OSPAR COMMISSION

Overview of OSPAR assessments 1998 - 2006

Monitoring and Assessment Series

2006

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, 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.

contents

Main conclusions

This overview report is based on the thematic assessments undertaken by OSPAR over the period 1998 – 2006. The aim of the report is to summarise the conclusions reached by OSPAR over this period in fulfilment of its obligations to make assessments, particularly of progress in implementing the OSPAR Strategies, and to identify gaps in knowledge required for future assessments and how these gaps might be filled.

The overall conclusion is that some progress has been made towards achieving the aims of the Strategies but that further efforts are necessary in most fields. For a number of the gaps in knowledge that have been identified, assessment products are already foreseen by the OSPAR Joint Assessment and Monitoring Programme (JAMP) and are due to be delivered in the period 2007 – 2009.

An overall assessment of the health of the marine environment based on the application of EcoQOs is not yet available. So far, OSPAR work has been focused on developing the EcoQO system in the North Sea. The application of the advanced EcoQOs will take place in the period leading up to the QSR 2010 and will provide practical experience for improvements in their application. An evaluation of the results of the EcoQO system will be prepared in 2009 as contribution to the development of the QSR 2010.

The main challenges for the development of the EcoQO system are:

a. the geographical extension of the EcoQO system to cover the complete OSPAR maritime area;

b. the completion of a coherent and integrated suite of EcoQOs in relation to the OSPAR Strategies and the human activities covered by them;

c. the operational development of EcoQOs. Co-ordination of the monitoring in relation to EcoQOs is necessary to ensure comparability of the results from monitoring. This can be achieved by setting up mechanisms, similar to those established under the CEMP, through which a common approach to monitoring and related monitoring guidelines are developed (addressing such elements as sampling strategies, assessment methods and criteria, and quality assurance).

There is a general issue of data quality and completeness of data sets for assessments which makes it difficult to observe trends in time series and to compare data between Contracting Parties or within the time series of one Contracting Party. This concerns data submissions under OSPAR monitoring programmes, in implementation reports and other data reports under any of the thematic Strategies alike. There is also a need to ensure that assessments prepared by OSPAR, particularly those in the context of the JAMP, are relevant to the obligation under Article 6 of the Convention to make assessments of the quality status of the marine environment, and of its development for the maritime area or for the OSPAR regions.

Biological Diversity and Ecosystem Strategy

OSPAR's work on biodiversity and ecosystems has so far been concerned with establishing priorities for action. At this stage, there has been limited progress on meeting the strategic objectives of protecting and conserving ecosystems and biodiversity, and restoring marine areas, which have been adversely affected by human activities, although there has been some progress in raising the profile of threatened and declining species and habitats, e.g. cold-water coral reefs, and in identifying a first set of Marine Protected Areas (MPAs).

There is now a need to make substantive progress on identifying and applying management approaches to ensure the protection of species, habitats and sites in need of protection and to determine the strategies to be applied for monitoring and assessment.

In work on MPAs, OSPAR has so far largely focussed on the reporting of sites under existing nature protection regimes (e.g. NATURA 2000). In the years up to 2010 it will be important to focus on MPAs that contribute to the ecological coherence of the network of MPAs.

OSPAR is at an early stage in work to assess and monitor biodiversity and there are many connections with related work under EU Directives and many areas to seek harmonisation and coherence. OSPAR should seek to design biological monitoring programmes that are coherent across countries and will address both the requirements under the various EU Directives and the objectives of OSPAR. This will not only be cost-effective, but also contribute to a common understanding of ecosystem quality. Because many of these monitoring programmes are under development, or yet to be developed, it is an important time to seek harmonisation across the programmes, as this will become increasingly more difficult as the individual programmes settle down over time.

For the human activities covered by the Biological Diversity and Ecosystems Strategy, OSPAR has scheduled assessments as a contribution to the QSR 2010. OSPAR will continue to monitor the impact of those human activities where it has measures in place and long standing assessment experience e.g. dumping at sea; dredging; and munitions. There is a need to continue the assessment work that has been started on human activities such as offshore wind farms, litter and the placement of artificial reefs to develop a comprehensive understanding of their impacts. It is important to resolve questions on the significance of the impact of noise on marine species and ecosystems.

There is also a need to understand the collective impact of all human activities on the marine environment and their relative impact and to take this into account in the work that OSPAR is taking forward on spatial planning in the marine environment. An assessment of collective impact is due to be developed by 2009.

Hazardous Substances Strategy:

OSPAR has largely established priorities for action on hazardous substances and, taking into account on-going activities in the EC, it is likely that there will be less emphasis on this aspect of the work in the years to come, other than for groups of substances that are not adequately covered by other international fora.

With regard to the aim of moving towards the target of the cessation of discharges, emissions and losses of hazardous substances by the year 2020, the regular reviews of the actions/measures identified in Background Documents for substances on the OSPAR List of Chemicals for Priority Action show that some progress is being made. For example, recent progress includes the development by the EC of marketing and use restrictions for mercury (medical devices), phthalates in toys or perfluorooctane sulphonates (proposal still under discussion). However, for the substances that are currently produced and/or in use in the OSPAR Convention area, there is still scope for action and further efforts are needed.

For the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances, the Background Documents and the recent assessments (of trends) within the existing environmental monitoring programmes RID, CEMP and CAMP give some indication that for some substances progress is also being made.

The OSPAR List of Substances of Possible Concern will be further reviewed in the near future (based on actual/new information on the PBT properties of those substances) in order to identify which of the substances may require further scrutiny and work by OSPAR and which substances should no longer be considered as subject to the commitments of the Hazardous Substances Strategy.

For the substances currently included in the OSPAR List of Chemicals for Priority Action which have current uses in the OSPAR Convention area resulting in releases to the environment, monitoring strategies have been developed in order to be able to assess whether the objectives have been met. The monitoring strategies set out for each substance whether the most efficient way to measure progress towards the goals of the Strategy is by monitoring sales and usage figures, monitoring of emissions, discharges and losses or monitoring of concentrations in the marine environment. The 2004 agreement on monitoring strategies (updated in 2005 and 2006) reflects the details for every single substance and must be implemented. To have a better understanding of the changes that can be expected, there is a need for assessments which link emissions/discharges, inputs and concentrations and trends in these three parameters.

In relation to the ultimate aim, OSPAR will continue to quantify what values represents close to zero or near background in assessments by developing Background Concentrations and Environmental Assessment Criteria for any new substances to be included in the CEMP, with a focus on supporting assessments in sediments and biota. For hydrophobic substances in marine waters, it is more effective to have the primary focus of chemical monitoring for spatial and temporal trend purposes on concentrations in biota and sediment, rather than in water, because of (i) the dynamic nature of marine waters which make representative sampling difficult; (ii) low solubility of these substances in seawater; (iii) analytical challenges of seawater monitoring.

There is a need to make progress on defining the appropriate monitoring requirements for the different assessments required of spatial distribution and temporal trends, and needed to comply with the opting-out procedure of the CEMP.

There is also a need to make progress in meeting commitments to assess the biological effects of hazardous substances, taking account of the outcome of the review of the role of biological effects monitoring within the CEMP. Assessments of biological effects will have higher relevance if assessment criteria can be developed for the biological effects monitored under the CEMP.

Eutrophication Strategy:

OSPAR has further developed the conceptual framework and the assessment parameters of the Common Procedure for a further assessment in 2007 of the eutrophication status of the OSPAR maritime area. This assessment will seek a final characterisation of the areas currently classified as potential problem areas. It is expected that the assessment will still result in a number of maritime areas to be classified as problem areas with regard to eutrophication and that the objective of the Eutrophication Strategy to achieve a healthy marine environment where eutrophication does not occur may not be achieved by 2010.

One main element of the Strategy is the reduction of discharges, emissions and losses of nutrients to the marine environment by 50% compared to 1985. Recent assessments show that this target has so far not been attained for nitrogen.

From the assessments to date it is difficult to ascertain whether the input reductions achieved so far have resulted, or will result, in any decrease of concentrations of nutrients in the sea and of the incidence of eutrophication effects, and whether the reduction target of 50% is sufficient to progress towards the Strategy's objective. OSPAR will need to address these questions on the basis of model-based assessments in 2008 of the effectiveness of measures on the marine environment and nutrient reduction scenarios. To this end, OSPAR will continue work to improve the reliability of scenario modelling.

Monitoring of nutrient concentrations in the sea is now mandatory under the CEMP, and therefore it is necessary and timely for OSPAR to make co-ordinated assessments of trends in concentrations of nutrients in problem areas with regard to eutrophication.

Radioactive Substances Strategy:

OSPAR work on radioactive substances has concentrated so far on measures and actions to reduce, and monitor, discharges of radioactive substances to the marine environment. OSPAR initiatives in the nuclear sector have been progressively extended to the non-nuclear sectors. The OSPAR Radioactive Substances Strategy covers all sectors and sets the objective of preventing pollution of the maritime area from ionising radiation through progressive and substantial reductions of discharges, emissions and losses of radioactive substances, with the ultimate aim of concentrations in the environment near background values for naturally occurring radioactive substances and close to zero for artificial radioactive substances. In achieving this objective, legitimate uses of the sea, technical feasibility, and radiological impacts on man and biota must be taken into account. As its timeframe, the Radioactive Substances Strategy further declares that, by the year 2020, the Commission will ensure that discharges, emissions and losses of radioactive substances are reduced to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, emissions and losses, are close to zero.

