjord with a sill depth of 10 m and basin depth of 120 m) to fjords with deep sills and inlets with free exchange of waters. The fjords with shallow sills on the southern coast of Norway are of particular concern. Due to their more or less stagnant deep water they are very sensitive to organic loads, which accelerate the oxygen depletion in the deep waters

The water masses that impact the region originate from the Atlantic and from freshwater. Most of the freshwater comes from local runoff to the coast, the Baltic Sea and the large rivers draining into the southern part of the North Sea. The current system (Figure 7.2) favours transboundary transport of nutrients from the Kattegat and the Southern North Sea to the Norwegian Skagerrak coast.

In the assessment, the OSPAR Comprehensive Procedure has been applied wherever possible. In some instances the classification uses the Norwegian Classification System (NCS) for nutrients, chlorophyll *a*, oxygen and soft-bottom fauna.

The assessment has incorporated additional data from a number of studies of local recipient waters, mainly based on data from the period 2001 - 2006 and especially on: calculation of the nutrient load for each area;

- oxygen measurements from a number of fjord basins;
- observations of the macroalgae along the coastline, especially in connection with the decline of the sugar kelp;
- observations of harmful planktonic algae.

Limitations and uncertainties in the assessment relate to lack of relevant observations, either because there are no data; the data are from studies more than 5 years back and may not be representative for the present situation; or data cover only a minor part of the area. With only 14 sub-areas this assessment has been less detailed than the previous assessment. Within each sub-area there will therefore be local areas which could have a different classification than the "overall" area.

The assessment tried to take these limitations into account for each area, also when considering the eutrophication status in neighbouring areas.

The overall picture shows that the regional nutrient enrichment is relatively marked and constant along the Norwegian Skagerrak coast, roughly up to Arendal. The enrichment decreases at the west of Arendal due to admixture of Atlantic water. One should note that the classification assumes that the observed decline of sugar kelp on the Norwegian Skagerrak coast is, to some extent, caused by eutrophication (high temperature in July/August is assumed to have been the direct cause). For some areas this assumption is crucial for the classification. If future studies of the disappearance of sugar kelp prove otherwise, this classification should be revised.

The second application of the Common Procedure has revealed the following needs for improvement:

- updating and improving of the area-specific background concentrations of nutrients during winter and for mean and maximum chlorophyll *a* in the growing season for the Skagerrak coast and fjords;
- improved guidance under the Common Procedure of the definition of growing season, maximum chlorophyll *a* and minimum number of observations;
- including oxygen consumption in basins with stagnant water in the assessment of oxygen deficiency;
- a better understanding of the causes of the disappearance of sugar kelp;
- improved knowledge on the use of data on phytoplankton indicator species.

8. Portugal

Based on the Screening Procedure, the overall classification for the Portuguese coast is as a non-problem area regarding to eutrophication. Concerning the estuaries, in the first application of the Comprehensive Procedure, Tagus and Sado estuaries were classified as non-problem areas, while Mondego estuary was classified as potential problem area. The second application of the Comprehensive Procedure concerns thus only the Mondego Estuary. The following is a summary of the second Portuguese eutrophication assessment, covering results from the period 2001-2005 (for the full report click here).

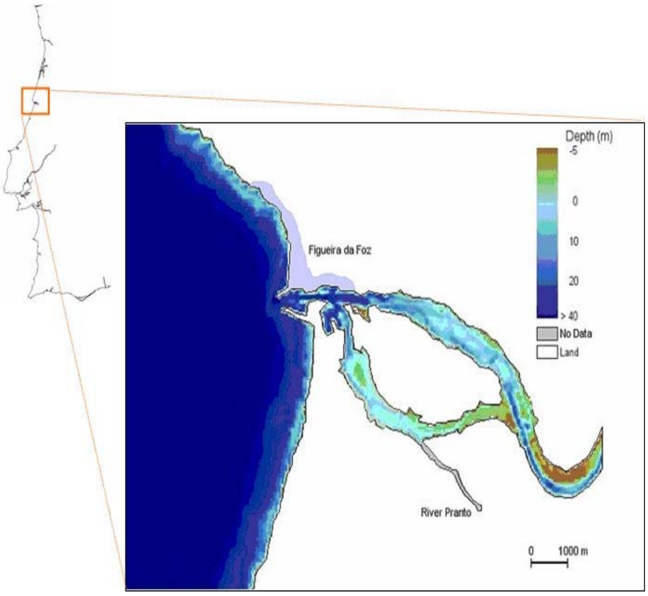


Figure 8.1 Mondego Estuary: localization and bathymetry.

The Mondego River, draining a 6700 km^2 watershed, is the main fresh water source of the estuary (Figure 8.1). The low estuary downstream of the bifurcation of the two channels has a surface of 6.4 km^2 and is about 7 km long. In this area the estuary is divided into two channels by the Murraceira island. The northern channel is hydrodynamically the most active, receiving most of the marine tidal water and most of the fresh water from Mondego River. As a consequence high daily salinity fluctuations are registered and the residence time is low (typically 2 days). The southern channel is saltier and has a longer residence time (9 days). It receives some fresh water from the Mondego and the water from the Pranto River which discharge is controlled by a sluice located 3 km upstream of the mouth. The anthropogenic pressure in the southern channel is lower than in the northern channel but the first one is more vulnerable to environmental problems, due to its low depth, restricted circulation and higher residence time.

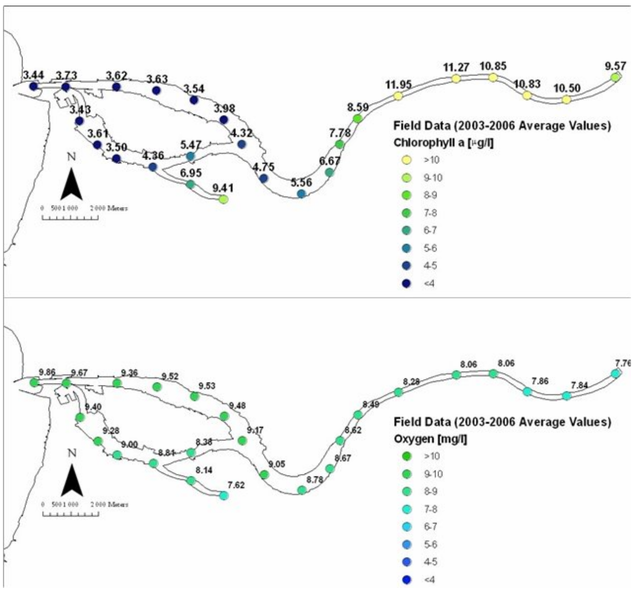


Figure 8.2 Chlorophyll *a* and Oxygen distributions in the estuary (2003-2006 average values).

The overall classification of the Mondego Estuary as a potential problem area regarding to eutrophication resulted from a shift of species recorded in the 1990ies when macroalgae replaced the seagrass meadows in a large area of the southern channel. The background concentrations required for the implementation of the comprehensive procedure were obtained using the older consistent values measured in the study area, since no alternative definition was found at that time. The characterization of the actual situation refers to the environmental conditions observed from 2003 to 2006, as result of a monitoring programme which includes 25 field stations, uniformly distributed along the estuary.

The assessment also includes the evaluation of total nitrogen and phosphorus riverine concentrations, winter DIN and DIP concentrations in the estuary and summer DO and chlorophyll *a* concentrations in the estuary. Macrophytes, including macroalgae, were considered region specific and changes or kills in zoobenthos and algal toxins were also monitored. Chlorophyll *a* concentrations in the estuary show a gradual decrease from upstream to downstream, are below the assessment level and oxygen depletion does not seem to occur in the estuarine waters (Figure 8.2).

The study is complemented with results obtained through a three-dimensional water modelling system (www.mohid.com), simulating the actual environmental conditions in the estuary, considering ocean tide and fresh water discharge forcing.

Model results were annually averaged in each computing cell for comparing with field data (e.g. salinity, chlorophyll *a*, DIN) which is too scarce for comparing on a time basis. Model results are in good agreement with field data and were used for assessing the processes in the estuary on an instantaneous basis, putting into evidence the most relevant trends. Classes were defined for assessing the results and maps were produced showing the areas where concentrations of chlorophyll-*a* and DIN fall into those classes. The model has shown that phytoplankton production in northern channel is directly influenced by the Mondego River discharge which has a low residence time (2 days), too short to allow bloom's development inside the channel.

In terms of nutrients, the concentration is higher in the northern channel but eutrophication symptoms - green seaweeds *Ulva* spp*.* and *Enteromorpha* spp. growth - were detected in the southern channel. The observed shifts from long-lived macrophytes species like seagrass Z*oostera noltii* to those nuisance opportunistic short-lived species were explained by the model as being mainly attributed to morphological modification of southern channel and not a consequence of anthropogenic nutrient enrichment. The morphological modification of the southern channel – closure of the upstream communication with the main channel – modified the hydrodynamics and the salinity distribution of this channel creating better conditions for the development of macroalgae Reopening the communication between the channels in May 2006 recreated the previous conditions and should result into a decrease of eutrophication symptoms. The monitoring programme started in 2003 is continuing and data collected so far is supporting that forecast. The classification status of Mondego estuary as a potential problem area will remain unchanged up to the confirmation of the modelling results.

Areas for improvement of the assessment are:

- improvement of background levels for DIN, by using a catchment river model (SWAT) to simulate "pristine" conditions;
- updating and improvement of the estuary background concentrations of nutrients during winter, mean and maximum chlorophyll *a* values during the growing season, using the MOHID Modelling System.
- maintain the monitoring programme to get more data after the southern channel reopening.

9. Spain

Compared to previous years, all parameter values relating to contaminant discharges in the Cadiz Bay Natural Park (the only Spanish area previously classified as potential problem area) have been significantly reduced. DIN and DIP concentrations have decreased by 63% and 42% in the period 2001 – 2005. Inputs of nitrogen and phosphorus to this area decreased by 64% and 87%, respectively, in that period. Despite all improvements, the Cadiz Bay Natural Park has been classified as potential problem area with regard to eutrophication. This is based on the need for a larger data basis and better monitoring results for some eutrophication parameters in the assessment before a final classification of the area can be made. This means that the classification status of Cadiz Bay Natural Park remains unchanged compared to the first application of the Comprehensive Procedure which had been based on data for 2000 – 2001.

The second application of the Comprehensive Procedure included additional 14 areas screened as non-problem areas in 2001 and were therefore not assessed in the first application. The areas have been selected on the basis of monitoring data indicating possible eutrophication problems. Three areas were classified as non-problem areas, the remaining 11 as potential problem areas with regard to eutrophication (Figure 9.1). The following is a summary of the second Spanish eutrophication assessment (for the full report click here).

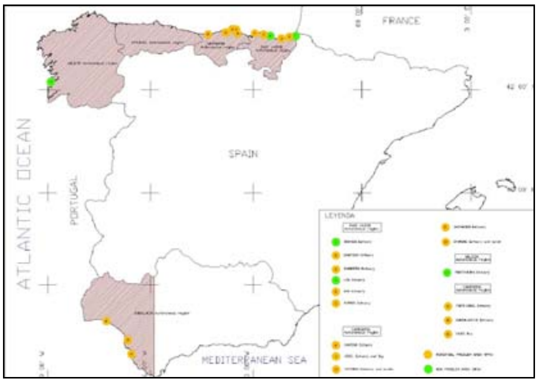


Figure 9.1 Classification of assessed areas under the second application of the Comprehensive Procedure.

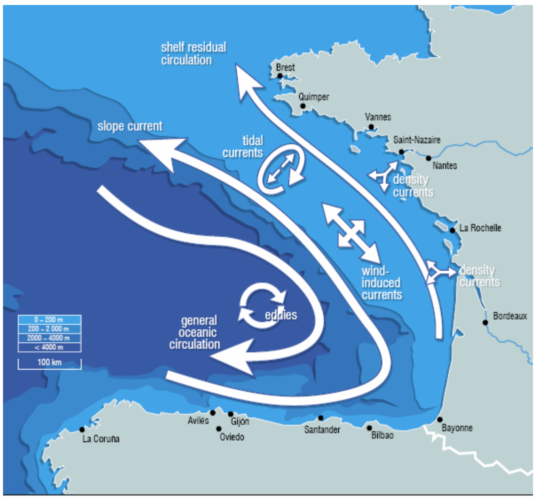


Figure 9.2 Prevailing circulation pattern off the Cantabrian coast and the Golf of Biscay.

The assessment covers the Spanish Atlantic waters in OSPAR Region IV (Bay of Biscay and Iberian coast) which encompass the waters off the coast of the Basque country, Cantabria, Asturias and Galicia in the North, with narrow continental shelf and rocky coastline, and the waters off Andalusia in the South, with a broader continental shelf, including the Bay of Cadiz. The estuaries covered by Region IV vary from virgin areas such as the Miño estuary to areas exposed to high population pressures and human activities (e.g. the Rias Baixas, Santander or Nervión). Estuaries in Galicia are characterised by natural upwellings of nutrient rich deep water.

The set of climatic and hydromorphological characteristics of the Spanish waters favour conditions (currents and tides, water renovation and high mixing grades, and pronounced slope inclines) which may contribute to reduced eutrophication effects in response to nutrient enrichment in the coastal waters (Figure 9.2). Eutrophication only occurs in estuaries and bays with restricted circulation and renovation in areas which are exposed to population pressures and human activities.

The assessment is mainly based on the degree of nutrient enrichment (river load, DIN and DIP concentrations, N/P ratio) and on the concentrations of chlorophyll *a* and oxygen. For background levels and assessment levels, provisionally defined limits were used. The classification of the assessed areas in Cantabria is based on the precautionary principle as too few data were available to analyze temporal trends for any of the assessment parameters.

The temporal trends for the assessed parameters in the Cadiz Bay Natural Park are in general decreasing and it is expected that this trend will continue (Figure 9.3). This was mainly achieved through implementation of treatment and purification systems throughout the area. The actions taken to improve the status of Cadiz Bay Natural Park also include the implementation of the monitoring requirements of the Eutrophication Monitoring Programme for potential problem areas.

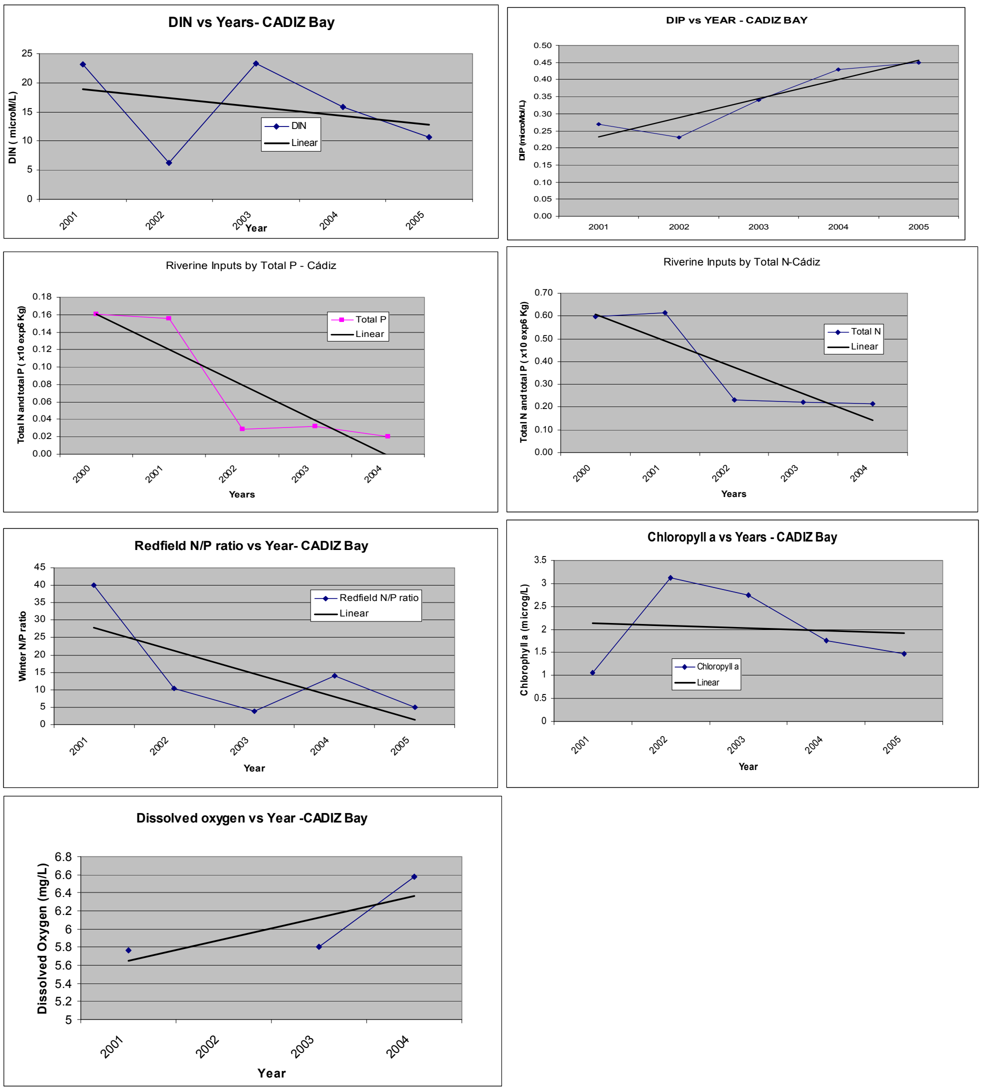


Figure 9.3 Temporal trends in nutrient loads, DIN, DIP, N/P, chlorophyll *a* and oxygen for the Cadiz Bay Natural Park in the period 2001 – 2005.

10. Sweden

The Kattegat offshore and inshore waters were identified as problem areas with regard to eutrophication. The offshore Skagerrak, which had been classified as problem area in the first application of the Comprehensive Procedure, has now been identified as a non-problem area with regard to eutrophication. For the inshore Skagerrak waters, the OSPAR parameter categories I – IV indicate a slight incoherence in the assessment, but the overall assessment resulted in its identification as a problem area. The present assessment confirms the general results obtained from the first application of the Comprehensive Procedure, covering the time period 1998 to 2000. For the last ten years no statistically significant trend in nutrient inputs could be observed. In the period 1985 – 2005, total emissions, discharges and losses of nitrogen decreased by 20% and 19%, respectively. The following is a summary of the second Swedish eutrophication assessment in 2007 (for the full report click here).

The surface areas of the Kattegat and the Skagerrak, located in the eastern North Sea, are about 22 000 km^2 and 32 000 km^2, and the mean depths are about 23 m and 210 m, respectively. The Skagerrak and the Kattegat area forms the inner end of the Norwegian trench, which has the characteristics of a deep (700 m) fjord connecting the Baltic Sea with the Norwegian Sea. The sill depth of the fjord is about 270 m.

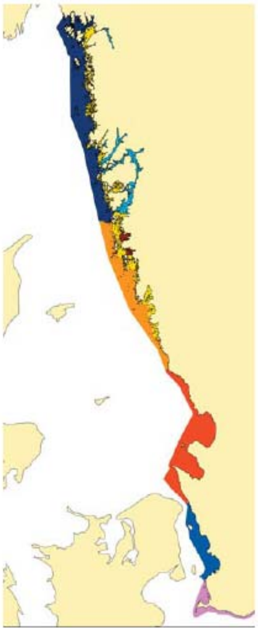


Figure 10.1 WFD typology of Swedish coastal waters

The coastal waters are characterised by a high salinity range, stratified with a shallow halocline and of relatively high influence of surface waves. The southernmost part of Kattegat coastal waters is shallow with characteristic bottom substrates interaction. On water masses influencing the region, there is the average outflow of low-saline water from the Baltic Sea and the Kattegat which transport nutrients from the Baltic along the Swedish coast (the Baltic current) and the Norwegian coasts (the Norwegian Coastal current) into the Skagerrak. A deep-reaching high-saline inflow from the central and the northern North Sea circulates in a cyclonic direction and forms the bulk of the Skagerrak water. A weaker, less saline inflow from the southern North Sea transports nutrients to the surface layers of the Skagerrak along the northern Jutland off the Danish coast (the Jutland current). These currents may reach the Swedish coast and add to the northward flow below the less saline Baltic current. The inflows from the North Sea also contribute to the inflows to the northern Kattegat. About 65 % of the freshwater volume of the Skagerrak is contained in a band of about 30 km width along western Sweden and southern Norway. Shifting wind speed and direction on the Skagerrak area may modulate the general circulation pattern on short terms.

The assessment is based on nutrient inputs, DIN/DIP concentrations, N/P ratio, chlorophyll *a*, phytoplankton indicator species, oxygen and algal toxins.

The decreasing trends of dissolved nutrients also continued during 2001 to 2005 but were still above elevated levels in Kattegat and inshore Skagerrak areas, as defined by the Comprehensive Procedure. The chlorophyll concentrations remain high and above assessment levels and oxygen still decreased in most areas clearly below deficiency levels. Zoobenthos is still disturbed by low faunal diversity, abundance and biomass at many coastal sites. Phytoplankton indicator species are still present at elevated levels. Algal toxins occurred also during the present assessment period.

In comparison with the procedure under the Water Framework Directive, OSPAR background and elevated levels for some parameters and sub-areas (Figure 10.1) are generally higher compared to WFD reference and moderate levels. In addition, summer and winter total nitrogen and phosphorus are also assessed under the Water Framework Directive but not by OSPAR. Nevertheless, these two parameters support the main results obtained for winter dissolved nutrients.

The Skagerrak and Kattegat area is influenced by transboundary fluxes to a great extent. Especially the inflow of nitrogen and phosphorus from the Baltic Sea is a major source for both nutrients, according to the budgets presented. Lowering the inputs to the area is best achieved by reduction of nitrogen from land but also from the Baltic Sea. For phosphorus the most effective measure should be to lower the concentration in the southern Baltic Sea, i.e. to combat eutrophication in the Baltic. Nitrogen reduction is more important than phosphorus, taking into account the OSPAR and Water Framework Directive classification schemes.

Areas for improvements of the assessment concern the need for

- model hindcasting and scenarios to inform judgement on measures and abatement;
- a model approach to improve understanding of the effects of climate change;
- considerations of higher trophic levels in ecosystem models to assess the influence on eutrophication of, for example, overexploitation of fish and subsequent alteration in the pelagic food web structure;
- harmonising background and assessment levels for nutrient and chlorophyll *a* concentrations with the classification scheme of the Water Framework Directive.

11. United Kingdom

The results of the second, more robust, application of the OSPAR Comprehensive Procedure generally confirms those of the first application which had covered long time series up to 2001. The evidence for the period 2001 – 2005 clearly shows, with a good degree of confidence, that the coastal and marine waters around the UK are non-problem areas with regard to eutrophication and show no signs of undesirable disturbance. However, the evidence confirms that there are a number of small estuaries, loughs and harbours which are problem areas with regard to eutrophication, or are at risk due to factors such as restricted circulation. While the UK has achieved a reduction in discharges and emissions of nitrogen and phosphorus of 9% and 38%, respectively in 1985 – 2003, no statistically significant trends in riverine inputs and direct discharges could be observed for the four major UK catchments (Bristol Channel, Liverpool Bay, Humber/Wash and the Thames). The following is a summary of the second UK eutrophication assessment (for the full report click here).

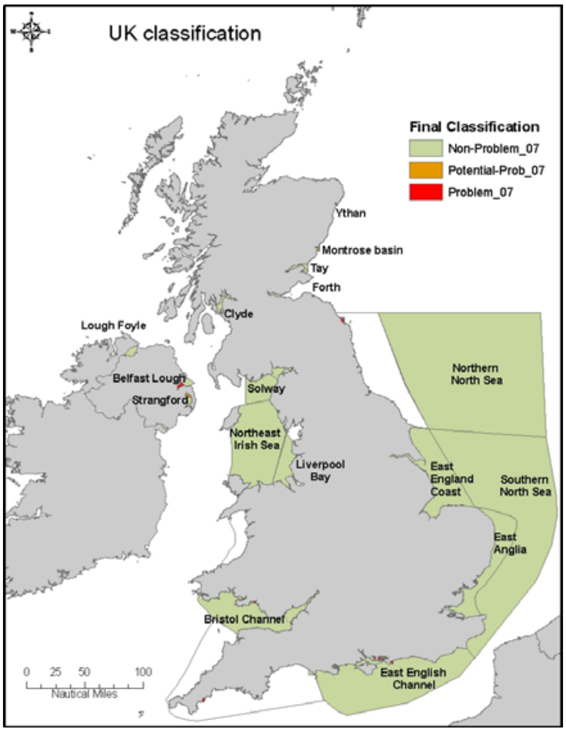


Figure 11.1 Final classification of UK areas assessed under the Comprehensive Procedure. Non-coloured areas were screened as non-problem areas. Problem areas and potential problem areas are at estuary level and difficult to see at the scale of the map.

A screening review was undertaken to provide assurance that the identification in 2001/2002 of obvious non-problem areas under the Screening Procedure of the Common Procedure was still valid. The review confirmed the previous screening results and identified the waters in the North Sea to the east of Scotland as obvious non-problem areas to be excluded from the assessment under the Comprehensive Procedure due to nutrient concentrations near to background and no identified risks of significance.

The areas assessed under the Comprehensive Procedure of the Common Procedure include specific estuaries and embayments (transitional waters), areas of coastal water with significant freshwater input and offshore areas, either well mixed or seasonally stratified (Figure 11.1). Sub-division of these wider sea areas is on the basis of a good understanding of ecological type. Boundaries are also set on the basis of national jurisdiction, e.g. the median line in the North Sea and Channel. Within some larger sea areas, waters were assessed on the basis of salinity gradients which result from the mixing of freshwater and seawater in accordance with three salinity regimes: estuaries (0 – < 30.0), coastal waters in the Irish Sea (30 – 34.0) and the North Sea (30 – 34.5), and offshore waters in the Irish Sea and North Sea (> 34.0 and > 34.5, respectively).

The classification under the Comprehensive Procedure is mainly based on nutrient enrichment parameters (RID input data in areas adjacent to the coast and winter DIN concentrations), chlorophyll, phytoplankton indicator species (phytoplankton index), macrophytes, oxygen deficiency, and changes/kills in zoobenthos. The assessment levels used in the first application of the Comprehensive Procedure have been reviewed for this assessment, taking account of regional differences where this was required, lessons learnt from the first application, and national developments in the field of eutrophication assessment, including work with respect to European Directives. Where scientifically justified, similar assessment levels were used across the wider variety of water types in the UK area for simplicity and transparency.

Some of the UK estuaries/embayments have also received prior assessment of eutrophication status for the purposes of the EC Urban Waste Water Treatment Directive and the Nitrates Directive. Where these assessments have resulted in designation as a ‘sensitive area’ (eutrophic) or ‘polluted water’ (eutrophic), they are deemed, subject to confirmation, as either an OSPAR problem area or potential problem area.

Coastal and offshore marine waters (salinity > 30) were identified as non-problem areas in the first application of the Comprehensive Procedure and retained this status (19 areas in total). There is more confidence in the results of the current assessment, especially in the coastal areas identified in the first application of the Comprehensive Procedure as areas of particular ongoing interest, due to enhanced monitoring and research programmes that were designed to detect any adverse anthropogenic related changes that could threaten the non-problem area status. These areas are East England, East Anglia, Liverpool Bay, the Solent and the Clyde. On the basis of available evidence of susceptibility, the lack of observed change in status and level of risk, it is not likely that these areas would become problem areas with respect to eutrophication in the near future.

Regions of restricted exchange including estuaries, loughs and harbours were identified as problem areas (17) and potential problem areas (5). Some of these had been identified as problem or potential problem areas in the first application of the Comprehensive Procedure. Through the ongoing assessment programme related to the implementation of EC Directives a further 5 problem areas and 3 potential problem areas have now been identified[3]. Many of these are small water bodies.

The possible impacts of climatic change on the assessment have been considered and while there may be a tendency, in some areas, to increase the risk of nutrient enrichment-related effects in the seas, further work is required to help develop confidence in such prediction. Currently, predicted change would only become significant several decades into the future.

The second application of the Comprehensive Procedure has helped develop the understanding of the eutrophication status of UK waters, and the assessment methods for each of the harmonised assessment parameters from developments in the underpinning science and parallel developments for the purposes of the Water Framework Directive (e.g. use of 90 percentile for chlorophyll *a*, and Water Framework Directive tools for assessing phytoplankton indicators). One of the outcomes is a clear conclusion that several components of the overall assessment process need to be refined, in order to come to a clearer and more robust conclusion reflecting the definition of eutrophication. These limitations include:

- insufficient scientific justification to link presence of toxins-producing algae and toxicity in bivalve mollusc tissues to anthropogenic nutrient enrichment;
- scope for improvement of quantitative assessment tools relating to macrophytes, including macroalgae;
- the mix of category II assessment parameters for direct eutrophication effects which reflect the different aspects of the overall definition of eutrophication relating to “accelerated growth” (e.g. chlorophyll and macrophyte biomass) and “undesirable disturbance to the balance of organisms or the quality of the water” (e.g. phytoplankton indicator species, shifts in the nature of the macroalgae/macrophytes). This may lead to misclassification where nutrient enrichment and accelerated growth are scored above assessment levels but where none of the parameters indicating undesirable disturbance to the balance of organisms or the quality of the water is found above assessment levels.

[3] The status of some of these areas is still provisional, and is dependent on formal designation under the Nitrates and UWWT Directive. Most of these areas were designated in 2007. The UK will inform OSPAR when decisions are made on the few remaining areas.

Annex 2 Compilation of national assessment results

Reported by Contracting Parties in the format of the Common Procedure (agreement 2005-3)

Key to the table

NI	Riverine inputs and direct discharges of total N and total P	Mp	Macrophytes including macroalgae
DI	Winter DIN and/or DIP concentrations	O2	Oxygen deficiency
NP	Increased winter N/P ratio	Ck	Changes/kills in zoobenthos and fish kills
Ca	Maximum and mean chlorophyll *a* concentration	Oc	Organic carbon/organic matter
Ps	Area-specific phytoplankton indicator species	At	Algal toxins (DSP/PSP mussel infection events)

\+ = Increased trends, elevated levels, shifts or changes in the respective assessment parameters

\- = Neither increased trends nor elevated levels nor shifts nor changes in the respective assessment parameters

? = Not enough data to perform an assessment or the data available is not fit for the purpose

Note: Categories I, II and/or III/IV are scored '+' in cases where one or more of its respective assessment parameters is showing an increased trend, elevated levels, shifts or changes.