Overall, the general conclusions are that:

a. for the non-nuclear sectors, there is no evidence whether the Radioactive Substances Strategy is yet being delivered, but there are some signs that appropriate actions are being taken;

b. for the nuclear sector, there is a spectrum, both within countries and between countries:

    (i) for some categories of discharges, levels of discharge in 2002 – 2004 were still above the average of the baseline period (1995 – 2001); for some other categories of discharges, there is statistically significant evidence of reductions and, in a few cases, of substantial reductions; most other categories of discharges lie in between;

    (ii) the substantial decreases include the very welcome decreases in discharges of technetium-99 since 2002, which are expected to continue. Technetium-99 was an issue to which both the 1998 and 2003 OSPAR Ministerial Meetings drew especial attention;

    (iii) since the evaluation is based on data for only three years (2002 – 2004), it is not possible to say generally whether the aims of the OSPAR Radioactive Substances Strategy are being delivered.

The recent assessment highlighted that there is a need to ensure coherence in trend assessment approaches and analysis with those used by OSPAR under the other Strategies, such as those techniques applied in relation to the CEMP.

OSPAR work on radioactive substances would need to be reflected in the ecosystem approach to human activities and its effects on the marine environment, for example through linking it to the system of ecological quality objectives.

Offshore Oil and Gas Industry Strategy:

On Offshore Oil and Gas Industry, there has been good progress with regard to the setting of environmental goals for the offshore oil and gas industry and the establishment of improved management mechanisms. Over the next years the emphasis of OSPAR's work will be in monitoring the implementation of these commitments and the level of success in preventing and eliminating pollution and protecting the maritime area against the adverse effects of offshore activities.

Discharges of oil to the marine environment from offshore activities are decreasing, although the amounts of discharges of oil through produced water in the North Sea is expected to increase over the next years. The achieved reductions can in part be accounted for by the virtual cessation of discharges of cuttings contaminated with oil-based mud. It remains to be seen whether controls on oil in produced water, leading in part to increased produced water re-injection will contribute significantly to a continuing downward trend. The data collected on use and discharges of chemicals offshore does not allow for an assessment of progress towards the goals of the Strategy yet. Assessments of data on discharges, spills and emissions for the years 2004 and 2005 will be available in 2007, and data from 2006 and 2007 will become available in time for the overall assessment planned in 2009 of the extent and impact of the offshore oil and gas industry. OSPAR concluded that placement of structures and associated infrastructure on the seabed are well regulated by Contracting Parties' national legislation and, thus, there is no current need for additional OSPAR measures. The conclusion implies that the impacts of offshore activities other than pollution do not have a detrimental effect. Information used to support these conclusions will be further assessed in 2007.

Conclusions principales

Le présent rapport récapitulatif est fondé sur les évaluations thématiques qui ont été réalisées par OSPAR entre 1998 et 2006. Le but de ce rapport est de résumer les conclusions auxquelles OSPAR a abouti en réponse à ses obligations d'effectuer des évaluations, en particulier sur les progrès réalisés dans la mise en oeuvre des Stratégies OSPAR, et de déterminer les lacunes dans les connaissances requises pour les prochaines évaluations et la manière de les combler.

On conclut, d'une manière générale, que certains progrès ont été effectués dans la réalistation des objectifs des Stratégies mais qu'il faudra poursuivre des efforts dans la plupart des domaines. Le Programme conjoint OSPAR d'évaluation et de surveillance continue (JAMP) a déjà prévu des produits d'évaluation qui correspondent à un certain nombre de lacunes dans les connaissances. La réalisation de ces produits est prévue entre 2007 et 2009.

On ne dispose pas encore d'une évaluation générale de l'état de santé du milieu marin basée sur l'application des EcoQO. Pour l'instant, les travaux d'OSPAR se sont concentrés sur le développement d'un système d'EcoQO dans la mer du Nord. L'application des EcoQO perfectionnés aura lieu durant la période qui mène au QSR 2010 et constituera une expérience pratique permettant d'améliorer leur application. On préparera en 2009 une évaluation des résultats du système d'EcoQO qui contribuera au développement du QSR 2010.

Le développement du système d'EcoQO présente les épreuves suivantes:

a. extension géographique du système d'EcoQO afin d'inclure toute la zone maritime OSPAR;

b. achèvement d'une série cohérente et intégrée d'EcoQO pour les Stratégies OSPAR et les activités de l'homme correspondantes;

c. développement opérationnel d'EcoQO. Il est nécessaire de coordonner la surveillance continue liée aux EcoQO afin de s'assurer que les résultats qui en découlent soient comparables. Ceci peut être réalisé en mettant en place des mécanismes, semblables à ceux qui ont été utilisés dans le cadre du CEMP, et qui permettent de développer une approche commune de surveillance et des lignes directrices correspondantes (et donc qui traitent de questions telles que les stratégies d'échantillonnage, les méthodes et les critères d'évaluation, et l'assurance de qualité).

Il est difficile de déterminer les tendances des séries temporelles et d'établir une comparaison entre les données des diverses Parties contractantes ou au sein d'une série temporelle d'une Partie contractante dans la mesure où, d'une manière générale, la qualité des données pose des problèmes et les séries de données ne sont pas toujours complètes. Il s'agit des données notifiées dans le cadre des programmes de surveillance d'OSPAR, dans les rapports de mise en œuvre ainsi que dans d'autres rapports de données dans le cadre des Stratégies thématiques. Il est également nécessaire de s'assurer que les évaluations qui sont préparées par OSPAR, en particulier dans le contexte du JAMP, sont pertinentes aux exigences de l'article 6 de la Convention OSPAR, à savoir d'effectuer des évaluations de l'état de santé du milieu marin et des développements correspondants en ce qui concerne la zone maritime ou les régions OSPAR.

Stratégie diversité biologique et écosystèmes

Les travaux d'OSPAR relatifs à la diversité biologique et aux écosystèmes se sont concentrés, jusqu'à présent, sur la détermination de mesures prioritaires. A ce jour, peu de progrès ont été effectués dans le sens des objectifs stratégiques, c'est-à-dire vis-à-vis de la protection et la préservation des écosystèmes et de la diversité biologique et la restauration des zones marines dans lesquelles les activités de l'homme ont eu un effet préjudiciable. Des progrès ont cependant été réalisés en ce qui concerne la promotion des espèces et des habitats menacés ou en déclin, par exemple les récifs de corail d'eau froide, et la détermination d'une première série de Zones marines protégées (ZMP).

Il est nécessaire, maintenant, de progresser sérieusement dans la détermination et l'application d'approches de gestion afin d'assurer la protection des espèces et des habitats ainsi que des sites qui doivent être protégés. Il est également nécessaire de déterminer des stratégies que l'on pourra appliquer à la surveillance et à l'évaluation.

En ce qui concerne les travaux sur les ZMP, OSPAR s'est concentrée, jusqu'à présent, sur les sites qui font l'objet de régimes existants de protection de la nature (par exemple NATURA 2000). Il est important que jusqu'en 2010, l'on se concentre sur les ZMP qui contribuent à la cohérence écologique du réseau des ZMP.

Les travaux d'évaluation et de surveillance de la diversité biologique d'OSPAR sont à un stade préliminaire et présentent de nombreux liens avec les travaux correspondants qui sont entrepris dans le cadre des Directives de l'UE. On recherche également l'harmonisation et la cohérence dans de nombreux domaines. OSPAR s'efforcera de concevoir des programmes de surveillance biologique qui sont cohérents pour tous les pays et qui remplissent à la fois les exigences dans le cadre des Directives de l'UE et les objectifs d'OSPAR. Ceci présentera des avantages financiers et contribuera également à parvenir à une entente commune de la qualité des écosystèmes. Dû au fait que beaucoup de programmes de surveillance soient en cours de développement, ou doivent être encore développés, il est important, dès maintenant, de rechercher à les harmoniser. Ceci devient beaucoup plus difficile lorsque les programmes individuels ont été bien établis dans le temps.

OSPAR a prévu des évaluations relatives aux activités de l'homme qui sont couvertes par la Stratégie diversité biologique et écosystèmes, évaluations qui contribueront au QSR 2010. OSPAR poursuivra la surveillance de l'impact de ces activités de l'homme dans les cas où elle a mis en place des mesures et où elle possède une longue expérience de l'évaluation, par exemple, pour les immersions en mer, le dragage et les munitions. Il est nécessaire de poursuivre les travaux d'évaluation qui ont été commencés et qui portent sur des activités de l'homme telles que les parc d'éoliennes en mer, les déchets et l'installation de récifs artificiels. Ceci permettra de comprendre, de manière exhaustive, leur impact. Il est important de résoudre la question de l'impact sonore sur les espèces marines et les écosystèmes.

Il est également nécessaire de comprendre l'impact collectif de toutes les activités de l'homme sur le milieu marin ainsi que leur impact relatif et d'en tenir compte dans les travaux qu'OSPAR poursuit sur la planification spatiale dans le milieu marin. Il est prévu d'effectuer une évaluation de l'impact collectif en 2009 au plus tard.

Stratégie substances dangereuses:

OSPAR a dressé une liste générale des actions prioritaires pour les substances dangereuses et, si l'on tient compte des activités en cours de la CE, il est fort probable que l'on se focalisera moins sur ces travaux dans les années à venir, à l'exception des groupes de substances qui ne sont pas couvertes de manière adéquate par les autres instances internationales.

Les études régulières des actions/mesures qui sont identifiées dans les documents de fond sur les substances inscrites dans la liste OSPAR des produits chimiques devant faire l'objet de mesures prioritaires démontrent que des progrès ont été accomplis dans le sens de l'objectif de cessation des rejets, émissions et pertes de substances dangereuses d'ici 2020. Par exemple, des progrès ont été récemment accomplis dans le développement, par la CE, de la commercialisation et des restrictions de l'utilisation du mercure (appareillage médical), des phthalates (jouets) ou des sulfonates de perfluorooctane (proposition en cours de discussion). Cependant, en ce qui concerne les substances qui sont actuellement fabriquées et/ou utilisées dans la zone de la Convention OSPAR, d'autres actions seraient souhaitables et il est nécessaire de faire des efforts supplémentaires.

Les documents de fond et les évaluations récentes (des tendances) dans le cadre des programmes actuels de surveillance de l'environnement RID, CEMP et CAMP indiquent également que des progrès ont été accomplis, pour quelques substances, dans le sens de l'objectif ultime, à savoir parvenir à des teneurs dans le milieu marin qui se rapprochent des niveaux ambiants, ou qui sont proches de zéro dans le cas des substances de synthèse.

La liste OSPAR des substances potentiellement préoccupantes sera à nouveau révisée très prochainement, à partir des informations actuelles et nouvelles sur les propriétés PBT de ces substances. Ceci permettra d'identifier quelles substances devront faire l'objet de nouveaux examens et de nouveaux travaux de la part d'OSPAR et quelles substances ne feront plus partie des obligations de la Stratégie substances dangereuses.

Des stratégies de surveillance ont été développées afin de permettre d'évaluer si l'on est parvenu aux objectifs en ce qui concerne les substances qui sont actuellement inscrites sur la liste OSPAR des produits chimiques devant faire l'objet de mesures prioritaires, actuellement utilisées dans la zone de la Convention et qui donnent lieu à des rejets dans le milieu marin. Ces stratégies de surveillance déterminent, pour chaque substance, si l'observation des statistiques de vente et de consommation, la surveillance des émissions, des rejets et des pertes ou des teneurs dans le milieu marin constituent la manière la plus efficace d'évaluer les progrès accomplis dans le sens de leur objectif. L'accord de 2004 sur les stratégies de surveillance (actualisé en 2005 et 2006) comporte les détails relatifs à chaque substance et doit être mis en oeuvre. Il est nécessaire d'effectuer des évaluations qui établissent un lien entre les émissions/rejets, les apports et les teneurs, d'une part, et les tendances de ces trois paramètres, d'autre part, afin de mieux comprendre les changements auxquels on peut s'attendre.

En ce qui concerne l'objectif ultime, OSPAR poursuivra la quantification des valeurs qui sont proches de zéro ou des valeurs ambiantes dans les évaluations en développant des teneurs ambiantes et des critères d'évaluation environnementale pour toutes les nouvelles substances qui seront inscrites dans le CEMP, en insistant plus particulièrement sur les évaluations sous-jacentes dans les sédiments et le milieu vivant. Dans le cas des substances hydrophobiques dans les eaux marines, il est plus efficace que la surveillance chimique - afin de déterminer des tendances spatiales et temporelles - se concentre principalement sur les teneurs dans le milieu vivant et les sédiments plutôt que dans l'eau, dans la mesure où (i) le dynamisme des eaux marines rend difficile un échantillonnage représentatif; (ii) ces substances sont peu solubles dans l'eau de mer; (iii) la surveillance de l'eau de mer présente des problèmes analytiques.

Il faut mieux définir les exigences de surveillance adéquate pour les diverses évaluations nécessaires afin de déterminer les tendances spatiales et temporelles et de respecter la procédure de dérogation du CEMP.

Il est également nécessaire de faire des progrès dans le sens des engagements qui ont été pris en ce qui concerne l'évaluation des effets biologiques des substances dangereuses en tenant compte des résultats de l'étude du rôle de la surveillance des effets biologiques dans le cadre du CEMP. Les évaluations des effets biologiques seront plus pertinentes si l'on peut développer des critères d'évaluation correspondants pour la surveillance dans le cadre du CEMP.

Stratégie eutrophisation:

OSPAR a développé plus avant le cadre conceptuel et les paramètres d'évaluation de la Procédure commune en vue d'une nouvelle évaluation, en 2007, de l'état d'eutrophisation de la zone maritime OSPAR. Cette évaluation cherchera à définir de manière définitive les caractéristiques des zones qui sont actuellement classées comme zones à problème potentiel d'eutrophisation. On prévoit que cette évaluation révèlera encore un certain nombre de zones maritimes qui doivent être classées comme zones à problème et que l'objectif de la Stratégie eutrophisation, à savoir parvenir à un milieu marin sain exempt d'eutrophisation, risque de ne pas être atteint d'ici 2010.

L'un des principaux éléments de cette Stratégie est une réduction de 50% des rejets, émissions et pertes de nutriments dans le milieu marin par rapport à 1985. Des évaluations récentes montrent que l'on n'est pas encore parvenu à cet objectif pour l'azote.

Il est difficile d'établir, à partir des évaluations qui ont été effectuées à ce jour, si la réduction des apports à laquelle on est parvenu jusqu'à présent a conduit ou conduira à une réduction des teneurs en nutriments dans la mer et de la présence d'effets d'eutrophisation et si l'objectif de réduction de 50% suffira pour atteindre l'objectif de la Stratégie. OSPAR devra aborder ces questions en se basant sur des évaluations qui seront effectuées à partir de modèles en 2008. Ces évaluations porteront sur l'efficacité de ces mesures dans le milieu marin et sur les scénarios de réduction des nutriments. A cette fin, OSPAR poursuivra ses travaux afin d'améliorer la fiabilité de la modélisation des scénarios.

La surveillance continue des teneurs en nutriments dans la mer est maintenant obligatoire dans le cadre du CEMP. Il est donc nécessaire et opportun qu'OSPAR coordonne les évaluations des tendances des teneurs en nutriments dans les zones à problème d'eutrophisation.

Stratégie substances radioactives:

Les travaux d'OSPAR sur les substances radioactives se sont concentrés, jusqu'à présent, sur des mesures et des actions visant à réduire et à surveiller les rejets de substances radioactives dans le milieu marin. Les initiatives d'OSPAR dans le secteur nucléaire se sont progressivement étendues aux secteurs non nucléaires. La Stratégie OSPAR substances radioactives couvre tous les secteurs et définit l'objectif, à savoir prévenir la pollution de la zone maritime par les radiations ionisantes par des réductions progressives et substantielles des rejets, émissions et pertes de substances radioactives, le but étant en dernier ressort de parvenir à des teneurs dans l'environnement qui soient proches des valeurs ambiantes dans le cas des substances radioactives présentes à l'état naturel et proches de zéro dans celui des substances radioactives de synthèse. Dans la réalisation de cet objectif, il convient de tenir compte des utilisations légitimes de la mer, de la faisabilité technique et des impacts radiologiques sur l'homme et sur le milieu vivant. Le calendrier de la Stratégie substances radioactives stipule de plus que d'ici l'an 2020, la Commission fera en sorte que les rejets, les émissions et les pertes de substances radioactives se réduisents à des niveaux où l'excédent des concentrations dans le milieu marin, par rapport aux niveaux historiques résultant de ces rejets, émissions et pertes, soit proche de zéro.

On conclut d'une manière générale que:

a. dans le cas des secteurs non nucléaires, il n'est pas prouvé que la Stratégie substances radioactives ait atteint son objectif. Cependant il semble que des mesures appropriées soient prises;

b. dans le cas du secteur nucléaire, les conclusions varient énormément, aussi bien au sein d'un pays qu'entre divers pays:

   (i) dans le cas de certains types de rejets, les niveaux entre 2002 et 2004 se situent toujours au dessus de la moyenne pour la période de base (de 1995 à 2001); dans le cas d'autres types de rejets, les statistiques révèlent nettement des réductions et, dans quelques cas, des réductions importantes. La plupart des autres rejets se situent entre les deux;

   (ii) les réductions importantes comprennent les réductions de technetium-99, depuis 2002, qui sont les bienvenues et qui devraient se poursuivre. Les deux réunions ministérielles d'OSPAR, en 1998 et en 2003, avaient attiré plus particulièrement l'attention sur la question du technetium-99;

   (iii) il n'est pas possible de confirmer, d'une manière générale, si l'objectif de la Stratégie OSPAR substances radioactives a été atteint dans la mesure où les évaluations sont réalisées à partir de données qui ne portent que sur trois ans (de 2002 à 2004).

La récente évaluation a mis en évidence qu'il est nécessaire de s'assurer que les approches et les analyses d'évaluation des tendances soient cohérentes avec celles qui sont utilisées par OSPAR, dans le cadre des autres stratégies, telles que les techniques qui sont appliquées dans le cadre du CEMP.

Il faut tenir compte des travaux d'OSPAR sur les substances radioactives dans l'approche écosystémique relative aux activités de l'homme et à leurs effets sur le milieu marin, en établissant par exemple un lien entre cette approche et la série d'objectifs de qualité écologique.

Stratégie industrie du pétrole et du gaz offshore:

De grands progrès ont été accomplis dans l'industrie du pétrole et du gaz offshore en ce qui concerne la définition des objectifs environnementaux et la mise en place de mécanismes de gestion améliorés. Durant les prochaines années les travaux d'OSPAR se concentreront sur la surveillance de la mise en œuvre de ces engagements et des progrès accomplis dans la prévention et l'élimination de la pollution ainsi que sur la prise de mesures nécessaires à la protection de la zone maritime contre les effets préjudiciables des activités offshore.