Note: Areas shaded in yellow are those whose final eutrophication status changed in step 3 of the Common Procedure

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
BELGIUM												
Coastal waters	NI	-	Ca	+	O_2	-	At	? (-)	Problem area	No change in status compared with previous years	Problem area	2001-2005 comparison: <1995-2000
	DI	+	Ps	+/?	Ck	+/?						
	NP	+	Mp	Nr	Oc	?						
Offshore waters	NI	-	Ca	+	O_2	-	At	? (-)	Problem area	No change in status compared with previous years. Due to the lowering of chlorophyll *a* assessment levels from 15 to 8.4 µg/l it turned to a problem area, but the spatial extent of the monitoring offshore is still considered insufficient to provide a reliable assessment.	Potential problem area	2001-2005 comparison: <1995-2000
	DI	-	Ps	?	Ck	?						
	NP	-	Mp	Nr	Oc	?						
DENMARK												
1. The North Sea, open waters	NI	-	Ca	+	O2	-	At	-	Problem area	Northern part: Concentrations of nutrients are not elevated. Central part: Nutrient concentrations elevated due to the Jutland Coastal Current.	Non problem area/ Potential Problem area/ Problem area	2001-2005
	DI	+	Ps	-	Ck	-						
	NP	-	Mp	-	Oc	-						
2. The North Sea, southern coastal waters	NI	-	Ca	+	O2	-	At	-	Problem area	Nutrient and Chl-a concentrations elevated due to local inputs and inputs from the Jutland Coastal Current.	Problem area	2001-2005
	DI	+	Ps	-	Ck	-						
	NP	-	Mp	-	Oc	-						
3. The North Sea, coastal waters	NI	-	Ca	+	O2	-	At	-	Problem area	Nutrient concentrations elevated due to local inputs and input from the Jutland Coastal Current.	Problem area	2001-2005
	DI	+	Ps	-	Ck	-						
	NP	-	Mp	-	Oc	-						
4. The Wadden Sea	NI	-	Ca	+	O2	-	At	-	Problem area	Nutrient concentrations elevated. Tendency towards reduction in bottom fauna biomass.	Problem area	2001-2005
	DI	+	Ps	-	Ck	(+)						
	NP	-	Mp	-	Oc	-						
5. Ringkøbing Fjord	NI	+	Ca	+	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentrations elevated. Oxygen depletion rare. Depth limit and coverage of eelgrass reduced.	Problem area	2001-2005
	DI	-	Ps	-	Ck	+						
	NP	-	Mp	+	Oc	-						

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
6. Nissum Fjord	NI	+	Ca	(+)	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentrations elevated. Oxygen depletion occurs annually. Depth limit and coverage of eelgrass reduced.	(Problem area)	2001-2005
	DI	-	Ps	-	Ck	-						
	NP	-	Mp	+	Oc	-						
7. The Skagerrak, coastal waters	NI	-	Ca	+	O2	-	At	-	Problem area	Nutrient and Chl-a concentrations elevated due to input from the Jutland Coastal Current.	Problem area	2001-2005
	DI	+	Ps	-	Ck	-						
	NP	-	Mp	-	Oc	-						
8. The Skagerrak, open waters	NI	-	Ca	+	O2	-	At	-	Non problem area	Concentrations of nutrients are not elevated.	Non problem area	2001-2005
	DI	+	Ps	-	Ck	-						
	NP	-	Mp	-	Oc	-						
9. Limfjorden, western parts	NI	-	Ca	-	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentrations elevated. Oxygen depletion rare. Depth limit and coverage of eelgrass reduced. Bottom fauna deteriorated.	Problem area	2001-2005
	DI	+	Ps	-	Ck	+						
	NP	-	Mp	+	Oc	-						
10. Limfjorden, central parts	NI	-	Ca	+	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentrations elevated. Oxygen depletion common. Depth limit and coverage of eelgrass reduced. Bottom fauna deteriorated.	Problem area	2001-2005
	DI	-	Ps	-	Ck	+						
	NP	-	Mp	+	Oc	-						
11. Limfjorden, southern parts	NI	-	Ca	+	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentrations elevated. Severe oxygen depletion common. Depth limit and coverage of eelgrass reduced. Bottom fauna deteriorated.	Problem area	2001-2005
	DI	+	Ps	-	Ck	+						
	NP	-	Mp	+	Oc	-						
12. Limfjorden, eastern parts	NI	-	Ca	-	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentrations elevated. Oxygen depletion rare. Depth limit and coverage of eelgrass reduced. Bottom fauna deteriorated.	(Problem area)	2001-2005
	DI	-	Ps	-	Ck	(+)						
	NP	-	Mp	+	Oc	-						
13. The Kattegat, northern open waters	NI	-	Ca	+	O2	-	At	-	Problem area	Nutrient and Chl-a concentrations elevated	Problem area	2001-2005
	DI	+	Ps	-	Ck	-						
	NP	-	Mp	-	Oc	-						
14. The Kattegat, central open waters	NI	-	Ca	+	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentrations elevated. Oxygen depletion common.	Problem area	2001-2005
	DI	+	Ps	-	Ck	+						
	NP	-	Mp	-	Oc	-						
15. The Kattegat, western coastal waters	NI	-	Ca	+	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentration elevated. Oxygen depletion occurring regularly. Distribution of eelgrass reduced. Bottom fauna indicators indicate deteriorate status.	Problem area	2001-2005
	DI	+	Ps	-	Ck	(+)						
	NP	-	Mp	(+)	Oc	-						
16. The Kattegat, south-western coastal waters	NI	-	Ca	+	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentration elevated. Oxygen depletion occurring regularly. Distribution of eelgrass reduced. Bottom fauna indicators indicate deteriorate status.	Problem area	2001-2005
	DI	+	Ps	-	Ck	+						
	NP	-	Mp	-	Oc	-						
17. The Kattegat, southern coastal waters	NI	-	Ca	+	O2	(+)	At	-	Problem area	Nutrient and Chl-a levels slightly elevated. Severe oxygen depletion common.	Problem area	2001-2005
	DI	+	Ps	-	Ck	-						
	NP	-	Mp	-	Oc	-						
18. The Kattegat, southern open waters	NI	-	Ca	+	O2	(+)	At	-	Problem area	Nutrient and Chl-a levels slightly elevated. Severe oxygen depletion common.	Problem area	2001-2005
	DI	+	Ps	-	Ck	-						
	NP	-	Mp	-	Oc	-						

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
19. Mariager Fjord	NI	-	Ca	-	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentration elevated. Oxygen depletion regularly reaching surface/shallow waters (<10m). Distribution of eelgrass reduced. Bottom fauna deteriorated.	Problem area	2001-2005
	DI	+	Ps	-	Ck	+						
	NP	-	Mp	(+)	Oc	-						
20. Randers Fjord	NI	-	Ca	+	O2	(+)	At	-	Problem area	Nutrient and chl-a concentration elevated. Oxygen depletion occurring. Distribution of eelgrass reduced.	Problem area	2001-2005
	DI	+	Ps		Ck	+						
	NP	-	Mp	+	Oc	-						
21. Isefjord	NI	-	Ca	(+)	O2	-	At	-	Problem area	Nutrient and Chl-a concentrations elevated. Toxic algae rare and no problems observed. Slightly decreased depth limit of eelgrass – around 90% of reference condition.	Problem area	2001-2005
	DI	-	Ps	-	Ck	+						
	NP	-	Mp	+	Oc	-						
22. Roskilde Fjord	NI	-	Ca	(+)	O2	(+)	At	-	Problem area	Nutrient and Chl-a concentrations elevated. Phosphorus particular high in inner part. Decreased depth limit of eelgrass. No oxygen depletion.	Problem area	2001-2005
	DI	+	Ps	-	Ck	+						
	NP	-	Mp	+	Oc	-						
FRANCE												
F1. Dunkerque et Calais (Problem area)	NI	?	Ca	+	O_2	?	At	-	Problem area	Although the coastal area of Nord, Pas-de-Calais and Picardie regions are subject to proliferations of *Phaeocystis globosa*, what has been learned in recent years do not support the conclusion about a real embarrassment for professional activities (fish and shellfish) or with important consequences on the functioning of benthic and pelagic ecosystems. In addition, nutrients inputs in the area were significantly reduced. The status of porential problem area is then considered more appropriate to these two areas (Dunkirk and Calais, Boulogne and Somme).	Potential problem area	
			Ps	+	Ck							
			Mp		Oc							
F2. Boulogne Somme (Problem area)	NI	-	Ca	+	O_2	?	At	-	Problem area		Potential problem area	
	DI		Ps	+	Ck							
	NP		Mp		Oc							
F3. Pays de Caux (Non problem area?)	NI	?	Ca	?	O_2	?	At	-	Non problem area?			
	DI		Ps	?	Ck							
	NP		Mp		Oc							
F4. Estuaire et baie de Seine	NI	+	Ca	+	O_2	+	At	+	Problem area			
	DI		Ps	+	Ck							
	NP		Mp		Oc							
F5. Calvados (Problem area)	NI	+	Ca	+	O_2	?	At	+	Problem area			
	DI		Ps	+	Ck							
	NP		Mp		Oc							
F6. Baie des Veys et St Vaast (Potential problem area)	NI	-	Ca	+	O_2	-	At	-	Problem area			
	DI		Ps	+	Ck							
	NP		Mp		Oc							
F7. Cherbourg (Non problem area)										2002 Screening Procedure	Non problem area	

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
F8. Ouest Cotentin (Non problem area)										2002 Screening Procedure	Non problem area	
F9. Cancale (Non problem area)										2002 Screening Procedure	Non problem area	
F10. Rance (Non problem area?), Arguenon et Fresnaye (local problem area)	NI	?	Ca	-	O_2	?	At	-	Problem area			
	DI		Ps	-	Ck							
	NP		Mp	+	Oc							
F11. St Brieuc (Problem area)	NI	?	Ca	-	O_2	?	At	-	Problem area			
	DI		Ps	-	Ck							
	NP		Mp	+	Oc							
F12. Paimpol, Trieux, Jaudy, Perros-Guirec (Non problem area?)	NI	?	Ca	-	O_2	?	At	-	Non problem area			
	DI		Ps	-	Ck							
	NP		Mp	-	Oc							
F13. Lannion et Morlaix (Problem area)	NI	?	Ca	-	O_2	?	At	-	Problem area			
	DI		Ps	+	Ck							
	NP		Mp	+	Oc							
F14. Abers finistériens (Non problem area?)	NI	?	Ca	?	O_2	?	At	-	Problem area			
	DI		Ps	+	Ck							
	NP		Mp	+	Oc							
F15. Brest (Potential problem area?)	NI	+	Ca	+	O_2	?	At	+	Problem area			
	DI		Ps	-	Ck							
	NP		Mp	+	Oc							
F16. Iroise	NI	n.a.	Ca	?	O_2	?	At	+	Potential problem area			
	DI		Ps	+	Ck							
	NP		Mp	-	Oc							
F17. Douarnenez (Problem area)	NI	?	Ca	-	O_2	?	At	+	Problem area			
	DI		Ps	-	Ck							
	NP		Mp	+	Oc							
F18. Audierne (Non problem area?)	NI	?	Ca	+	O_2	?	At	+	Problem area			
	DI		Ps	+	Ck							
	NP		Mp	-	Oc							
F19. Concarneau (Problem area), Aven, Belon (Non problem area?)	NI	?	Ca	+	O_2	?	At	+	Problem area			
	DI		Ps	+	Ck							
	NP		Mp	+	Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
F20. Laïta (Non problem area?), Lorient (Potential problem area), Groix, Etel (Non problem area?)	NI	+	Ca	-	O_2	?	At	+	Potential problem area			
	DI		Ps	-	Ck							
	NP		Mp	-	Oc							
F21. Baie de Quiberon et Belle Ile (Non problem area?)	NI	?	Ca	-	O_2	?	At	+	Non problem area			
	DI		Ps	-	Ck							
	NP		Mp	-	Oc							
F22. Golfe du Morbihan (Non problem area?)	NI	?	Ca	?	O_2	?	At	-	Potential problem area			
	DI		Ps	+	Ck							
	NP		Mp	-	Oc							
F23. Vilaine (Potential problem area?)	NI	+	Ca	+	O_2	?	At	+	Problem area			
	DI		Ps	+	Ck							
	NP		Mp		Oc							
F24. Loire et Bourgneuf (Problem area)	NI	+	Ca	+	O_2	+	At	-	Problem area			
	DI		Ps	-	Ck							
	NP		Mp		Oc							
F25. Vendée (Non problem area)										2002 Screening Procedure	Non problem area	
F26. Pertuis Breton (Non problem area)										2002 Screening Procedure	Non problem area	
F27. Pertuis d'Antioche (Non problem area)										2002 Screening Procedure	Non problem area	
F28. Marennes (Non problem area)										2002 Screening Procedure	Non problem area	
F29. Gironde (Non problem area)										2002 Screening Procedure	Non problem area	
F30. Arcachon et Landes (Non problem area?)	NI	-	Ca	-	O_2	-	At	+ ?	Non problem area?	For At, mollusc toxicity has not been proved to be algal in origin (atypical toxin) The Arcachon basin remains sensitive to all increases in nitrogen input, which is currently under control	Non problem area	
	DI		Ps	-	Ck							
	NP		Mp		Oc							
F31. Pays basque (Non problem area)										2002 Screening Procedure	Non problem area	
GERMANY												
D1. Estuaries	NI	+	Ca	Nr	O_2	+	At	Nr	Problem area, 2001-2005	No change in status compared with previous years (<1998); averaged result is identical to 'per year' result.	Problem area	2001-2005
	DI	+	Ps	Nr	Ck	?						
	NP	+	Mp	?	Oc	+						

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
D2. Wadden Sea	NI	?	Ca	+	O_2	Nr	At	-	Problem area, 2001-2005	No change in status compared with previous years (<1998); averaged result is identical to 'per year' result	Problem area	2001-2005
	DI	+	Ps	+	Ck	?						
	NP	+	Mp	?	Oc	+						
D3. Coastal waters	NI	+	Ca	+	O_2	+	At	-	Problem area, 2001-2005	No change in status compared with previous years (<1998); averaged result is identical to 'per year' result	Problem area	2001-2005
	DI	+	Ps	+	Ck	?						
	NP	+	Mp	?	Oc	+						
D4. Offshore waters	NI	+	Ca	-	O_2	+/?	At	Nr	Inner part: Problem area, outer part: Potential problem area 2001-2005	Classification was based on occasional oxygen depletion in bottom waters (<70%) and insufficient monitoring. This area is affected by transboundary fluxes from adjacent waters.	Potential problem area	2001-2005
	DI	-	Ps	?	Ck	?						
	NP	-	Mp	Nr	Oc	-						
IRELAND												
Castletown Estuary, Inner and Outer Dundalk Bay												
(1) Castletown Estuary	NI		Ca	+	O_2	+	At		Problem area	Fish kill reported during 2001-2005 period, but concurrent environmental data not available.	Problem area	2001-2005
	DI	+	Ps		Ck	+						
	NP		Mp		Oc							
(2) Inner Dundalk Bay	NI		Ca	+	O_2	+	At		Problem area	No data on winter nutrient levels but direct and indirect effects arising during five-year assessment period. Algal toxins not assessed in this area.	Problem area	2001-2005 (Part of Non problem area 1995-1999)
	DI		Ps		Ck							
	NP		Mp		Oc							
(3) Outer Dundalk Bay	NI		Ca	-	O_2	-	At	-	Non problem area		Non problem area	2001-2005
	DI	-	Ps	-	Ck							
	NP		Mp		Oc							
Boyne Estuary and Plume Zone												
(4) Boyne Estuary	NI		Ca	-	O_2	-	At		Potential problem area	Elevated macroalgae biomass present.	Potential problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp	+	Oc							
(5) Boyne Estuary Plume Zone	NI		Ca	-	O_2	-	At	-	Non problem area	Direct or indirect effects not arising during five-year assessment period.	Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
Rogerstown Estuary and Adjacent Coastal Waters												
(6&7) Rogerstown Estuary (Inner)	NI		Ca	+	O_2	+	At		Problem area		Problem area	2001-2005 Non problem area (1995-1999)
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(6&7) Rogerstown Estuary (Outer)	NI		Ca	-	O_2	+	At		Problem area		Problem area	2001-2005 Non problem area (1995-1999)
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(8) Adjacent Coastal	NI		Ca	-	O_2	-	At		Non problem area		Non problem area	1995-1999
	DI	-	Ps		Ck							
	NP		Mp		Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
(9) Broadmeadow Estuary (Inner)	NI DI NP	 + 	Ca Ps Mp	+ 	O_2 Ck Oc	+ + 	At		Problem area	Reports of zoobenthic mortalities of small crustaceans (crabs), no concurrent dissolved oxygen data available. Algal toxins not assessed in this area.	Problem area	2001-2005
(10) Broadmeadow Estuary (Outer)	NI DI NP	 + 	Ca Ps Mp	- 	O_2 Ck Oc	- 	At		Potential problem area	Direct or indirect effects not arising during five-year assessment period. Initial classification has changed from non problem area in 1995-1999 to potential problem area in 2001-2005.	Non problem area	2001-2005
(11) Adjacent Coastal	NI DI NP	 - 	Ca Ps Mp	- 	O_2 Ck Oc	- 	At		Non problem area		Non problem area	2001-2005
Liffey Estuary, Dublin Bay and Adjacent Coastal Waters												
(12) Liffey Estuary	NI DI NP	 - 	Ca Ps Mp	- 	O_2 Ck Oc	+ 	At		Potential problem area	Winter nutrient (DIN and DIP) and summer chlorophyll levels below assessment levels but indirect effects still present.	Potential problem area	2001-2005
(13) Dublin Bay	NI DI NP	 - 	Ca Ps Mp	- 	O_2 Ck Oc	- 	At		Non problem area		Non problem area	2001-2005
(14) Adjacent Coastal	NI DI NP	 - 	Ca Ps Mp	- 	O_2 Ck Oc	- 	At		Non problem area		Non problem area	2001-2005
Avoca Estuary and Adjacent Coastal Water												
(15) Avoca Estuary	NI DI NP	 - 	Ca Ps Mp	- 	O_2 Ck Oc	- 	At		Non problem area		Non problem area	2001-2005
(16) Adjacent Coastal	NI DI NP	 - 	Ca Ps Mp	- 	O_2 Ck Oc	- 	At		Non problem area		Non problem area	2001-2005
Slaney Estuary and Wexford Harbour												
(17) Slaney (Estuary Upper)	NI DI NP	 + 	Ca Ps Mp	- 	O_2 Ck Oc	- 	At		Potential problem area	Initial classification has changed from problem area to potential problem area as summer chlorophyll and dissolved oxygen levels below assessment levels for the period 2001-2005. However, summer chlorophyll levels above assessment levels in 2006 so final classification problem area	Problem area	2001-2005
(18) Slaney Estuary (Lower)	NI DI NP	 + 	Ca Ps Mp	- 	O_2 Ck Oc	+ 	At		Problem area		Problem area	2001-2005
(19) South Wexford Harbour	NI DI NP	 + 	Ca Ps Mp	- 	O_2 Ck Oc	- 	At		Problem area	Direct or indirect effects not arising during five-year assessment period, but direct and indirect effects present in 2006, so overall classification is problem area	Problem area	2001-2005 Non problem area (1995-1999)