Les rejets, dans le milieu marin, de pétrole provenant d'activités offshore sont en baisse. On s'attend cependant, dans les toutes prochaines années, à une augmentation des quantités de pétrole rejeté dans la mer du Nord avec les eaux de production. La baisse est en partie due à l'arrêt quasi total de rejets de déblais de forage contaminés par des boues à base de pétrole. Il faudra attendre pour voir si les contrôles auxquels est soumis le pétrole dans les eaux de production, qui conduisent en partie à une augmentation de la réinjection de l'eau de production, contribueront de manière significative à une tendance continue à la baisse. Les données recueillies sur l'utilisation et le rejet de produits chimiques offshore ne permettent pas encore d'évaluer les progrès accomplis dans le sens de l'objectif de la Stratégie. Les évaluations des données sur les rejets, les déversements et les émissions pour les années 2004 et 2005 seront disponibles en 2007. Les données pour les années 2006 et 2007 seront disponibles à temps pour l'évaluation globale, qui est prévue en 2009. Il s'agit des données relatives à l'envergure et à l'impact de l'industrie du pétrole et du gaz offshore. OSPAR conclut que l'implantation de structures et d'infrastructures correspondantes sur le fond de la mer est bien réglementée par la législation nationale des Parties contractantes et qu'il n'y a donc pas lieu, actuellement, de prendre des mesures OSPAR supplémentaires. Cette conclusion signifie que les impacts des activités offshore, autres que la pollution, n'ont pas d'effets préjudiciables. Les informations qui ont été utilisées à l'appui de cette conclusion seront à nouveau examinées en 2007.

1. Basis for the assessment

1.1 Approach to the overview

The 1992 OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") requires that Contracting Parties shall "take all possible steps to prevent and eliminate pollution and shall take the necessary measures to protect the maritime area against the adverse effects of human activities so as to safeguard health and to conserve marine ecosystems and, when practicable, restore marine areas which have been adversely affected".

To provide a basis for such measures, Contracting Parties are required to undertake and publish at regular intervals joint assessments of the quality status of the marine environment and of its development. The OSPAR Quality Status Report 2000 (QSR 2000) provided a first holistic and integrated summary of the status of the entire OSPAR maritime area. This overview of OSPAR assessments 1998 – 2006 aims to provide a statement of the conclusions reached by OSPAR over the period 1998 – 2006, in fulfilment of its obligations to make assessments. It is based upon the assessments adopted by OSPAR and its main committees since the date after which new work could not be taken into account in the QSR 2000 and is considered to be an interim product before the publication of the next major quality status report on the OSPAR maritime area in 2010.

Although the work has drawn on existing material, it has also involved the re-presentation of the conclusions, where this has been needed to achieve a consistent, readable approach across all the fields in which OSPAR has carried out assessment work. The overview has been prepared by the OSPAR Environmental Assessment and Monitoring Committee (ASMO).

1.2 OSPAR maritime area

The sea area covered by the OSPAR Convention 1992 is the North-East Atlantic. This is defined as extending westwards to the east coast of Greenland, eastwards to the continental North Sea coast, south to the Straits of Gibraltar and northwards to the North Pole (Figure 1.1). This maritime area does not include the Baltic or Mediterranean seas; the Helsinki and Barcelona Conventions apply in these sea areas. For assessment purposes the OSPAR maritime area is divided into the following five regions: Region I – Arctic Waters; Region II – Greater North Sea, Region III – Celtic Seas, Region IV – Bay of Biscay and Iberian Coast, Region V – Wider Atlantic.

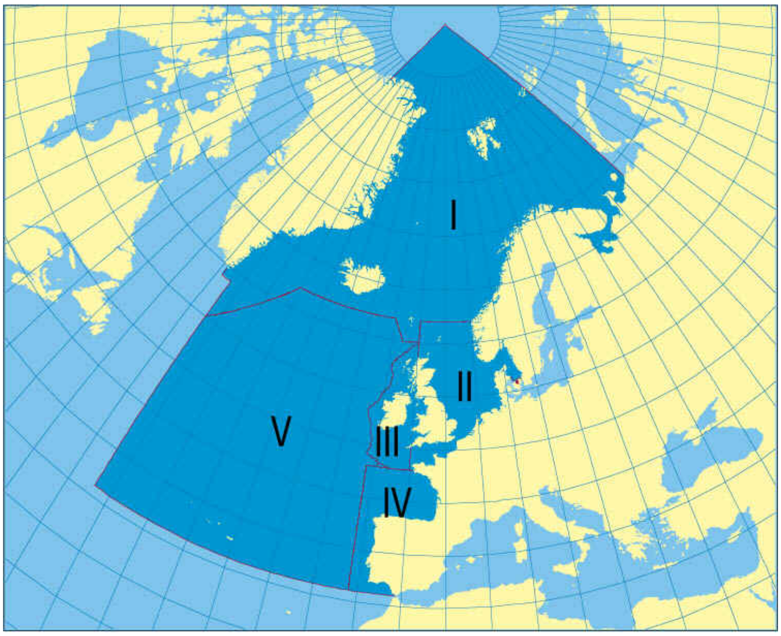


Figure 1.1 The OSPAR maritime area and its regions

1.3 Assessment of the state of play with regard to implementing OSPAR Strategies

The Ministerial Meeting of the OSPAR Commission in Sintra (Portugal) in July 1998 agreed on Strategies aimed at guiding the future work of the Commission. In 1998 and 1999, the Commission adopted five thematic Strategies for the purpose of directing its work in the medium to long term in five main areas, i.e. the protection and conservation of the ecosystems and biological diversity, hazardous substances, radioactive substances, eutrophication, and offshore oil and gas. These Strategies were further updated at the second Ministerial Meeting of the OSPAR Commission in Bremen (Germany) in June 2003 (OSPAR agreement 2003-21) and supplemented by a sixth OSPAR Strategy for the Joint Assessment and Monitoring Programme (JAMP) to evaluate progress in implementing each of the five thematic strategies and to assess the overall quality of the marine environment (OSPAR agreement 2003-22).

This overview provides a basis by which to identify what progress can be deduced in relation to the objectives of each of the Strategies from the assessment work done by OSPAR in the period 1998 – 2006; and to identify gaps in knowledge required for future assessments and suggest how these might be filled. However, the reader should bear in mind that work on implementing the OSPAR Strategies is still on-going both within OSPAR and through co-operation with other international organisations.

While OSPAR played a pioneer role in the past in undertaking initiatives to prevent and eliminate pollution of the marine environment from numerous human activities, similar actions have in the meantime been taken in other international forums, in particular in the European Community. OSPAR co-operation with the European Community takes place for example in connection with the European Marine Strategy and the proposed Marine Strategy Directive, the Water Framework Directive (2000/60/EC), the existing chemicals legislation and the proposed REACH Regulation, technical abatement measures like the IPPC Directive (1996/61/EEC), the Nitrates Directive (91/676/EEC) or the Urban Waste Water Treatment Directive (91/271/EEC). For the specific purpose of the present overview of OSPAR assessment work, the focus is on OSPAR initiatives only and their contribution towards achieving the objectives of the OSPAR Strategies.

1.4 Ecosystem approach to the management of human activities

In 2003, OSPAR and HELCOM jointly adopted the statement on the Ecosystem Approach to the Management of Human Activities. The ecosystem approach can be defined as "the comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity". The application of the precautionary principle is equally a central part of the ecosystem approach.

OSPAR has undertaken to pursue the implementation of the five OSPAR thematic Strategies, so as to provide management measures consistent with an ecosystem approach. In doing so, the aim is to work coherently towards a holistic approach to the problems addressed by the Strategies. To underpin this work OSPAR has agreed to focus on:

a. monitoring the ecosystems of the marine environment, in order to understand and assess the interactions between and among the different species and populations of biota, the non-living environment and humans;

b. setting objectives for environmental quality, underpinned by monitoring, in support both of the formulation of policy and of assessments;

c. assessing the impact of human activities upon biota and humans, both directly and indirectly through impacts on the non-living environment, together with the effects on the non-living environment itself.

2. Background to assessments: Exogenous driving forces

OSPAR's work to protect the marine environment of the North-East Atlantic takes place within the context of a changing background. In addition to the pressures from human activities directly addressed by the five OSPAR thematic Strategies, the quality status of the marine environment is influenced by a range of other driving forces and pressures. These include:

a. natural driving forces such as climatic variability and climate change;

b. socio-economic factors;

c. direct pressures that are not covered by the OSPAR Convention e.g. fisheries.

This chapter presents information on the recent evolution of these factors and predictions as to how they might be expected to change in the next decade.

2.1 Natural driving forces and variability

Amongst the natural driving forces in the OSPAR area climate is the most important. Climate varies for natural reasons between years. However, over the recent decades it also shows a trend towards general warming. This affects productivity and distribution of life in the ocean and the adjacent seas.

The surface waters of the OSPAR area can roughly be divided into two different general oceanic regimes. The south eastern part including the shelf seas is influenced by the relatively warm and salty North Atlantic Drift which originates from the subtropical western Atlantic Ocean. The north western part parallel to the east coast of Greenland is supplied with cold and slightly less saline surface water from the central Arctic Ocean. The general water circulation pattern shows the oceanographic links between OSPAR regions. The general pattern is shown by the arrows in (Figure 2.1).

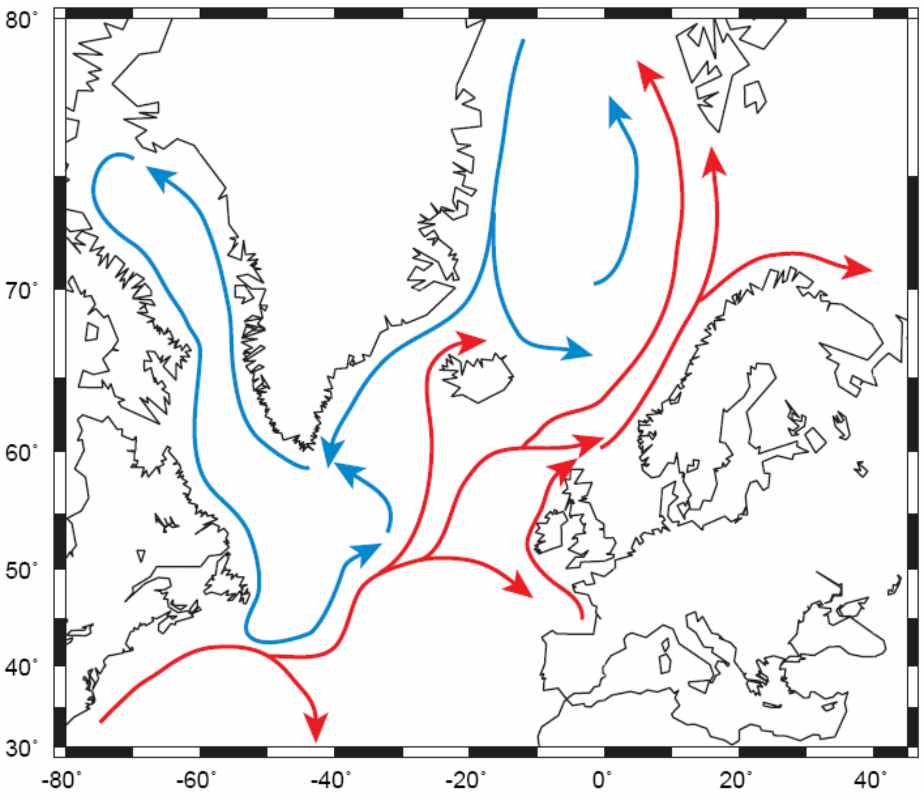
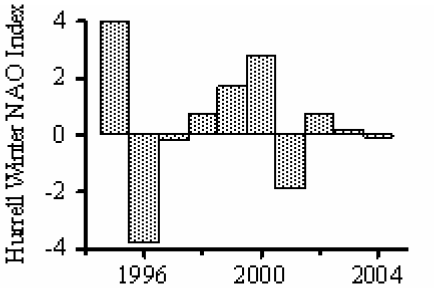


Figure 2.1 Schematic of the general surface circulation of the North Atlantic presented in the Annual ICES Ocean Climate Status Summary. The blue arrows indicate the cooler waters of the sub-polar gyre. The red arrows show the movement of the warmer waters in the sub-tropical gyre. Source: ICES 2004/2005.

The climate shows both trends and significant inter-annual variability. The North Atlantic Oscillation (NAO) which has a frequency of roughly eight years largely controls the climate variability of Europe. The NAO index is the normalised air pressure difference between Iceland and the Azores in the winter months. Negative values mean preferably longitudinal (north to south) transport of air masses (resulting in cold and dry winter conditions in Europe) whereas positive values mean preferably latitudinal transport (west to east) resulting in mild and wet winter conditions over Europe (Figure 2.2).



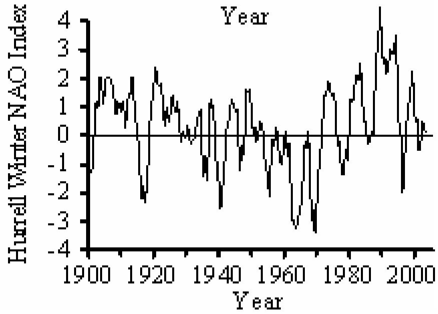


Figure 2.2 The winter NAO index in terms of the present decade (left) and the last 100 years (right – a two-year running mean has been applied). Source: ICES 2004/2005

The long-term trend of the NAO index in Figure 2.2 shows the most positive values of the index in the last decade of the 20th century. The increase since about 1970 is attributed to climate warming in the North-East Atlantic area. Figure 2.3 gives an example of the 2004 annual temperature situation and shows anomalies for the North Atlantic. This illustrates the geographical variability in the warming process and this has as a consequence that the effects on marine life will show a similar geographical variability.

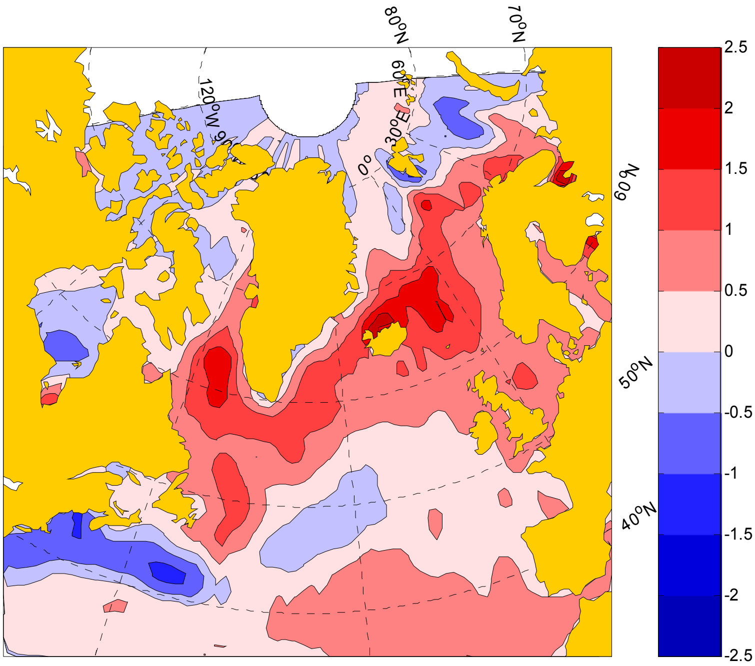


Figure 2.3 Map of annual sea surface temperature anomalies (°C) over the North Atlantic for 2004 from the NOAA Optimum Interpolation SSTv2 dataset, provided by the NOAA-CIRES Climate Diagnostics Center, USA. The colour coded temperature scale is the same in all panels. The anomaly is calculated with respect to normal conditions for the period 1971 – 2000. The data are produced on a one-degree grid from a combination of satellite and *in situ* temperature data. Source: ICES 2004/2005

2.2 Climate change

Since the late 1950s, increases in overall global temperature in the lowest 8 kilometres of the atmosphere and in average surface temperature have been similar to 0.1˚C per decade and global ocean heat content has increased. Global average temperatures are projected to increase under all emission scenarios published by the Intergovernmental Panel on Climate Change (IPCC) by a range between 1.4˚C and 5.8˚C over the period 1990 to 2100.

There is increasingly stronger evidence that most of the warming observed over the past 50 years is attributable to human activities and that these influences will continue to change atmospheric composition and temperature throughout the 21st century. Increasing temperatures have in turn important consequences for the seas. Atmospheric and ocean climate and circulation are strongly linked since the oceans act as the main heat reservoir for the earth.

As a result of this warming, direct effects on the seas such as decreases in polar sea ice cover and sea level rise due to thermal expansion of the sea water and supply of melt water from continental ice masses can be expected. For example, over the past 30 years, the annual average sea-ice extent has decreased by about 8% or nearly one million square kilometres. Sea-ice extent in summer has declined more dramatically than the annual average, with a loss of 15 – 20% of the late-summer ice coverage. The sea level is presently rising with a rate of about 3 cm/decade.

A range of complex impacts, interactions and feedback mechanisms between all physical, chemical and biological marine compartments have been predicted which have potentially significant implications for the quality status of the marine environment and its ecosystems.

For example, the warming of the sea causes changes in the distribution of the species where some stocks on the southern border of their occurrence have retracted northwards and southerly species have extended their occurrence northwards. Numerous studies show this change. The change in the environment leads to changes in productivity and in particular recruitment of many species. There is evidence that the distribution of both exploited and non-exploited North Sea fishes have responded markedly to recent increases in sea temperature, with nearly two-third of species shifting in mean latitude and/or depth over 25 years.

Another example is the increasing levels of CO_2 in the atmosphere which lead to CO_2 uptake across the air-sea interface and increased carbon concentrations in the ocean. This increases the acidity of the seawater, expressed by a reduced pH. Surface waters of the world oceans have already experienced a pH reduction of about 0.1 pH units. Further reductions of the order of 0.2 – 0.3 by 2100 are expected and even larger reductions may occur thereafter depending on future emission scenarios. The acidification occurs first in the surface mixed layer which is typically 50 – 200m deep, and with some delay to deeper waters. In regions with efficient ventilation to great depths, such as in the Greenland Sea, waters down to several thousand meters depth may experience acidification rates in this century approaching those of near surface water.

Changes in ocean carbon chemistry due to elevated atmospheric CO_2 are not restricted to increased acidity, i.e. reduced pH. An increased concentration of dissolved CO_2 in seawater also implies reduced concentration of carbonate ions. This has consequences for the carbonate saturation state of the seawater and implies that it is becoming gradually more difficult for marine organisms to build carbonate shells. Corals including those living in cold water coral reefs in the OSPAR maritime area, and some pelagic organisms, including species of phytoplankton and zooplankton of larger relevance for the food web, are likely to be significantly negatively affected by the ongoing acidification.