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
(20) Wexford Harbour	NI		Ca	-	O_2	-	At	-	Potential problem area	Direct or indirect effects not arising during five-year assessment period, but direct and indirect effects present in 2006, so overall classification is problem area. Low levels of DSP toxins and *Dinophysis* detected in this area.	Problem area	2001-2005 Non problem area (1995-1999)
	DI	+	Ps	+	Ck							
	NP		Mp		Oc							
Barrow-Nore-Suir Estuaries												
(23) Nore Estuary	NI		Ca	-	O_2	+	At		Problem area	Excessive levels of winter and summer DIN and oxygen supersaturation.	Problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(23) Barrow Estuary	NI		Ca	-	O_2	+	At		Problem area		Problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(24) Barrow Nore Estuary (Lower)	NI		Ca	-	O_2	-	At		Potential problem area	Direct or indirect effects not arising during five-year assessment period.	Non problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(25) Suir Estuary (Upper)	NI		Ca	+	O_2	+	At		Problem area	Elevated dissolved oxygen super-saturation and summer chlorophyll levels.	Problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(26) Suir Estuary (Lower)	NI		Ca	-	O_2	-	At		Potential problem area	Direct or indirect effects not arising during five-year assessment period.	Non problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(27) Barrow Nore Suir Estuary (Outer)	NI		Ca	-	O_2	-	At		Non problem area	Initial classification of potential problem area in previous assessment due to elevated DIN. In the current assessment (2001-2005) DIN did not exceed the assessment level.	Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(28) Outer Waterford Harbour	NI		Ca	-	O_2	-	At	+	Non problem area	Initial classification of potential problem area in previous assessment due to elevated DIN. In the current assessment (2001-2005) DIN did not exceed the assessment level. Intermittent low levels of DSP Algal toxins and intermittent episodes of Dinophysis above assessment assessment levels but at levels considered not to be indicative of eutrophication.	Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
Colligan Estuary and Dungarvan Harbour												
(30) Colligan River Estuary	NI		Ca	-	O_2	+	At		Problem area	Elevated winter DIN levels in inflowing Colligan River	Problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(31) Dungarvan Harbour	NI		Ca	-	O_2	+	At	-	Non problem area	2006 assessment indicated elevated levels of dissolved oxygen super-saturation and preliminary survey of macrophyte abundance and distribution in 2007 indicates elevated levels Intermittent low levels of DSP Algal toxins and intermittent episodes of Dinophysis above assessment levels but at levels considered not to be indicative of eutrophication.	Problem area	2001-2006
	DI	+	Ps	+	Ck							
	NP		Mp	+	Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Blackwater Estuary and Youghal Harbour												
(32) Blackwater Estuary Upper	NI		Ca	+	O_2	-	At		Problem area	Elevated summer and winter DIN levels.	Problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(33) Blackwater Estuary Lower	NI		Ca	+	O_2	+	At		Problem area		Problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(34) Youghal Harbour	NI		Ca	-	O_2	-	At	-	Non problem area		Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
Lee Estuary, Lough Mahon, Owenacurra Estuary and Cork Harbour												
(35) Lee Estuary	NI		Ca	-	O_2	+	At		Problem area	Oxygen undersaturation in bottom-layer.	Problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(36) Lough Mahon	NI		Ca	-	O_2	+	At		Problem area		Problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(37&38) Owennacurra Estuary/North Channel	NI		Ca	+	O_2	+	At	-	Problem area	PSP and DSP toxins detected sporadically and presence of *Alexandrium* and *Dinophysis*, above respective assessment levels but no elevated trend detected.	Problem area	2001-2005
	DI	+	Ps	+	Ck							
	NP		Mp		Oc							
(39) Cork Harbour	NI		Ca	-	O_2	-	At		Potential problem area	Elevated winter DIN levels but no direct or indirect effects arising during five-year assessment period.	Non problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
Bandon Estuary and Kinsale Harbour												
(40) Upper Bandon Estuary	NI		Ca	+	O_2	+	At		Problem area	Elevated summer chlorophyll and dissolved oxygen super-saturation levels associated with blooms of the diatom *Cylindrotheca closterium* and the dinflagellate *Heterocapsa triquetra*.	Problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(41) Lower Bandon Estuary	NI		Ca	+	O_2	+	At		Problem area	Elevated summer chlorophyll and dissolved oxygen super-saturation levels	Problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(42) Kinsale Harbour	NI		Ca	-	O_2	+	At	-	Problem area	Elevated winter DIN and dissolved oxygen undersaturation in summer. Undersaturation may be partly due to the presence of stratification but further investigation is required. Low levels ASP and DSP toxins present – no elevated trend detected.	Problem area	2001-2005 (Non problem area 1995-1999)
	DI	+	Ps		Ck							
	NP		Mp		Oc							
Argideen Estuary												
(43) Argideen Estuary	NI		Ca		O_2		At		Problem area	Elevated levels of macroalgae – opportunistic green algal blooms recorded in 2004, 2006 and 2007.	Problem area	2004-2007
	DI		Ps		Ck							
	NP		Mp	+	Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Lee (Tralee) Estuary and Tralee Bay												
(44) Upper Lee (Tralee) Estuary	NI		Ca	+	O_2	+	At		Problem area	Elevated levels of summer DIP.	Problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(45) Lower Lee (Tralee) Estuary	NI		Ca	-	O_2	-	At		Potential problem area	Further information required on winter nutrient levels to assess trends.	Potential problem area	2001-2005 (Problem area 1995-1999)
	DI	(?)	Ps		Ck							
	NP		Mp		Oc							
(46) Tralee Bay	NI		Ca	-	O_2	-	At		Non problem area		Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
Cashen Feale Estuary												
(47) Upper Feale Estuary	NI		Ca	-	O_2	-	At		Non problem area		Non problem area	2001-2005 (Problem area 1995-1999)
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(48) Cashen Feale Estuary	NI		Ca	+	O_2	(?)	At		Potential problem area	Further information required on summer oxygenation conditions.	Potential problem area	2001-2005 (Problem area 1995-1999)
	DI	-	Ps		Ck							
	NP		Mp		Oc							
Shannon Estuary												
(49) Deel Estuary	NI		Ca	-	O_2	-	At		Potential problem area	Elevated winter DIN levels but direct or indirect effects not arising during five-year assessment period.	Non problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(50) Fergus Estuary	NI		Ca	-	O_2	-	At		Potential problem area	Elevated summer DIP levels but direct or indirect effects not arising during five-year assessment period.	Non Problem area	2001-2005 (Problem area 1999-2001)
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(51) Maigue Estuary	NI		Ca	-	O_2	-	At		Potential problem area	Elevated winter DIN and summer DIP levels but direct or indirect effects not arising during five-year assessment period.	Non problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(52) Tidal Shannon River	NI		Ca	-	O_2	-	At		Problem area	Elevated summer DIP levels but direct or indirect effects not arising during five-year assessment period.	Non problem area	2001-2005
	DI	+	Ps		Ck							
	NP		Mp		Oc							
(53) Upper Shannon Estuary	NI		Ca	-	O_2	-	At		Non problem area		Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(54) Lower Shannon Estuary	NI		Ca	-	O_2	-	At	-	Non problem area	Low levels of DSP and *Dinophysis*; above assessment level but not considered at levels indicative of eutrophication.	Non problem area	2001-2005
	DI	-	Ps	+	Ck							
	NP		Mp		Oc							
Corrib Estuary and Inner Galway Bay												
(55) Corrib Estuary	NI		Ca	-	O_2	-	At		Non problem area		Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
(56) Inner Galway Bay	NI		Ca	-	O_2	-	At	-	Non problem area	Intermittent low levels of DSP and *Dinophysis* above assessment level but not considered at levels indicative of eutrophication.	Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
Moy Estuary and Killala Bay												
(57) Moy Estuary	NI		Ca	-	O_2	-	At		Non problem area		Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(58) Killala Bay	NI		Ca	-	O_2	-	At	-	Non problem area	AZP and low levels of DSP and *Dinophysis*.	Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
Garavoge Estuary and Sligo Bay												
(59) Garavoge Estuary	NI		Ca	-	O_2	+	At		Problem area	Transient elevated oxygen levels recorded in summer 2003. Nutrient loadings to this water body are low, not considered to be a problem or potential problem area.	Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(60) Sligo Harbour	NI		Ca	-	O_2	-	At		Non problem area		Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(61) Sligo Bay	NI		Ca	-	O_2	-	At	-	Non problem area	Low levels of DSP and *Dinophysis*; above assessment level but not considered at levels indicative of eutrophication.	Non problem area	2001-2005
	DI	-	Ps	+	Ck							
	NP		Mp		Oc							
Killybegs Harbour and McSwyne's Bay												
(63) Killybegs Harbour	NI		Ca	+	O_2	+	At		Problem area		Problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(64) McSwyne's Bay	NI		Ca	-	O_2	+	At	+	Problem area	Significant dissolved oxygen undersaturation in summer. Donegal Bay is an area of slack residual flow and water column stratification can occur close to the coast. Oxygen undersaturation in the bottom layer of this water body may be partly due to the presence of stratification but further investigation is required. Persistant and high levels of AZP, low levels of DSP toxins and low levels of *Dinophysis*.	Potential problem area	2001-2005 (Non problem area 1995-1999)
	DI	-	Ps	+	Ck							
	NP		Mp		Oc							
Lough Swilly												
(65) Upper Swilly Estuary	NI		Ca	+	O_2	+	At		Problem area	Significant levels of oxygen undersaturation and elevated chlorophyll levels in summer. Large blooms of the dinoflagellate *Heterocapsa triquetra* in summer.	Problem area	2001-2005 (Non problem area 1995-1999)
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(66) Lower Swilly Estuary	NI		Ca	-	O_2	-	At		Non problem area		Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(67) Lower Lough Swilly	NI		Ca	-	O_2	-	At		Non problem area		Non problem area	2001-2005
	DI	-	Ps		Ck							
	NP		Mp		Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Coastal and Offshore areas of the western Irish Sea and eastern celtic Sea												
(1) Carlingford-Wicklow (Coastal)	NI		Ca	-	O2	-	At		Non problem area	Measurements of chlorophyll and oxygen in adjacent coastal sub-areas indicate no direct or indirect effects arising.	Non problem area	2001-2005 (Not previously assessed)
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(2) Northwest (Irish Sea (Offshore)	NI		Ca		O2		At		Non problem area	Measurements of chlorophyll and oxygen in adjacent coastal sub-areas indicate no direct or indirect effects arising.	Non problem area	2001-2005 (Not previously assessed)
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(3) Wicklow Carnsore (Offshore)	NI		Ca		O2		At		Non problem area		Non problem area	2001-2005 (Not previously assessed)
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(4) St. George's Channel (Offshore)	NI		Ca	-	O2	-	At		Non problem area		Non problem area	2001-2005 (Not previously assessed)
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(5) Cork-Waterford (Coastal)	NI		Ca	-	O2	-	At		Non problem area	Measurements of chlorophyll and oxygen in adjacent coastal sub-areas indicate no direct or indirect effects arising.	Non problem area	2001-2005 (Not previously assessed)
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(6) Waterford-Carnsore (Coastal)	NI		Ca	-	O2	-	At		Non problem area	Measurements of chlorophyll and oxygen in adjacent coastal sub-areas indicate no direct or indirect effects arising.	Non problem area	2001-2005 (Not previously assessed)
	DI	-	Ps		Ck							
	NP		Mp		Oc							
(7) Celtic Sea (Offshore)	NI		Ca		O2		At		Non problem area		Non problem area	2001-2005 (Not previously assessed)
	DI	-	Ps		Ck							
	NP		Mp		Oc							
NETHERLANDS												
Coastal area	NI	+	Ps	+	Ck	?			Problem area, 2001-2005	Problem area in 2001-2005 based on all assessment parameters; no change in status compared with previous years (<1995-2000); averaged result is identical to 'per year' result, except chl-a in 2005; *Influenced by Rhine, and to lesser extent by Meuse and Scheldt.*	Problem area	2001-2005 comparison: <1995-2000
	DI	+	Mp	n.r.	Oc	-						
	NP	+	Ca	+	O2	-	At	-				
Wadden Sea	NI	+	Ps	+	Ck	?			Problem area, 2001-2005	Problem area in 2001-2005 based on all assessment parameters; no change in status compared with previous years (<1995-2000); averaged result is identical to 'per year' result, except chl-a in 2005; *Influenced by Rhine, and to lesser extent by Meuse and Scheldt.*	Problem area	2001-2005 comparison: <1995-2000
	DI	+	Mp	?.	Oc	-						
	NP	+	Ca	+	O2	+	At	-				
Western Scheldt	NI	+	Ps	+	Ck	?			Problem area, 2001-2005	Problem area in 2001-2005 based on all assessment parameters; no change in status compared with previous years (<1995-2000); averaged result is identical to 'per year' result, except O2 in 2002; *Influenced by Scheldt.*	Problem area	2001-2005 comparison: <1995-2000
	DI	+	Mp	?.	Oc	-						
	NP	+	Ca	+	O2	-	At	-				