2.3 Populations

Changes in populations in the OSPAR Contracting Parties give some indication of changes in pressures from human activities (e.g. urban waste water, industries, fishing etc.) resulting in inputs of nutrients or hazardous substances to the marine environment or other impacts. Human population in the catchments of the OSPAR regions (see Figure 1.1) ranges considerably. It is particularly low in Region V, where the only population centre is the Azores, and high in Region II. Populations in coastal areas often show considerable seasonal variation due to tourism with particularly high seasonal pressures for example from urban waste water. Where human populations concentrated in coastal towns grow, competition and conflict can arise between the exploitation of natural resources and the consequent development and the need for nature conservation. The pressure on the coast is considerably lower if the population density is low (for example in Iceland, northern Norway, or the Scottish Highlands) as compared to very dense populated countries like the Netherlands.

In 1998 – 2005, the population in the EU-15 grew by nearly 12 million people (drawn from Eurostat data). This is a mean annual population growth of more than 0.4%. In the same period, the mean annual growth of the populations of Iceland and Norway were more than 1% and 0.6%, respectively. The change in population in 1998 – 2005 varied considerably among OSPAR Contracting Parties with Spain, France and the UK showing greatest increases in population while the population in Germany continued to decrease (Figure 2.4).

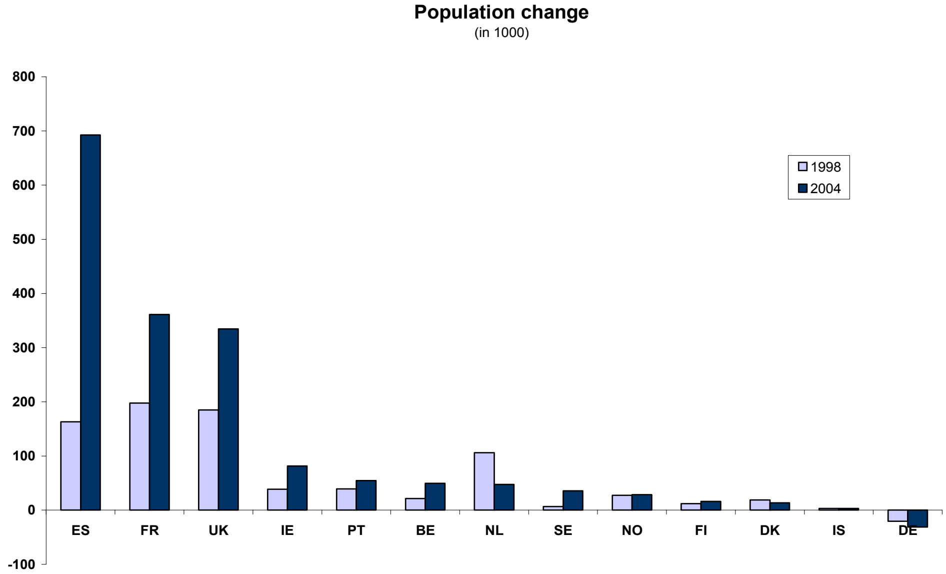


Figure 2.4 Population change in OSPAR Contracting Parties bordering the North-East Atlantic in thousands in 1998 – 2004. Source: Eurostat

2.4 Urban waste water

Untreated waste water is a source for nutrient inputs to the sea and may cause eutrophication (see Chapter 5). The connection of industry and households to waste water treatment has been constantly improving in the last years. In 2002, 90% of households in the EU-25 have been connected to waste water treatment plants (Eurostat 2006). By that year, the waste water, that is collected and treated, generally has received at least secondary treatment. For example in Ireland in 2004, only 2% of waste water received only primary treatment and 67% received at least secondary treatment; Germany, the Netherlands, Finland and Sweden applied tertiary treatment to the waste water from 80% or more of their populations (Eurostat 2006).

Even if OSPAR has long been concerned by the eutrophication of coastal waters, it is acknowledged that a key driving force in this context is the response of Contracting Parties to the EC Urban Waste Water Treatment Directive (91/271/EEC). The various requirements for collection and specified treatment of waste water for agglomerations and industries were to be implemented by EU-15 Member States in three stages by 1998, 2000 and finally 2005. These stages were function of the size of the agglomerations, the quality of the receiving waters and the specification of the treatment imposed. By 2002, the rate of achievement of the first stage concerning 210.2 millions population equivalents (p.e.) was 79% and the rate for the second stage which concern 261.6 millions p.e. was 70% (EC 2004). There are a number of legal actions pending against EU Member States for not timely or correctly implementing the Directive. The achievement of its final stages still needs to be assessed.

2.5 Changes to industries and their structures

Some of the major industrial centres in Contracting Parties bordering the North-East Atlantic are located along estuaries and close to the main coastal cities and ports. Some of the larger industries to be found at such locations include: metal and metal-processing; smelters; chemical, petrochemical and paper-making plants; oil refineries; gas terminals; vehicle factories; shipbuilding; power stations; and fish processing. The pressures from these industries include discharges, emissions and losses of hazardous substances to the environment.

On the industrial sectors addressed by OSPAR measures to reduce discharges, emissions and losses of hazardous substances (section 4.3.1), the EU-25 index of production (drawn from Eurostat) indicates for example a steep rise in 1998 – 2003 for the chemicals and the pulp and paper industry, while in the same period production in the textile sector declined substantially. For other sectors, for example the non-ferrous metal and steel industry, the production index indicates little change since 1998.

The chemicals industry is the largest manufacturing sector in the EU accounting for 12% of gross value added in EU manufacturing in 2004 and covering the four main sub-sectors petrochemicals, polymers, speciality and fine chemicals, and consumer chemicals. In 2002, production in EU-15 had risen by 38% since

1990, while total energy consumption had increased only by 2.5% and CO_2 emissions per unit of production have even decreased almost 44% in that period (EC 2005a).

The pulp and paper industry in the EU currently meets one quarter of the world demand in paper and board. Production output has increased since 1991 on average by 3.2% per annum. At the same time, all bleached kraft and sulphite paper mills, which were an important contributor of discharges of chlorinated organic substances in the past, have been closed in the OSPAR Convention area. Policy and research initiatives for substantial changes in the production patterns of this sector are currently ongoing in the EU framework and are expected to result in substantial reductions of waste and/or emissions from this industry.

Other examples of important changes over the period 1998 – 2006 result from changes in the structuring of industries, production methods and volumes, or technological developments. The introduction of membrane technology for chlorine production is one example. After several years of more or less stable production capacities, mercury-cell based chlorine production capacities have been reduced in 2003 to 78 % of the capacity in 1998 with an even more pronounced reduction in mercury losses through product, waste water and air emissions (losses in 2003 are about 60% of those in 1998). Another example is the phosphate fertiliser industry, which in 1993 contributed 28% to the total discharges of radionuclides other than tritium from OSPAR Contracting Parties, but by 2005 had ceased following the closure of all plants involved.

With the adoption in 1996 of EC Directive 96/61/EC on integrated pollution prevention and control (IPPC Directive), the European Community has progressively taken on OSPAR work on pollution abatement. The IPPC Directive provides means equivalent to OSPAR's measures for the reduction at source of discharges and emissions of hazardous substances through the application of best available techniques and associated discharge and emission limits.

2.6 Agriculture

There are extensive areas of agricultural land in Regions II, III and IV which contribute to pressures on the marine environment for example as a source of nutrients, hazardous substances (e.g. pesticides) and through soil erosion.

One of the main changes over the period 1998 – 2006 was the steady increase, at EU-15 level, in organic farming which avoids or largely excludes the use of synthetically compounded fertilizers and pesticides (holding a share of nearly 4% of agricultural land in 2003) (Figure 2.5). Another important aspect is the reform of the Common Agricultural Policy in 2003 which improved the framework for environmental integration through new or amended measures to promote the protection of the farmed environment. It also decoupled most direct agricultural payments from production and from 2005 a single payment scheme will be established, reducing many of the incentives for intensive production that have been associated with increased environmental risks.

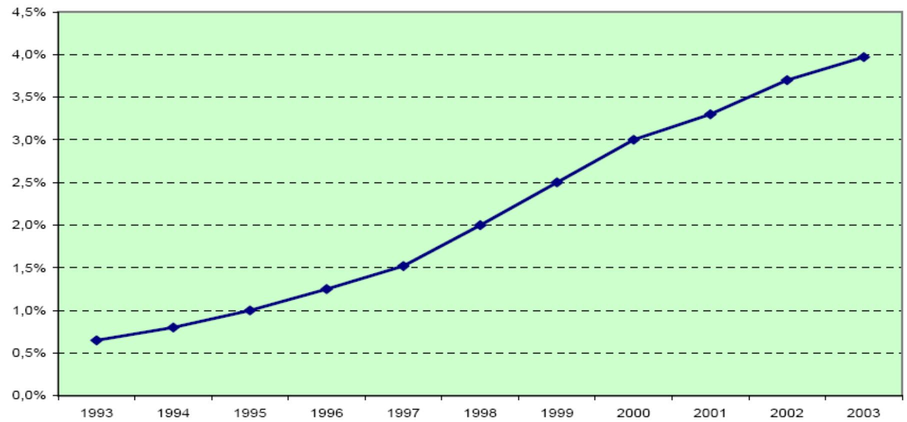


Figure 2.5 Percentage share of organic area in utilized agriculture areas in EU-15 in 1993 – 2003. Source: EC 2005b

Sales statistics for pesticides (drawn from Eurostat) indicate that sales of active ingredients in the EU-15 which had reached a peak in 1998 (355 537 tonnes), have been declining. However, levels in 2001 (327 280 tonnes) were still higher than in 1992 (291 865 tonnes). There has been no general trend in the density of livestock units per hectare of utilised agricultural land in the period 1998 – 2006 in the OSPAR area, which could indicate trends in the use of fertilizers and risk of nutrient leakage.

In 2000, the agricultural gross nutrient balance remained positive for all EU-15 Member States (Figure 2.6). While the surplus was substantially lower in some states compared to 1990, it remained fairly stable or even increased for others. At EU-15 level, the gross nitrogen balance in agricultural land, aggregated on a national basis, was calculated to be 55 kg/ha in 2000. This is 16% lower than the 1990 estimate of 66 kg/ha (EEA 2005). From these statistics it may be expected that over the period 1998 – 2006 there was still a great potential for run-off of nitrogen from agriculture.

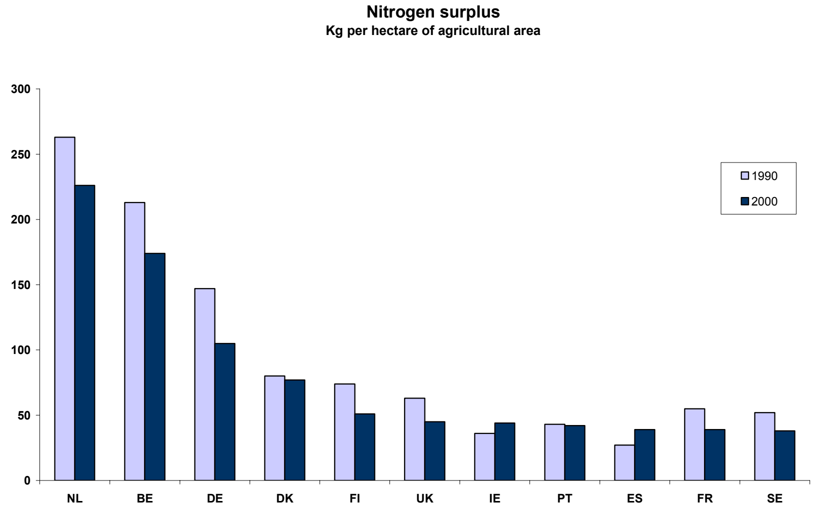


Figure 2.6 Nitrogen surplus in kg per hectare of agricultural land in OSPAR Contracting Parties. Source: Eurostat

2.7 Fisheries

Commercial fishing has led to overexploitation of many fish stocks and related direct and indirect impacts on the marine ecosystems (section 8.6). Technical developments have led to more efficient exploitation of commercial fish stocks. Fishing has great economic and social importance for most OSPAR Contracting Parties. The North-East Atlantic is the most important fishing region for the EU-25 Member States with 71% of their catches having been taken from this region in 2003 (Eurostat 2005). The fisheries statistics show that the EU-25 accounted for 40% of the total catch in 2003, and Iceland and Norway together for 43%; over the period 1990 – 2004, the EU-25 catch in the North-East Atlantic has fallen by around 14% while the combined catch of Iceland and Norway has risen by 46% (Eurostat 2005). An overview of the development of annual catches in the North-East Atlantic in the period 1998 – 2004 is given in Figure 2.7.

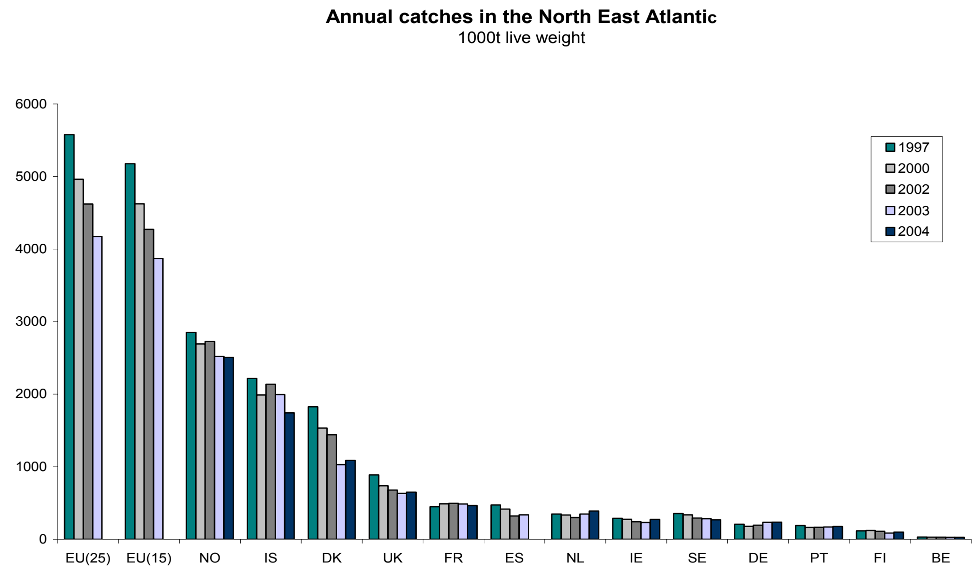


Figure 2.7 Catches in the North-East Atlantic by EU-25, EU-15, and Contracting Parties bordering the North-East Atlantic in 1998 – 2004 (1000 tonnes live weight). Source: Eurostat/ICES

Statistics on fishing fleets (drawn from Eurostat) show that the number of fishing vessels of Contracting Parties has dropped over the period 1997 – 2004, giving a reduction of 16% for North Sea EU Member States (Table 2.1). However, in terms of tonnage, the size of the fishing fleet rose between 1997 and 2002 for most Contracting Parties (except Sweden and the United Kingdom), but has since then dropped slightly (2.5 % for the North Sea EU Member States over the period 1997 to 2004). Nevertheless, in terms of the power-rating (kilowatts) of the vessels, there has been a continuing drop since 1998 (Figure 2.8).

In Norway the fleet was reduced in total numbers from 1997 – 2002 (by 22%) but the reduction in the number of larger vessels (100 tons and over) was significantly less (4%). Over this period, the gross tonnage and power-rating rose substantially (by 10% and 12% respectively). Since 2002, the gross tonnage has remained more or less constant, there was a substantial (unexplained) drop in power-rating.

In conclusion, the combination of the development in number of vessels, tonnage and power-rating of fishing vessels of the North Sea EU Member States and Norway indicates a reduction in fleet capacity and deployed fishing effort of these states in the period 1997 – 2004.

The review of the Common Fisheries Policy in 2002 is expected to have a positive effect on the sustainable development of the fisheries industry with improved regimes for reducing fishing fleets and fishing efforts. These include the setting of TACs in the context of a multi-annual approach to stock management to keep stocks within safe biological limits and the adoption of technical and other measures to protect marine resources and the marine ecosystem from fishing activities, and for enforcing fisheries regulations.

Table 2.1 Number of vessels, gross tonnage, and power rating of the total fishing fleet of the North Sea EU Member States and Norway. Based on the report of OSPAR on fish and ships to the 6th North Sea Conference. Data source: Eurostat

North Sea States		Number of vessels *(of which 100 tons or over)*		Gross tonnage		Power rating (kw)	
		1997	**2004**	**1997**	**2004**	**1997**	**2004**
EU Member States	Belgium	147 *(78)*	125 (77)	23012	23586	64675	67848
	Denmark	4585 *(206)*	3404 *(203)*	98448	94824	377641	334787
	France	8819 *(555)*	7873 *(548)*	210356	215577	1145661	1067844
	Germany	2337 *(95)*	2160 *(85)*	68577	66520	161614	162733
	Netherlands	1076 *(362)*	859 *(319)*	176039	190497	494550	455309
	Sweden	2263 *(123)*	1602 *(109)*	48816	44061	247 848	216546
	United Kingdom	8210 *(674)*	6891 *(511)*	251390	219407	1012188	882116
	Total	**27437** *(2093)*	**22914** *(1852)*	**876638**	**854472**	**3504177**	**3187183**
Norway		13645 *(496)*	8183 *(475)*	358705	394846	2225643	1328945

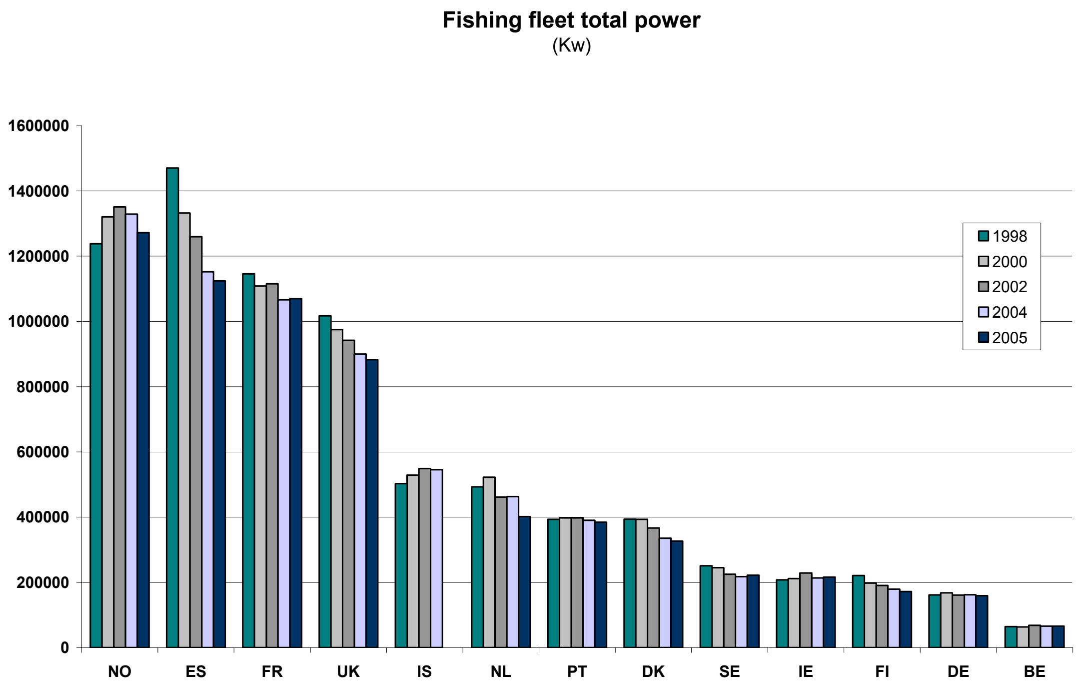


Figure 2.8 Total fishing fleet power in kilowatt of Contracting Parties (1998 – 2005). Source: Eurostat/DG Fish