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Ems-Dollard	NI	+	Ps	+	Ck	?			Problem area, 2001-2005	Problem area in 2001-2005 based on all assessment parameters; no change in status compared with previous years (<1995-2000); averaged result is identical to 'per year' result, except chl-a in 2001 and O2 in 2002 and 2004. *Influenced by Ems river and outlets of estuary*	Problem area	2001-2005 comparison: <1995-2000
	DI	+	Mp	?	Oc	-						
	NP	+	Ca	-	O2	+	At	-				
Southern Bight offshore	NI		Ps	+	Ck	?			Problem area, 2001-2005	Problem area in 2001-2005, based on the assessment parameters chlorophyll-*a* and nuisance phytoplankton indicator species *Phaeocystis*; no change in status compared with previous years (<1995-2000); averaged result is identical to 'per year' result, except chl-a in 2005. *Influenced by waters flowing from the Channel, NL and Belgium*	Problem area**,** transboundary transport	2001-2005 comparison: <1995-2000
	DI	-	Mp	n.r.	Oc	-						
	NP	-	Ca	+	O2	-	At	-				
Oyster Grounds	NI		Ps	+	Ck	?			Problem area, 2001-2005, based on toxic Ps	Initially a problem area in 2001-2005, but only based on elevated levels of toxic phytoplankton indicator species. Because of the uncertainty of a cause-effect relationship between nutrient availability and the elevated levels of these toxic species this area is finally classified as a non-problem area; averaged result is identical to 'per year' result, except chl-a in 2003. Change in status compared with previous years (<1995-2000). *Receiving waters from Atlantic Ocean and UK*	Non problem area	2001-2005 comparison: <1995-2000
	DI	-	Mp	n.r.	Oc	-						
	NP	-	Ca	-	O2	-	At	-				
Dogger Bank	NI		Ps	+	Ck	?			Problem area, 2001-2005, based on toxic Ps	Initially a problem area in 2001-2005, but only based on elevated levels of toxic phytoplankton indicator species. Because of the uncertainty of a cause-effect relationship between nutrient availability and the elevated levels of these toxic species this area is finally classified as a non-problem area; averaged result is identical to 'per year' result. No change in status compared with previous years (<1995-2000, see OSPAR 2003: the so-called Dutch utmost northern offshore waters). *Receiving waters from mainly Atlantic Ocean, and to a minor extent from UK*	Non problem area	2001-2005 comparison: <1995-2000
	DI	+	Mp	n.r.	Oc	-						
	NP	+	Ca	+	O2	-	At	-				
NORWAY												
S1 Iddefjord, Hvaler and Singlefjord	NI	-	Ca	+	O2	+	At	?	Problem area	No significant change in anthropogenic load. Oxygen deficiency. Phytoplankton blooms and concentration. Some decline in sugar kelp (status: moderate to bad).	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI	+	Ps	+	Ck	-						
	NP	+	Mp	+	Oc							
S2 Oslofjord to Breiangen, Drammensfjord and Sande bay	NI	-	Ca	+	O2	+	At	?	Problem area	Anthropogenic load has significantly decreased. Macrophytes are improving but are still affected. Oxygen deficiency varies a lot with variation in annual water exchange from Outer Oslofjord. The same is valid for changes/kills in zoobenthos but their status seems to improve.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI	+	Ps	?	Ck	(+)						
	NP	+	Mp	+	Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
S3 Main outer Oslofjord, including Tønsberg and Sandefjord	NI	-	Ca	-	O2	+	At	?	Problem area	Decreased nutrient loads in last 10 years. DIN/DIP concentrations and mean and maximum chlorophyll a concentrations touching elevated levels. Macrophytes mainly moderately affected; major decline of sugar kelp. Locally low oxygen but generally good. Small overall effects on soft bottom fauna.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI	+?	Ps	+	Ck	(-)						
	NP	-	Mp	+	Oc							
S4 Southern part of outer Oslofjord	NI		Ca	-	O2		At		Potential problem area	Decreased nutrient loads in 10 last years. Elevated levels/bloom of nuisance species. Moderate to good status of macrophytes. None or minor decrease in sugar kelp. Softbottom fauna mainly good but one local stations moderate. No data on algae toxins	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI	-	Ps	?	Ck	(-)						
	NP	-	Mp	(+)	Oc							
S5 Grenland fjords	NI	-	Ca	?(+)	O2	+	At		Problem area	Insignificant change in nutrient load. No data since previous classification on DIN/DIP, N/P ratio and mean/max chlorophyll a. Phytoplankton elevated concentrations. Major decline in sugar kelp. Oxygen status bad in inner part but good at Langesund. Softbottom fauna dead in inner part below 50-60m. No data on algal toxins.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI	?(+)	Ps	+	Ck	+						
	NP	?(+)	Mp	+	Oc							
S6 Telemark coastline	NI	-	Ca		O2	+	At		Potential problem area	Transboundary load, possible local areas with oxygen problems and algal toxins.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI		Ps		Ck	(-)						
	NP		Mp	(+)	Oc							
S7 Kragerøfjord and Stølefjord	NI	?	Ca		O2	+	At	?	Problem area	Varying trends for N and P. Major sugar kelp decline. Nuisance species and algal toxins: present, but difficult to classify.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI		Ps	?	Ck							
	NP		Mp	+	Oc							
S8 Søndeledfjord and Sandnesfjord	NI	-	Ca		O2	+	At		Potential problem area	There is reason to believe that this problem area would be the classification if more data describing the biological communities were available.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI		Ps		Ck							
	NP		Mp		Oc							
S9 Agder coastline and Kristiansand	NI	-	Ca		O2	+	At	?	Problem area	Overall low and decreasing nutrient load. Major decline of sugar kelp except in exposed areas. Lyngør possible at risk due to low oxygen.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI		Ps	?	Ck	+						
	NP		Mp	+	Oc							
S10 Tvedestrandsfjord	NI	-	Ca		O2	+?	At		Potential problem area	There is no reason to believe that major changes have taken place since the previous assessment.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI		Ps		Ck							
	NP		Mp	+	Oc							
S11 Arendal fjord and Utnes-Ærøy	NI	-	Ca		O2	-	At		Problem area	Reduced N-load but constant P-load. Major decline of sugar kelp. Moderate oxygen at Utnes – improved. Soft bottom fauna moderate status at Utnes, better at Ærøy deep water – improved. Organic carbon/matter moderate.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI		Ps		Ck	-/+						
	NP		Mp	+	Oc	-						
S12 Lillesand coast	NI	-	Ca		O2	+	At		Problem area	Decline of N and P load. Major decline in sugar kelp. Serious (< 2.5 ml/L oxygen) in several fjord basins.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI		Ps		Ck							
	NP		Mp	+	Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
S13 Ålefjærfjord, Topdalsfjord, Kristiansandsfjord	NI	-	Ca		O2	+	At		Problem area	The identified problems are local or to a large extent caused by topography (sills) and transboundary loads. Major decline in sugar kelp. Serious (< 2.5 ml/L oxygen) and may be increasing. Damage to bottom fauna. High organic content in basins.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI		Ps		Ck							
	NP		Mp	+	Oc	+						
S14 Coastal area Kristiansand – Lindesnes including minor fjords	NI	-	Ca		O2	+	At	?	Problem area	Varying but probably relatively constant nutrient load over time. Major decline in sugar kelp and reduced biodiversity. No updated information, but very low oxygen concentrations (< 2.5 ml/L) in several fjords.	Problem area	2001 – 2005 comparison: < 1990 - 2002
	DI		Ps	?	Ck							
	NP		Mp	+	Oc							
PORTUGAL												
Mondego Estuary	NI	+	Ca	-	O_2	-	At	-	Problem area	Data and modelling confirms that the north channel is a non-problem area, mostly because of its short residence time. Local characteristics of the south channel are consequence of hydrodynamic conditions instead of nutrients overenrichment. Mitigation actions have been implemented and improvements in the environmental quality of the southern channel are expected.	Potential problem Area	2003-2006 (Actual Situation)
	DI	-	Ps	?	Ck	-						
	NP	?	Mp	+	Oc	?						
SPAIN												
Butroe Estuary	NI	+ / -	Ca	-	O2	-	At	?	Potential problem area	The waste water collection systems have been improving in the estuary, especially since 1997. The specific deteriorations could be due to a specific waste dump or situations such as the dredging works that were carried out in the last few years. The coastal part is in good state.	Potential problem area	2001-2005
	DI	- / -	Ps	?	Ck	?						
	NP	+	Mp	?	Oc	?						
Oka Estuary	NI	+ / -	Ca	-	O2	-	At	?	Potential problem area	In the Oka estuary, there is a clear gradient from the inside to the outside. The situation it is in is also determined by the fact observed upstream in the tributary. This situation will only improve with the development of the sewerage plan anticipated for the entire region.	Potential problem area	2001-2005
	DI	- /-	Ps	?	Ck	?						
	NP	+	Mp	?	Oc	?						
Lea Estuary	NI	- / -	Ca	-	O2	-	At	?	Non problem area	This water mass is subjected to low pressure overall; and the principal pressures come from waste dumps from the treatment plant. The coastal zone is in good state.	Non problem area	2001-2005
	DI	-/-	Ps	?	Ck	?						
	NP	-	Mp	?	Oc	?						
Inurritza Estuary	NI	?	Ca	-	O2	-	At	?	Potential problem area	The Orio coastal zone, represented by the L-O10 and L-O20 stations, is classified with a good ecological state at both. At the L-O20 station, the benthos has improved, although there is also influence from the Zarautz underwater outfall.	Potential problem area	2001-2005
	DI	-/-	Ps	?	Ck	?						
	NP	+	Mp	?	Oc	?						

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Oiartzun Estuary	NI	- / +	Ca	-	O2	-	At	?	Potential problem area	This water mass shows several pressures, such as industrial waste dumps and some urban waste dumps. Despite this, the greatest pressure currently comes from the port itself (it occupies 92% of the water mass), which includes maritime traffic, shipyards, dredging works, canalisation, moorings, etc. and obvious degradation. Overall, the pressure on the water mass is high. In the estuary, the breakwaters at the river mouth have been extended in the last few years. The morphological structure of the external area has been changed in order to build a port and narrow the riverbed. In 2005, work on a sports port started on the external part. The situation is considered to be 'Good' on the internal part and 'Acceptable' on the external part. It is an estuary with recovery and restoration possibilities for various flood prone areas, which would improve the hydromorphology greatly.	Potential problem area	2001-2005
	DI	+/-	Ps	?	Ck	?						
	NP	+	Mp	?	Oc	?						
Bidasoa Estuary	NI	?	Ca	-	O2	-	At	?	Non problem area	The most significant pressures on this estuary include the waste dumps (basically on the French side, as on the Spanish side, they have almost all been eliminated, which has produced a considerable improvement in the quality in the last few years, which has made shell fishing possible), the canalisation of some sections, and the presence of several ports (despite there being five, their total surface area represents little more than 3% of the water mass) with a large number of moorings within and outside of them (this entails dredging works, the introduction of non indigenous species, spills, etc.). Overall, the pressure on the water mass is moderate.	Non problem area	2001-2005
	DI	-/-	Ps	?	Ck	?						
	NP	-	Mp	?	Oc	?						
Santona	NI	?	Ca		O2	?	At	?	Potential problem area	Since there is not enough data from the assessed period (2001-2005) and since these areas are declared as sensitive by the Urban Waste Water Directive, it has been decided, under the precautionary principle, to classify them as potential problem areas in anticipation of a definitive classification at the next application of the Comprehensive Procedure.	Potential problem area	2001-2005
	DI		Ps	?	Ck	?						
	NP		Mp	?	Oc							
Victoria	NI	?	Ca		O2	?	At	?	Potential problem area		Potential problem area	2001-2005
	DI		Ps	?	Ck	?						
	NP		Mp	?	Oc							
Joyel	NI		Ca		O2	?	At	?	Potential problem area		Potential problem area	2001-2005
	DI		Ps	?	Ck	?						
	NP		Mp	?	Oc							
Oyambre	NI	?	Ca		O2	?	At	?	Potential problem area		Potential problem area	2001-2005
	DI		Ps	?	Ck	?						
	NP		Mp	?	Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Santander	NI	?	Ca		O_2	?	At	?	Potential problem area		Potential problem area	2001-2005
	DI		Ps	?	Ck	?						
	NP		Mp	?	Oc							
Pontevedra Ria	NI	?	Ca	-	O_2	-	At	?	Non problem area	The Ria, with help from the hydrographic characteristics – the constant renovation due to the estuary circulatory current flows and reflows- of the middle-external zones, can be rebalanced in the internal zones by purifying and monitoring the waters, thus ending the uncontrolled dumping of urban and industrial effluents. The situation is quite different between the inside of the ria and the external part.	Non problem area	2001-2005
	DI	- / -	Ps	?	Ck	?						
	NP	-	Mp	?	Oc	?						
Cadiz	NI	-	Ca	-	O_2	-	At	?	Potential problem area	The actions carried out in the Cádiz Bay Potential problem area: ✓ Monitoring of the surveillance requirements included in the Nutrient Monitoring Programme for Potential Problem Areas. ✓ Improvements to the treatment systems: especially on the inside of the Bay, in the municipalities of: Cádiz, Puerto Real, San Fernando and Chiclana de la Frontera. ✓ In March 2002 the "Cádiz-San Fernando" WWTP plant began to operate and the treated waste waters were dumped into the Atlantic via underwater outfall. ✓ For this reason, direct non-purified waste dumps (Cádiz and San Fernando) have disappeared, although only one of them (San Fernando) discharged in the Bay through the Sancti Petri tidal channel.	Potential problem area	2001-2005
	DI	-/+	Ps	?	Ck	?						
	NP	-	Mp	?	Oc	?						
Tinto-Odiel	NI	?	Ca	-	O_2	-	At	?	Potential problem area	Shows nutrient loads from different sources. Shows morphological alterations (defence work, channelling, dredging works, etc.). Shows anthropic incidences such as urban and industrial waste dumps, port activities, etc. Shows soil use which affects the state of the waters, such as invasion of the public hydraulic domain, riverside vegetation elimination, etc. Shows major occupation in urban and industrial nuclei. It is an at-risk area. http://www.chguadiana.es/	Potential problem area	2001-2005
	DI	+/+	Ps	?	Ck	?						
	NP	+	Mp	?	Oc	-						

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Guadalquivir	NI DI NP	? +/- -	Ca Ps Mp	- ? ?	O_2 Ck Oc	- ? ?	At	?	Potential problem area	<u>Environmental problems detected</u> Contamination of the waters due to urban and industrial waste dumps. Diffused contamination from farming. The uncontrolled dumping of solid urban waste. The high soil erosion and the high sedimentation in aquatic ecosystems and dams. The invasion of the riverbed. <u>Improvements proposed in the Measures Plan</u> Joint action between the Administrations in purifying urban waters. 0 Tolerance Programme regarding waste dumping. Promote the use of good agricultural practices. Improved treatment techniques. for waste from farming industries. Forest hydrology correction. Monitoring of treatment operations and intensification of pre-potability quality controls. *Description of measures at:* http://www.chguadalquivir.es/chg/opencms/chg-web/pics/acuerdoAgua/Presentacion_Plan_Medidas.pdf	Potential problem area	2001-2005
SWEDEN												
Offshore Skagerrak	NI DI NP	+ - -	Ca Ps Mp	- + ?	O_2 Ck Oc	- - ?	At	?	Non-problem areas	No extra information available. Only one phytoplankton indicaotr species occur above assessment levels and this species is not a good indicator of eutrophication.	Non problem area	2002-2005
Inshore Skagerrak	NI DI NP	+ + +	Ca Ps Mp	+ + ?	O_2 Ck Oc	+ + ?	At	+	Problem area	Additional parameters such as TP and TN shows elevated concentrations according to the WFD. Primary production is high compared to historical data (OSPAR Assessment 2002), while clearly below threshold values set by Nixon (1995).	Problem area	2002-2005
Inshore and Offshore Kattegat	NI DI NP	+ + +	Ca Ps Mp	+ + ?	O_2 Ck Oc	+ + ?	At	+	Problem area	Additional parameters such as TP and TN shows elevated concentrations according to the WFD assessment criteria. The area is also influenced by inflow of nutrients from southern Baltic Sea, which is euthrophicated according to HELCOM assessments and WFD preliminary classification scheme	Problem area	2002-2005

Area	**Category I** Degree of nutrient enrichment	**Category II** Direct effects	**Category III and IV** Indirect effects/ other possible effects	Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
UNITED KINGDOM							
Northern North Sea	NI DI - NP -	Ca - Ps Mp	O_2 - At Ck - Oc	Non problem area	• There is strong evidence that the area is not nutrient enriched (high confidence). Although this is based on limited monitoring data the conclusion is confirmed by taking account of > 30 years of ICES data and a published climatology report (UKCIP02, 2002). • There is evidence that there is no accelerated growth (medium confidence). The chlorophyll 90th percentiles were <10 µg l^{-1} in all years and the modified green test is also passed. The conclusion is confirmed by taking account of ICES data and the climatology report. • The available evidence does not suggest that there is any undesirable disturbance (low confidence). The final classification of the area is a non problem area (high confidence), based on the lack of nutrient enrichment, the absence of accelerated growth and evidence that there is no undesirable disturbance to the biology or water quality.	Non problem area	Nutrients (1999-2006) Biomass (1999-2004)
Southern North Sea	NI DI - NP -	Ca - Ps Mp	O_2 - At Ck - Oc	Non problem area	• There is no nutrient enrichment (high confidence) based upon extensive measurements from SmartBuoy time-series and spatial data. • There is evidence of no accelerated growth (medium confidence). High intensity sampling has shown that since 2002 chlorophyll 90th percentiles in waters of >34.5 salinity were below the threshold. • The evidence available suggests that there is no undesirable disturbance (medium confidence). Measurements show DO was consistently > 4 mg l^{-1}, there was no detectable disturbance in the zoobenthos community and there was an absence of fish kills. The final classification of the Southern North Sea is as a Non-Problem Area (high confidence). The results show that there was no nutrient enrichment, accelerated growth or undesirable disturbance.	Non problem area	Nutrients (1999-2006) Biomass (1999-2006)

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Eastern English Coast (area of particular continuing interest)	NI	-	Ca	+	O_2	-	At	-	Problem area	Following the 2002 application of the Comprehensive Procedure this area was subject to enhanced monitoring and surveillance. • There is nutrient enrichment (high confidence) with winter DIN exceeding the threshold. • There is evidence of accelerated growth (low confidence). The chlorophyll 90th percentiles exceeded the threshold in the 3 years with sufficient data. However, the means were below the threshold in all years, except 2004. • There is evidence of no undesirable disturbance (high confidence). The phytoplankton indicator was below the threshold and there was no excessive opportunistic macroalgae growth. DO was consistently > 4 mg l^{-1}. The zoobenthos showed no evidence for change, there were no reported fish kills and no toxicity in bivalve mollusc tissue. The final classification of the area is a non problem area (high confidence) based on evidence that in spite of nutrient enrichment and accelerated growth, there high confidence that there is no evidence of undesirable disturbance, and that problem area status is not justified.	Non problem area	Nutrients (1999-2006) Biomass (1999-2004)
	DI	+	Ps	-	Ck	-						
	NP	+	Mp	-	Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
East Anglia (area of particular continuing interest)	NI	-	Ca	+	O_2	-	At	-	Problem area	Following the 2002 application of the Comprehensive Procedure this area was subject to enhanced monitoring and surveillance. • The area is nutrient enriched (high confidence) with winter DIN exceeding the threshold in most years. • The area is assessed as showing signs of accelerated growth (medium confidence). Chlorophyll 90th percentiles exceeded the threshold in 30 – 34.5 salinity, but were below threshold in salinity >34.5. • The area exhibits strong evidence of no undesirable disturbance (high confidence). The phytoplankton indicator and opportunistic macroalgal growth levels were below their thresholds. DO was consistently > 4 mg l^{-1}. The zoobenthos showed no evidence for change and there were no reported fish kills. There were no incidents of toxicity in bivalve mollusc tissue. The final classification is of a non problem area (medium confidence), because in spite of nutrient enrichment and accelerated growth, there is high confidence that there is no evidence of undesirable disturbance, and that problem area status is not justified.	Non problem area	Nutrients (1999-2006) Biomass (1999-2006)
	DI	+	Ps	-	Ck	-						
	NP	+	Mp	-	Oc							
Northeast Irish Sea	NI		Ca	-	O_2	-	At	-	Non problem area	• The area is assessed as showing evidence of nutrient enrichment, (low confidence). Winter DIN exceeded the threshold in 3 out of 5 years but N/P ratios did not. • The area is assessed as showing evidence of no accelerated growth (high confidence) as chlorophyll 90th percentiles were consistently <15 µg l^{-1}. • The area is assessed as showing evidence of no undesirable disturbance (high confidence). Phytoplankton indices did not exceed thresholds. DO was consistently >4 mg l^{-1}. There were no recorded fish kills and zoobenthos data provide evidence of no change in community structure. There were no incidents of toxicity in bivalve mollusc tissue. The final classification is of the northeast Irish Sea as a non problem area (high confidence), based on evidence that in spite of nutrient enrichment, there was no evidence of accelerated growth or undesirable disturbance.	Non problem area	Nutrients (1999-2005) Biomass (1999-2006)
	DI	+	Ps	-	Ck	-						
	NP	-	Mp	-	Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Liverpool Bay (area of particular continuing interest)	NI DI NP	- + -	Ca Ps Mp	- - -	O_2 Ck Oc	- -	At	-	Non problem area	Following the 2002 application of the Comprehensive Procedure this area was subject to enhanced monitoring and surveillance. • This area is assessed as showing evidence of nutrient enrichment (high confidence). Winter DIN exceeded the threshold, although DIN/DIP ratios did not. • The area is assessed as showing evidence of no accelerated growth (medium confidence). The chlorophyll 90^{th} percentiles were >15 µg l^{-1} in 2004, but <15 µg l^{-1} in more recent years. • There is evidence of no undesirable disturbance (high confidence). The phytoplankton indicator was below the threshold and N:Si would not favour flagellate growth. There are no macroalgae blooms above the threshold. DO was consistently >4 mg l^{-1}. The zoobenthos showed no evidence for change and there were no reported fish kills. There were no incidents of toxicity in bivalve mollusc tissue. The final classification is of a non problem area (high confidence), based on evidence that in spite of nutrient enrichment there was good evidence that there was no accelerated growth or undesirable disturbance.	Non problem area	Nutrients (1999-2006) Biomass (1999-2005)
Bristol Channel	NI DI NP	- + +	Ca Ps Mp	- - -	O_2 Ck Oc	- -	At	-	Non problem area	• The area is assessed as nutrient enriched (medium confidence). Winter DIN and DIN/DIP ratios exceeded the threshold in the 3 years with sufficient data. • The area is assessed as showing evidence of no accelerated growth (high confidence), with chlorophyll 90^{th} percentiles below the threshold. • Bristol Channel is assessed (high confidence) as showing evidence of no undesirable disturbance. The phytoplankton indicator and opportunistic macroalgal growth levels were below their thresholds. DO was consistently > 4 mg l^{-1}. The zoobenthos showed no evidence for change and there were no reported fish kills. There were no incidents of toxicity in bivalve mollusc tissue. The final classification of the Bristol Channel is of a non problem area (high confidence), based on evidence that in spite of nutrient enrichment, there is strong evidence that there was no accelerated growth or undesirable disturbance.	Non problem area	Nutrients (1999-2004) Biomass (1999-2004)

Area	**Category I** Degree of nutrient enrichment	**Category II** Direct effects	**Category III and IV** Indirect effects/ other possible effects	Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Eastern English Channel	NI DI + NP +	Ca - Ps - Mp -	O_2 - Ck - Oc At -	Non problem area	• This area is assessed as showing evidence of nutrient enrichment, (medium confidence). Winter DIN exceeded the thresholds in waters 30 – 34.5 salinity, but in only one year in >34.5 salinity. • The area is assessed as showing no evidence of accelerated growth (low confidence). Chlorophyll 90th percentiles were below thresholds, except in 2002 in 30 – 34.5 salinity. Chlorophyll means were below thresholds. • There is evidence of no undesirable disturbance (medium confidence). Phytoplankton indices did not exceed the threshold and there were no excessive opportunistic macroalgal blooms. DO was consistently >4 mg l^{-1}. There have been no recorded fish kills and zoobenthos data did not indicate long-term change. There were no incidents of toxicity in bivalve mollusc tissue. The final classification is of the east English Channel as a non problem area (medium confidence), based on evidence that in spite of nutrient enrichment, there was no accelerated growth or undesirable disturbance.	Non problem area	Nutrients (1999-2006) Biomass (1999-2003)
Solent (area of particular continuing interest)	NI DI + NP +	Ca - Ps - Mp -	O_2 - Ck - Oc At -	Non problem area	Following the 2002 application of the Comprehensive Procedure this area was subject to enhanced monitoring and surveillance. • The area is assessed as nutrient enriched (high confidence), with winter DIN in waters <34.5 salinity exceeding the threshold. • The area assessment is of no accelerated growth (medium confidence). Chlorophyll 90th percentiles did not exceed the thresholds in 5 out of 6 years. • The area is assessed as showing no undesirable disturbance (medium confidence). Phytoplankton indices remained below thresholds. DO was consistently >4mg l^{-1}. There were no fish kills and no toxicity in bivalve mollusc tissue. In conclusion, the Solent has the final classification of a non problem area (medium confidence), based on evidence that in spite of nutrient enrichment, there was no accelerated growth or undesirable disturbance.	Non problem area	Nutrients (1999-2005) Biomass (1999-2004)

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Solway	NI	-	Ca	-	O_2	-	At		Non problem area	• There are sufficient nutrient data to demonstrate that there is no evidence of nutrient enrichment (high confidence). • There are limited data showing that chlorophyll concentrations did not exceed assessment criteria on surveys between 2001 and 2005, giving low confidence in the conclusion that there is no evidence of accelerated growth. • There is low confidence in the lack of evidence of undesirable disturbance, due to the limited data. The phytoplankton data were qualitative rather than quantitative so the new assessment criterion could not be used. However, the waters are well oxygenated and there was evidence of no fish or zoobenthos kills. The final assessment of the Solway is as a non problem area (medium confidence), based on strong evidence of no nutrient enrichment and some evidence that there was no accelerated growth or undesirable disturbance.	Non problem area	2001-2005
	DI	-	Ps	?	Ck	-						
	NP	-	Mp	-	Oc							

Area	**Category I** Degree of nutrient enrichment	**Category II** Direct effects	**Category III and IV** Indirect effects/ other possible effects	Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Clyde estuary (area of particular continuing interest)	NI - DI + NP -	Ca - Ps ? Mp -	O_2 - Ck - Oc - At	Potential problem area	• There is evidence of nutrient enrichment (high confidence), as winter DIN exceeded the assessment threshold. However, the N/P ratio did not exceed the threshold. • There are sufficient chlorophyll data to give high confidence that there is no evidence of accelerated growth. • There is low confidence in the evidence of undesirable disturbance due to very limited phytoplankton data, however the existing data suggest that the criterion would not be exceeded. The low dissolved oxygen concentrations at the head of the estuary during summer are related to inputs of urban wastewater rather than eutrophication. There is evidence to show that measures taken to reduce these discharges have led to an increase in diversity and abundance of zoobenthos in the estuary. There was evidence of no fish or zoobenthos kills since 1990. The final assessment of the Clyde estuary is as a non problem area (medium confidence), based on evidence that in spite of nutrient enrichment, there is strong evidence that there was no accelerated growth and evidence to show there was no undesirable disturbance.	Non problem area	2001-2005
Inner Firth of Clyde	NI - DI - NP -	Ca - Ps - Mp -	O_2 - Ck - Oc - At -	Non problem area	• There is no evidence of nutrient inputs increasing. There are sufficient winter nutrient data to give high confidence that there is no evidence of nutrient enrichment. • There are sufficient summer chlorophyll data to give high confidence that there is no evidence of accelerated growth. • The lack of suitable phytoplankton data gives low confidence in the conclusion of no undesirable disturbance. There is no evidence of alteration of the phytoplankton community. Macrophyte growth is below the assessment criterion. The waters are well oxygenated and there was evidence of no zoobenthos or fish kills. This is not a commercial shellfish area, so there have been no mussel infection events. The final assessment of the Inner Firth of Clyde is as a Non-Problem Area (high confidence), based on strong evidence of no nutrient enrichment or accelerated growth and evidence of no undesirable disturbance	Non problem area	2001-2005

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Forth estuary	NI	-	Ca	-	O_2	-	At	-	Non problem area	• Winter DIN exceeded the assessment criterion's threshold in 6 years between 1983 and 2005, but anthropogenic nutrient inputs have decreased since 1991. The estuary is assessed as enriched (medium confidence). • Summer chlorophyll data exceeded the assessment criterion once in 1997, but remained below the threshold during 2001 – 2005 assessment period, so there is no evidence of accelerated growth (high confidence). • There were insufficient data to apply the phytoplankton community assessment tool. Low dissolved oxygen concentrations in the turbidity maximum in the upper estuary result from the degradation of resuspended terrigenous organic matter in the water column. There was evidence of no fish kills since the early 1990s. This is not a commercial shellfish area, so there have been no mussel infection events. The conclusion is that there is no undesirable disturbance (medium confidence). The final assessment of the Forth Estuary is as a non problem area (medium confidence), based on evidence that in spite of nutrient enrichment, there is strong evidence that there was no accelerated growth and evidence to show there was no undesirable disturbance.	Non problem area	2001-2005
	DI	+	Ps	-	Ck	-						
	NP	-	Mp	-	Oc	-						

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Tay estuary	NI DI NP	- + +	Ca Ps Mp	- - -	O_2 Ck Oc	- - -	At	-	Non problem area	• Winter DIN exceeded the assessment criterion on 2 out of 6 years. The N/P ratio exceeded the threshold in saline waters in 1997, 1999 and 2000, but has not exceeded during the 2001 – 2006 assessment period. Nutrient inputs from wastewater discharges are low and have decreased over the study period. The area is assessed as enriched (medium confidence). • Chlorophyll was measured at 10 fixed stations on axial surveys during the summer (June – August) in 2001 – 2005, inclusive. Chlorophyll exceeded the assessment criterion in 2003 due to localised mid-estuarine peak, but was well below the assessment criterion in all other years. The area is assessed as having no accelerated growth (low confidence). • It was not possible to use the quantitative assessment criterion for phytoplankton; however, qualitative assessment indicated no undesirable disturbance. There were sufficient data to conclude that waters are well oxygenated. There was evidence of no zoobenthos or fish kills. Macroalgae growth was not extensive. Overall there is no evidence of undesirable disturbance (medium confidence). The final assessment of the Tay estuary is a non problem area (medium confidence), based on evidence that in spite of nutrient enrichment there is no evidence of accelerated growth and undesirable disturbance.	Non problem area	2001-2005

Area	**Category I** Degree of nutrient enrichment	**Category II** Direct effects	**Category III and IV** Indirect effects/ other possible effects	Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Eden estuary	NI - DI + NP +	Ca - Ps - Mp -	O_2 - Ck - Oc - At -	Non problem area	• Winter DIN and N/P ratios exceeded their assessment criteria. The estuary is designated as enriched with nutrients (high confidence). • Chlorophyll concentrations were low as phytoplankton growth is limited by the high flushing rate. There is low confidence in the conclusion of no evidence of accelerated growth, as the data are limited. • Estimates of macroalgal cover are limited to 2004 when the assessment criteria were not exceeded. The waters were well oxygenated and there was evidence of no zoobenthos or fish kills. The benthic community did not appear to be modified. This is not a commercial shellfish area, so there have been no mussel infection events. There is evidence of absence of undesirable disturbance (medium confidence). The final assessment of the Eden Estuary is as a non problem area (medium confidence), because in spite of nutrient enrichment there is some evidence to show there was no accelerated growth and reasonable evidence to show there was no undesirable disturbance.	Non problem area	2001-2005
South Esk estuary (Montrose Basin)	NI - DI + NP +	Ca - Ps - Mp +	O_2 - Ck - Oc - At -	Problem area	• Winter DIN and N/P ratios exceeded the assessment criteria. The area is considered to be nutrient enriched (high confidence). • Chlorophyll concentrations were low and there are sufficient data to give medium confidence in the evidence of no accelerated growth. • There was no evidence of modification of the phytoplankton community. Estimates of opportunistic green algal cover in the intertidal area exceeded the assessment criterion. The waters were well oxygenated. There was an abundant and diverse zoobenthos population in the intertidal area and there was evidence of no zoobenthos or fish kills. This is not a commercial shellfish area, so there have been no mussel infection events. There is no evidence of undesirable disturbance (medium confidence). The final assessment of the South Esk estuary (Montrose Basin) is a potential problem area (medium confidence), based on evidence of nutrient enrichment and accelerated growth of opportunistic green algae, although there is no evidence of undesirable disturbance.	Potential problem area	2001-2005

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Ythan estuary	NI	-	Ca	+	O_2	-	At	-	Problem area	• Nitrogen concentrations in the river Ythan were high, so winter DIN and the N/P ratio exceeded respective thresholds, indicating enrichment (high confidence). • Summer chlorophyll exceeded the assessment criteria (high confidence). • There was no evidence of modification of the phytoplankton community. The Ythan estuary was designated as a Nitrate Vulnerable Zone in 2000 on the basis of extensive growth of macrophytes covering the intertidal area. The waters were well oxygenated and there was evidence of no zoobenthos or fish kills. This is not a commercial shellfish area, so there have been no mussel infection events. The assessment is of no undesirable disturbance (medium confidence). The Comprehensive Procedure assessment indicates that the designation of the Ythan Estuary as a problem area purely on the basis of it being a nitrate vulnerable zone may be somewhat precautionary, as although there is strong evidence of nutrient enrichment and accelerated growth, there is reasonable evidence of no undesirable disturbance, which, overall would lead to classification as a non problem area or potential problem area.	Problem area	2001-2005
	DI	+	Ps	-	Ck	-						
	NP	+	Mp	+	Oc							

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Inner Belfast Lough	NI DI NP	- + -	Ca Ps Mp	+ ? ?	O_2 Ck Oc	- -	At	-	Problem area	The Inner Belfast Lough was designated as a UWWTD 'sensitive area' in 2001, and as described in section 4.2 of the national report, such waters have been automatically designated as problem areas or potential problem areas under the OSPAR Comprehensive Procedure. The assessment below uses the CP assessment to check this policy. • The Inner Lough is enriched in nutrient concentrations (high confidence), although there is evidence that reductions in nutrient inputs over the last five years have resulted in improvements. • There is still some evidence of accelerated growth on occasions in the chlorophyll and *in-situ* fluorescence data, (high confidence). • There has been evidence of undesirable disturbance to the balance of organisms (medium confidence). Toxin-producing algae and cysts have been recorded in the 1990s. There are no macroalgae records. DO concentrations are consistently high. There has been a step change improvement in benthic invertebrate faunal population, linked to the reductions in organic carbon as a result of improved effluent treatment and the consequent reduction in nutrients. No fish kills have been recorded. With the current location of WWTW outfalls, this will remain as either a Problem Area, or possibly a Potential Problem Area under the Comprehensive Procedure in the future (high confidence).	Problem area	Nutrients (1993-2005) Biomass (2002-2006) Phytoplankton spp. (1998-2002)
Outer Belfast Lough	NI DI NP	- - -	Ca Ps Mp	- - -	O_2 Ck Oc	- -	At	-	Non problem area	• The Outer Lough is not currently enriched with nutrients (high confidence). • There is no evidence of accelerated algal growth. There is evidence of a reduction in chlorophyll concentrations throughout the Lough from *in-situ* monitoring over the last 10 years (high confidence). Actual chlorophyll concentrations fall below the threshold value in 2004 – 2006. • There is no evidence of excessive growth of macroalgae. Dissolved oxygen concentrations are consistently >8 mg l^{-1}, i.e. well above the critical threshold. Zoobenthos data did not indicate long-term change. There is no evidence of an undesirable disturbance (high confidence). The final assessment of the Outer Belfast Lough is as a non problem area (high confidence); based on strong evidence that there was no nutrient enrichment, no accelerated growth and no undesirable disturbance.	Non problem area	Nutrients (1990-2005) Biomass (1991-2005)

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Carlingford Lough	NI DI NP	- + +	Ca Ps Mp	- - -	O_2 Ck Oc	- -	At	-	Non problem area	• There is some evidence of nutrient enrichment but over a longer time scale nutrient concentrations are not elevated and inputs are not increasing (medium confidence). • There is no evidence of accelerated growth of algae. Although the water sampling strategy changed in 1998 to winter only, an *in-situ* buoy has now been installed. • There are no nuisance phytoplankton species and only one toxin producing algae incident over the period. No excessive macroalgal growth. Dissolved oxygen is typically >8 mg l^{-1} i.e. well above the critical threshold. There are no impacts on fish or zoobenthos communities. There is no evidence of undesirable disturbance (high confidence). The final assessment of Carlingford Lough is as a non problem area (medium confidence) based on evidence that nutrient enrichment is decreasing, some evidence to show that there is no accelerated growth and strong evidence to show there is no undesirable disturbance.	Non problem area	Nutrients (1991-2003) Biomass (1991-2001)
Foyle Estuary & Lough	NI DI NP	- + +	Ca Ps Mp	- ? ?	O_2 Ck Oc	+ -	At	-	Problem area	• There is some evidence of enrichment of nitrogen on occasions and N/P ratios are elevated (high confidence). • There is evidence of accelerated growth in the chlorophyll and fluorescence data from an *in-situ* buoy (medium confidence). • Phytoplankton nuisance species levels remained low and toxin-producing algae were recorded but did not result in a shellfish toxin event. Dissolved oxygen is consistently above 6mg l^{-1} throughout both the Lough and the estuary with the occasional dip in DO concentrations in the most upstream of the freshwater sites (medium confidence). There is no undesirable disturbance to the fish or zoobenthos communities. Opportunist macroalgae abundance is low (medium confidence). The final assessment of the Foyle Estuary and Lough is as a potential problem area (medium confidence in *in-situ* monitoring), based on evidence of nutrient enrichment, accelerated growth and limited evidence of undesirable disturbance in the form of low dissolved oxygen values.	Potential problem area	Nutrients (1990-2006) Biomass (1997-2006)

Area	**Category I** Degree of nutrient enrichment	**Category II** Direct effects	**Category III and IV** Indirect effects/ other possible effects	Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Strangford Lough; north	NI - DI + NP -	Ca - Ps - Mp +	O_2 - Ck - Oc At -	Potential problem area	• Nutrient concentrations are elevated above the threshold, but DIN/DIP ratios are not. This is classified as nutrient enriched (medium confidence). • Chlorophyll is low and only exceeds the threshold on a few occasions. There is no accelerated growth (high confidence). • There are no exceptional occurrences in the phytoplankton data. Species richness of macroalgae is reduced in the north end of the Lough, with an increased abundance of *Enteromorpha* spp. Dissolved oxygen is predominantly >6 mg l^{-1}. Zoobenthos data show an improvement in the community to good/high ecological status. There is considered to be some evidence of undesirable disturbance given that *Enteromorpha* spp is taking over the ecological niche of the *Zostera* spp. beds (medium confidence). The north end of Strangford Lough is exhibiting some signs of disturbance. The final assessment of the Strangford Lough North is as a potential problem area (medium confidence), based on evidence of nutrient enrichment (medium confidence), accelerated growth (medium confidence) and limited evidence of undesirable disturbance (medium confidence) in the form of changing angiosperm/macroalgae dominance.	Potential problem area	Nutrients (1994-2005) Biomass (1990-2005)
Strangford Lough; south	NI DI - NP -	Ca - Ps - Mp -	O_2 - Ck - Oc At -	Non problem area	• Nutrient concentrations and DIN/DIP ratios are not elevated, though there are few recent data (medium confidence). • Chlorophyll is low and rarely exceeds the threshold (high confidence). • There was only one, short-lived exceedance in *Dinophysis* spp. (2004) in the phytoplankton data. This area supports a high diversity of macroalgal species and benthic infaunal quality fluctuates between good and high status. DO is predominantly below the threshold of 6 mg l^{-1}. The zoobenthos community is undisturbed. There have been no recorded incidents of toxicity in bivalve mollusc tissue in the Lough The final assessment of Strangford Lough South is as a non problem area (high confidence), based on good evidence that nutrient enrichment and accelerated growth do not occur, and strong evidence to show there is no undesirable disturbance.	Non problem area	Nutrients (1994-2004) Biomass (1990-2005)

Area	**Category I** Degree of nutrient enrichment		**Category II** Direct effects		**Category III and IV** Indirect effects/ other possible effects				Initial classification	Appraisal of all relevant information (concerning the harmonised assessment parameters, their respective assessment levels and the supporting environmental factors)	Final classification	Assessment period
Larne Lough	NI	-	Ca	-	O_2	-	At	-	Non problem area	• Winter nutrient concentrations within the Lough are close to background concentrations for the Irish Sea. DIN/DIP ratios are not elevated (high confidence). • Chlorophyll is consistently < 6 µg l^{-1} throughout the summer and concentrations cannot be considered to be elevated. However, there are no data since 2002 (medium confidence). • There have been no occurrences of algal scums (e.g. *Phaeocystis)*, nuisance algal blooms or toxicity in bivalve mollusc tissue. Dissolved Oxygen concentrations are consistently > 6 mg l^{-1}. The benthic invertebrate community are now considered consistent with unpolluted or normal conditions. There is no undesirable disturbance (high confidence). The final assessment of Larne Lough is as a non problem area (high confidence) based on good evidence that nutrient enrichment and accelerated growth do not occur, and strong evidence to show there is no undesirable disturbance	Non problem area	Nutrients (1993-2003) Biomass (1992-2002)
	DI	-	Ps	-	Ck	-						
	NP	-	Mp	?	Oc							

Annex 3 List of problem areas and potential problem areas with regard to eutrophication identified by Contracting Parties in the first and second application of the Comprehensive Procedure

Contracting Party and marine area	Classification in 2003 (OSPAR, 2003a)	Classification in 2008
Belgium		
Coastal area Offshore area	Problem area / Potential problem area / Non problem area	Coastal area: problem area Offshore area: potential problem area
Denmark		
Kattegat		
Kattegat Coastal areas	Problem area	
western coastal area Djursland southern coastal		A11 Problem area A18 Problem area A20 Problem area
Kattegat fjords and estuaries		
Limfjorden – eastern part Limfjorden – central parts Limfjorden – southern parts Limfjorden – western parts Mariager Fjord Randers Fjord Isefjorden Roskilde Fjorden		A12 (Problem area) A13 Problem area A14 Problem area A15 Problem area A16 Problem area A17 Problem area A21 (Problem area) A22 Problem area
Kattegat Open areas	Problem area	
northern part central part southern part		A9 Problem area A10 Problem area A19 Problem area
Skaggerak		
Skagerrak Coastal area	Problem area	A7 Problem area
Skagerrak Open area	Problem area	A8 Non-problem area
North Sea		
North Sea open waters		A1 Non problem area/Potential problem area/Problem area
North Sea Southern coastal waters		A2 Problem area
Wadden Sea	Problem area	A3 Problem area
North Sea Coastal area	Problem area	A4 Problem area
Ringkøbing Fjord		A5 Problem area
Nissum Fjord		A6 (Problem area)
France		
Dunkerque and Calais	Problem area	S1 Potential problem area
Boulogne and Canche	Problem area	S2 Potential problem area
Authie and Somme	Problem area	S2 Potential problem area
Estuary and Bay of Seine	Problem area	S4 Problem area
Calvados	Problem area	S5 Problem area
Bay des Veys and St Vaast	Potential problem area	S6 Potential problem area
Rance	Non problem area	S10 Problem area
Arguenon and Fresnaye	Problem area	S10 Problem area
St Brieuc	Problem area	S11 Problem area
Lannion	Problem area	S13 Problem area
Morlaix	Problem area	S13 Problem area
Abers finistériens	Non problem area	S14 Problem area
Iroise (not identified in 2002)	Non problem area	S15 Potential problem area
Brest	Potential problem area	S16 (Problem area)
Douarnenez	Problem area	S17 Problem area
Audierne	Non problem area	S18 Problem area
Concarneau	Problem area	S19 Problem area
Aven, Belon (and Laïta)	Non problem area	S19 Problem area
Lorient	Potential problem area	S20 Potential problem area
Etel (and Groix)	Non problem area	S20 Potential problem area

Golfe du Morbihan	Non problem area	S22 Potential problem area
Vilaine	Potential problem area	S23 (Problem area)
Loire and Bourgneuf	Problem area	S24 Problem area
Bassin d'Arcachon (Arcachon and Landes)	Problem area	S27 Non problem area
Germany		
Estuaries (<28): Elbe, Weser, Ems	Problem area	Problem area
Wadden Sea (15-33)	Problem area	Problem area
Coastal Waters (25-34.5)	Problem area	Problem area
Offshore (>34.5)	Potential problem area	Potential problem area
Ireland		
E16 Castletown Estuary	Problem area	A1 Problem area
Inner Dundalk Bay	Not assessed	A2 Problem area
Boyne Estuary	Not assessed	A4 Potential problem area
Rogerstown Estuary (Inner)	Not assessed	A6 Problem area
Rogerstown Estuary (Outer)	Not assessed	A7 Problem area
E12 Broadmeadow Estuary (Inner)	Problem area	A9 Problem area
E30 Liffey Estuary	Problem area	A12 Potential problem area
E39 Slaney Estuary (Upper)	Problem area	A17 Problem area
E40 Slaney Estuary (Lower)	Problem area	A18 Problem area
South Wexford Harbour	Not assessed	A19 Problem area
Wexford Harbour	Not assessed	A20 Problem area
Nore Estuary	Not assessed	A21 Problem area
E3 Barrow Estuary	Problem area	A22 Problem area
E5 Suir Estuary (Upper)	Problem area	A24 Problem area
E18 Colligan River	Problem area	A28 Problem area
E19 Dungarvan Harbour	Problem area	A29 Problem area
E8a Blackwater Estuary Upper	Problem area	A30 Problem area
E8b Blackwater Estuary Lower	Problem area	A31 Problem area
E26a Lee Estuary/Lough Mahon	Problem area	A33-34 Problem area
E26b Owennacurra Estuary/North Channel	Problem area	A35 Problem area
E1a Upper Bandon Estuary	Problem area	A37 Problem area
E1b Lower Bandon Estuary	Problem area	A38 Problem area
Kinsale Harbour	Not assessed	A39 Problem area
Argideen Estuary	Not assessed	A40 Problem area
E28a Upper Lee (Tralee) Estuary	Problem area	A41 Problem area
E28b Lower Lee (Tralee) Estuary	Problem area	A42 Potential problem area
E15a Upper Feale Estuary	Problem area	A44 Non problem area
E15b Cashen Feale Estuary	Problem area	A45 Potential problem area
E36 Maigue Estuary	Potential problem area	A48 Non problem area
E37 Deel Estuary	Potential problem area	A46 Non problem area
E38 Fergus Estuary	Problem area	A47 Non problem area
E24 Killybegs Harbour	Problem area	A59 Problem area
McSwyne's Bay	Not assessed	A60 Potential problem area
Upper Swilly Estuary	Not assessed	A61 Problem area
Netherlands		
Dutch offshore Oyster Grounds	Problem area	Non problem area
Dogger Bank	Non problem area	Non problem area
Dutch offshore Southern waters	Problem area	Problem area
Dutch coastal waters (salinity < 34.5)	Problem area	Problem area
Dutch Wadden Sea	Problem area	Problem area
Dutch Ems Dollard	Problem area	Problem area
Dutch Western Scheldt	Problem area	Problem area
Norway		
A1 Iddefjorden	Problem area	S1 Problem area
A2 Hvaler/Singlefjord	Problem area	S1 Problem area
A3 Inner Oslofjord	Problem area	S2 Problem area
A4 Drammensfjord	Problem area	S2 Problem area
A5 Sandebukta etc.	Problem area	S2 Problem area
A6 Middle part of outer Oslofjord coastline	Problem area	S3 Problem area

A7	Southern part of outer Oslofjord	Potential problem area	S4 Problem area
A8	Tønsbergfjord	Problem area	S3 Problem area
A9	Southern part of Tønsbergfjord	Potential problem area	S3 Problem area
A10	Sandefjordsfjord	Problem area	S3 Problem area
A11	Larviksfjord and Viksfjord	Potential problem area	S4 Problem area
A12-A13	Frierfjord/Grenlandsfjord	Problem area	S5 Problem area
A14	Telemark	Potential problem area	S6 Problem area
A15	Stølefjord/ Kragerøfjord	Potential problem area	S7 Problem area
A16	Stølefjord/ Kragerøfjord	Problem area	
A17-A18	Søndeledfjord/ Sandnesfjord	Problem area	S8 Problem area
A19	Lyngør archipelago	Potential problem area	S9 Problem area
A20	Tvedestrandsfjord	Problem area	S10 Problem area
A21	Flostadøysund	Potential problem area	S9 Problem area
A22	Tromøysund	Potential problem area	S9 Problem area
A23	Arendal fjord and Utnes	Problem area	S11 Problem area
A24	Arendal fjord and Utnes	Potential problem area	
A25	Fevik coast	Potential problem area	S9 Problem area
A26	Grosfjord, Vikkil and Bufjord	Potential problem area	S9 Problem area
A27	Grosfjord, Vikkil and Bufjord	Potential problem area	S9 Problem area
A28	Kaldvellfjord	Potential problem area	S12 Problem area
A29	Lillesand outer	Potential problem area	S12 Problem area
A30	Skallefjord and Tingsakerfjord	Potential problem area	S12 Problem area
A31-A32	Steindalsfjord, Isefjærfjord and Blindleia south	Problem area	S9 Problem area
A33	Steindalsfjord, Isefjærfjord and Blindleia south	Potential problem area	S9 Problem area
A34	Kvåsefjord	Potential problem area	S9 Problem area
A35-A36	Ålefjærfjord, Topdalsfjord and Kristiansandsfjord	Potential problem area	S13 Problem area
A37-A38	Vågsbygd and Songvårdsfjord	Potential problem area	S14 Problem area
A39	Trysfjord	Problem area	S14 Problem area
A40	Harkmarksfjord	Potential problem area	S14 Problem area
A41	Buøysund	Potential problem area	S14 Problem area
A42	Skogsfjord	Potential problem area	S14 Problem area
A43	Mannefjord	Potential problem area	S14 Problem area
A44	Hillesund-Snigsfjord	Potential problem area	S14 Problem area
Portugal			
Mondego Estuary		Potential problem area	Potential problem area
Spain			
Basque region			
	Butroe Estuary	Not assessed	Potential problem area
	Oka Estuary	Not assessed	Potential problem area
	Inurritza Estuary (unit of the Oria)	Not assessed	Potential problem area
	Oiartzun Estuary	Not assessed	Potential problem area
Cantabria			
	Oyambre Estuary	Not assessed	Potential problem area
	Santander Bay	Not assessed	Potential problem area
	Joyel Estuary and marshes	Not assessed	Potential problem area
	Victoria Esturay and marshes	Not assessed	Potential problem area
	Santoña Estuary and marshes	Not assessed	Potential problem area
Andalucia			
	Tinto-Odiel Estuary	Not assessed	Potential problem area
	Guadalquivir Estuary	Not assessed	Potential problem area
	P. N. Bahía de Cádiz	Potential problem area	Potential problem area
Sweden			
Coastal Kattegat		Problem area	Problem area
Offshore Kattegat		Problem area	Problem area
Coastal Skagerrak		Problem area	Problem area
Offshore Skagerrak		Problem area	Non problem area

UK		
England and Wales		
Seal Sands, Tees Estuary	Problem area	Problem area
Lindisfarne NNR area	Problem area	Problem area
Pagham Harbour	Problem area	Problem area
Chichester Harbour	Problem area	Problem area
Langstone Harbour	Problem area	Problem area
Eastern Yarn	Not assessed	[Problem area][1]
Portsmouth Harbour	Potential problem area	Problem area
Holes Bay (a small part of Poole Harbour embayment)	Problem area	Problem area
Poole Harbour	Potential problem area	Potential problem area
The Fleet	Potential problem area	Potential problem area
Truro, Tresillian and Fal Estuaries	Problem area	Problem area
Taw Estuary	Problem area	Problem area
Tawe	Problem area	Problem area
Loughor Estuary	Potential problem area	Problem area
Lower Fal estuary	Not assessed	[Problem area][1]
Medina estuary	Not assessed	Problem area
Newton Harbour	Not assessed	Problem area
Hamble estuary	Not assessed	Problem area
Scotland		
Ythan Estuary	Problem area	Problem area
South Esk estuary (Montrose basin)	Not assessed	Potential problem area[2]
Northern Ireland		
Quoile Pondage (in Strangford Lough Catchment) Strangford Lough North Strangford Lough South	Problem area	Potential problem area Non problem area
Inner Belfast Lough & Tidal Lagan Impoundment	Problem area	Problem area
Foyle estuary and lough	Not assessed	[Potential problem area][1]

[1] The status for these areas is provisional, and is dependent on formal designation under the Nitrates Directive. The UK will inform OSPAR when the position is clear.

2 The South Esk estuary (Montrose Basin) is not designated as a 'nitrate vulnerable zone' but most of the catchment in which it is situated has been designated as a 'nitrate vulnerable zone'. Therefore, this area should benefit from the associated nitrogen reductions.

Annex 4 Assessment levels of selected assessment parameters used by Contracting Parties

4.1 Assessment levels for winter DIN and winter DIP

Table 4.1 Salinity-related assessment levels used by Contracting Parties for winter DIN and winter DIP.

OSPAR Region	Contracting Party	Salinity: normalisation value (and nominal range)	Winter DIN (µmol/l) Range of salinity-related assessment levels			Winter DIP (µmol/l) Range of salinity-related assessment levels		
			Offshore	Coast	Estuary	Offshore	Coast	Estuary
II	Sweden/Kattegat	30 (10-33)	7 (1-15)	6 (1-20)	---	0.6 (0.1-1)	0.6 (0.3-1)	---
	Sweden/Skagerrak	30 (10-33)	7 (1-15)	6 (1-20)	---	0.6 (0.1-1)	0.6 (0.3-1)	---
	Norway[1]	20	---	9	9	---	0.7	0.7
	Denmark/North Sea open	(30–34.5)	5.9	5.3-5.9	---	0.9	0.6-0.9	---
	Denmark/Skagerrak	(30-34)	8.3	7.4	---	1.0	0.9	---
	Denmark/Kattegat	(20-30)	3.5-34.2	9.9-14.7	---	0.6-0.8	0.7-0.8	---
	Denmark/Wadden Sea	(27-34)	---	17.3	---	---	0.6	---
	Germany	30	8	11-12	17-26	0.5	0.6	0.2-0.5
	Netherlands	30	15	30	30	0.8	0.8	0.8
	Belgium	33.5	12	15	---	0.8	0.8	---
	France[5]	---	---	---	---	---	---	---
	United Kingdom[3]	35 (offshore) 32 (coastal)	15	20	30	---	---	---
III	United Kingdom[3]	35 (offshore) 32 (coastal)	15	20	30	---	---	---
	Ireland	34.8, 34.5, 30	12	18	42	0.8	1.25	1.5
IV	France[5]	---	---	---	---	---	---	---
	Spain[4]	30 (0.5 - >35)	---	12-15	24-50	---	0.68-1.0	0.78-1.10
	Portugal	---	--	---	66[2] (0-36)	---	---	---

[1] Norway used summer mean concentrations for nutrients with the assessment levels from the Norwegian Classification System. The values that are given here are the assessment levels for the nutrient winter mean concentrations of that same system. Recalculated from mg/l
[2] Portugal used the measured value of 1993
[3] The UK used the N/P ratio = 24 as assessment level (corresponds with 0.625, 0.83, 1.25 µmol/l DIP for offshore, coast and estuaries, respectively). The UK did not use winter DIP as nitrogen is the limiting nutrient in UK waters.
[4] Provisional values for Spain; a range needs to be established for all Spanish autonomous communities. Values for the coast are referred to 35 (average).
[5] France considered that the relationship between nutrient concentration and eutrophication is too complex to define a eutrophication criterion based on nutrient concentrations or nutrient ratios.

4.2 Assessment levels for chlorophyll *a*

Table 4.2 Assessment levels used by Contracting Parties for chlorophyll *a* mean and maximum (max.) concentrations and the 90 percentile (90 per.)

OSPAR Region	Contracting Party	Chlorophyll *a* (µg/l)								
		Offshore			Coast			Estuary		
		Mean	Max.	90 per.	Mean	Max.	90th per.	Mean	Max.	90th per.
II	Sweden/Kattegat	1.5	---	5.7	2.0	---	9.6	---	---	---
	Sweden/Skagerrak	1.4	---	5.9	2.3	---	10.1	---	---	2
	Norway	3.5	---	---	3.5	---	---	3.5	---	---
	Denmark/North Sea open	3.2	---	---	2.4-2.9	---	7.5	---	---	---
	Denmark/Skagerrak	3.8	---	---	2.7	---	4	---	---	---
	Denmark/Kattegat	0.9-2.3	---	3	1.5-2.4	---	---	---	---	---
	Denmark/Wadden Sea	---	---	---	2.9	---	7.5	---	---	---
	Germany	2.3	9		3	14				
	Netherlands	2.25	---	4.5	7.5	---	15	9	---	18
	Belgium	4.2	---	8.4	7.5	---	15	---	---	---
	France	---	---	15	---	---	15	---	---	15
	United Kingdom	---	---	10	---	---	15	---	---	15
III	United Kingdom	---	---	10	---	---	15	---	---	15
	Ireland	---	---	---	10[2]	---	20	15[2]	---	30
IV	France	---	---	10	---	---	10	---	---	15
	Spain[1]	---	---	---	---	---	7-12	12	---	15
	Portugal	---	---	---	---	---	---	7.4	56	15

[1] Provisional values for Spain. A range still must be established for all Spanish autonomous communities. For estuaries, the value for mean chlorophyll is applied in Andalusia; the value for the 90 percentile is applied in Basque Country.

[2] Applied as median. Assessment levels derived from chlorophyll data extracted using the hot methanol extraction method, assessment levels for chlorophyll data based on cold acetone extraction are 50% lower.

4.3 Assessment levels for oxygen

Table 4.3 Assessment levels used by Contracting Parties for oxygen in bottom layer for stratified water or in surface layer mixed waters; 'nr' marks where oxygen concentration is not relevant for the assessment.

OSPAR Region	Contracting Party	Oxygen deficiency in concentration (mg/l)	% saturation
II	Sweden/Kattegat	2.8 (0.6 – 5 percentile)	45 (8.5 – 5 percentile)***
	Sweden/Skagerrak	3.5 (0.0 – 5 percentile)	50 (0.0 – 5 percentile)
	Norway	5*	---
	Denmark	2 and 4	---
	Germany	6	70%, 84%**
	Netherlands	6	---
	Belgium	6	---
	France	3 (10 percentile)	---
	United Kingdom	4 (5 percentile)	---
III	United Kingdom	4 (5 percentile)	---
	Ireland	Assessed as % saturation Concentration mg/l equivalents for 5 percentile at 20° C are: 6.5 (tidal fresh waters) and 6.0 (full salinity waters)	5 percentile and 95 percentile: Tidal fresh waters: <70 or >130 Intermediate waters: <70 or >130 Full salinity waters: <80 or >120
IV	France	3 (10 percentile)	---
	Spain	6	80
	Portugal	8.4 (6mg/l, 10 percentile)	---

* recalculated from ml/l; ** applied additionally; *** (8.5 – 5 percentile) means that the average % saturation value is 8.5 for the lowest 5% of the observations.

4.4 Assessment level for area-specific phytoplankton indicator species

Table 4.4 Assessment levels for area-specific phytoplankton indicator species

"N.D.A": No Data Available, "√": parameter assessed but no threshold values found.

	Species	Belgium	Denmark	France	Germany	Ireland	Netherlands	Norway	Portugal	Spain	Sweden	UK
Nuisance species	*Phaeocystis spp.*	>10^7 cell/l >30 days duration*	-	Taxon list: 40% above the percentage of samples with at least one bloom defined by category and taxon size: small – 250.000 cells/L (unicellulars < 20 µm without chain); large: 100.000 cells/L (colonial species < 20 µm + sp. > 20 µm	>10^6 cells/l	-	>10^7 cells/l **	-	N.D.A.	N.D.A.	>10^6 cells/l	Phytoplankton index I_E: sum of the occurrence of any species (> 10^6), plus Phaeocystis (>10^6), plus total cell counts (>10^7) and counts of chlorophyll >10µg/l over a five year period. Assessment level: >25%
	Noctiluca scintillans	*	-		>10^4 cells/l	-	>10^4 cells/l	-	N.D.A.	N.D.A.	>10^4 cells/l	
Toxic species	*Chrysochromulina polylepis*	-	√		>10^6 cells/l	-	>10^6 cells/l	-	N.D.A.	N.D.A.	>10^6 cells/l	
	Karenia mikimotoi	-	-		>10^4 cells/l	-	>10^5 cells/l	√	N.D.A.	N.D.A.	>10^5 cells/l	
	Alexandrium spp.	-	-		>10^2 cells/l	-	>10^2 cells/l	√	N.D.A.	N.D.A.	>10^2 cells/l	
	Dinophysis spp.	*	√		>10^2 cells/l	-	>10^2 cells/l	√	N.D.A.	N.D.A.	>10^2 cells/l	
	Prorocentrum spp.	*	-		>10^4 cells/l	-	-	√	N.D.A.	N.D.A.	-	
	Pseudo-nitzschia spp.	-	√		>10^6 cells/l	-	-	√	N.D.A.	N.D.A.	>10^6 cells/l	
	Chattonella spp.	-	√		10^5 cell/l*	-	-	-	N.D.A.	N.D.A.	-	
	Odentella sinensis	-	-		>10^3 cells/l	-	-	-	N.D.A.	N.D.A.	-	
	Verrucophora spp.	-	-		-	-	-	√	N.D.A.	N.D.A.	>10^6 cells/l	

*: Data not available for the assessment period 2001-2005.
**: This parameter is new in the Dutch assessment.

OSPAR COMMISSION

New Court
48 Carey Street
London WC2A 2JQ
United Kingdom

t: +44 (0)20 7430 5200
f: +44 (0)20 7430 5225
e: secretariat@ospar.org
www.ospar.org

OSPAR's vision is of a clean, healthy and biologically diverse North-East Atlantic used sustainably

ISBN 978-1-906840-13-6
Publication Number: 372/2008