2.8 Shipping

Ocean transportation is steadily growing as world trade expands and is expected to increase in the next 20 years in particular in the container cargo sector (Figure 2.9). A considerable proportion of world ocean transport passes through the Channel and the North Sea and hence these areas are directly affected by the impacts of increased shipping (section 8.7). In the period 1996 – 2006, the annual tonnage change in the world merchant fleet shows a constant increase with highest growth rates in the last two years (Figure 2.11) while a slow-down in the decommissioning of merchant vessels can be observed in all market sectors. Scrapping of tankers dominates in number and tonnage and may be attributed to the phase-out of single hull tankers (by 2005 for pre-MARPOL tankers and 2010 for MARPOL tankers and smaller tankers) agreed under Annex I to the IMO MARPOL Convention. In the tanker segment, a trend can be observed in the shift in trade from crude oil to product. By 2006, the world tanker tonnage had a share of 41.1% of the world merchant fleet, while the share in tonnage of the world bulk carrier fleet was 36.2%, that of the container carriers 11.8% and that of passenger ships 0.6% (ISL 2006). The capacity of the container fleet has increased by 10% per year in the period 2002 – 2006 (Figure 2.10).

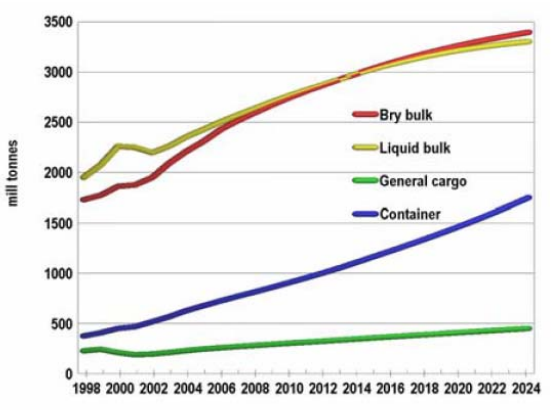


Figure 2.9 World cargo trade by loading category 1998 2024. Source: ISL 2005 (based on Global Insight, World Trade Service)

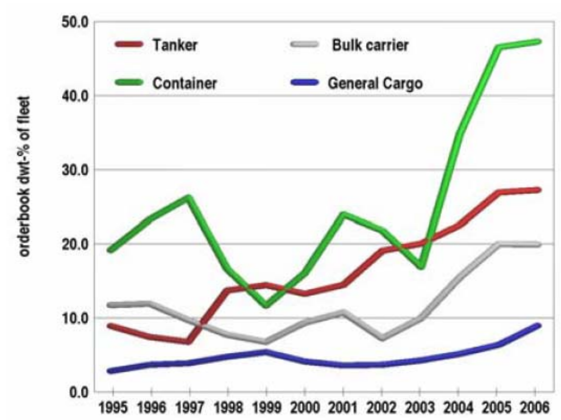


Figure 2.10 Share of the ordered tonnage (dry weight/dwt) on the existing world fleet as of 1 January, 1995 – 2006. Source: ISL 2006

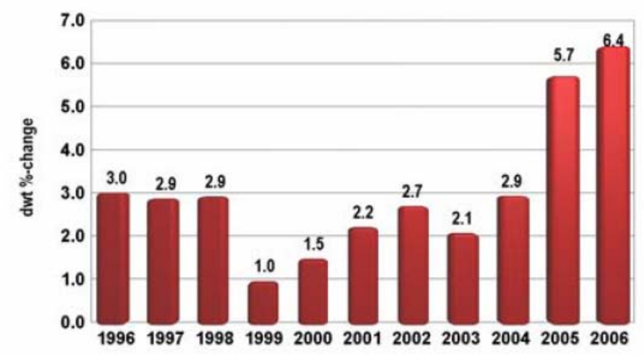


Figure 2.11 World merchant fleet – annual tonnage changes 1996 – 2006 (dry weight/dwt – per cent). Source: ISL 2006

2.9 Offshore oil and gas industry

There are substantial offshore oil and gas activities in the OSPAR area which contribute to sea-based pollution and other impacts on the marine environment (see Chapter 7). In Norway, the offshore oil and gas industry is still very important, being responsible for one fourth of all value creation and more than one fourth of the state's revenue. In the Netherlands and the United Kingdom, the offshore industry is less economically dominant (representing around 1% of Gross National Product and 2.5% of Gross Value Added[1], respectively), but is still very important economically and strategically through provision of secure, domestic sources of energy (over 80% of domestic consumption in the United Kingdom). In the other countries (Denmark, Germany, Ireland, Spain), the offshore industry is less significant, but still important because of the access that it gives to secure, domestic energy supplies. The Dutch (predominantly) and Irish (entirely) offshore industries are only for gas production.

While production of hydrocarbons has reached a peak in the North Sea and is expected to decline in the near future, oil and gas production in other parts of the OSPAR maritime area, such as the Barents Sea, might increase. The gross production of hydrocarbons was relatively stable in the period 1998 - 2004 (Table 2.2). The production of gas has reached nearly the same share of production volume as oil.

In the same period, the number of offshore installations has grown steadily (Table 2.3). These figures do not include drilling and subsea installations which do not discharge hydraulic fluid and whose effluents are transferred to another installation for treatment and processing. The number of such installations in the OSPAR maritime area is less certain.

Table 2.2 Total production in million tonnes oil equivalents (toeq). The total production in 1998 was 460 million tonnes, 482 in 1999 and 492 in 2000. Source: annual national reports

	2001	2002	2003	2004
Denmark	27,68	28,42	25,50	29,22
Germany	1,80	2,17	1,99	2,12
Ireland	0,78	0,67	0,76	1,01
The Netherlands	22,36	15,64	16,90	20,41
Norway	238	241	246	265
Spain	0,45	0,47	0,14	0,28
United Kingdom	213	209	199	182
TOTAL	504	497	490	500

Table 2.3 Number of installations by type of installation in the OSPAR maritime area with discharges to the sea, or emissions to the air (2000 – 2004). Source: OSPAR 2005h

	2000	2001	2002	2003	2004
Oil[1)]	174	152	153	146	144
Gas[2)]	239	223	225	256	257
Subsea[3)]	6,5	81	120	145	178
Drilling[4)]	69	76	86	45	58
Other[5)]	0	5	2	5	11
Total	**489**	**537**	**586**	**597**	**648**

[1)] Installations which produce oil and gas are considered "oil installations".

[2)] Installations which produce gas and condensate are considered "gas installations".

[3)] One installation per cluster of well heads.

[4)] Exploration & development drilling rigs with no simultaneous production only. The number is expressed in years-equivalent of activity.

[5)] Example: offshore underground storage

[1] The replacement statistic for the former Gross Domestic Product (GDP).

3. Biodiversity

3.1 Aims of the Biological Diversity and Ecosystems Strategy

The objective of the OSPAR Biological Diversity and Ecosystems Strategy, adopted in 1998 and revised in 2003, is to protect and conserve the ecosystems and the biological diversity of the maritime area which are, or could be, affected as a result of human activities, and to restore, where practicable, marine areas which have been adversely affected, in accordance with the provisions of the Convention. The Strategy covers work on the protection of species and habitats, the management of human activities, the development of an OSPAR network of Marine Protected Areas (MPAs) and Ecological Quality Objectives (EcoQOs).

3.2 Species and habitats in need of protection

As a means for setting priorities for programmes and measures under the Biological Diversity and Ecosystems Strategy, OSPAR is committed to assessing which species and habitats need to be protected. The first step has been the development of an Initial OSPAR List of Threatened and/or Declining Species and Habitats (the “Initial OSPAR List”) (OSPAR agreement 2004-6), on the basis of relevant criteria (the Texel-Faial criteria) and taking into account inventories of species and habitats in the maritime area and relevant lists developed by other international forums e.g. the European Commission, IUCN, etc. Lists such as the Initial OSPAR List are intended to provide the basis for priority action by OSPAR, for example the designation of Marine Protected Areas or other forms of protection.

3.2.1 Selection criteria for species and habitats in need of protection

The Texel-Faial criteria (OSPAR agreement: 2003-13) have been developed by OSPAR as the basis for identifying species, and habitats in need of protection. The selection criteria for species and habitats are: global and regional importance; rarity; sensitivity; and status of decline. For species an additional criterion is whether the species concerned is a keystone species (i.e. a species which has a controlling influence on a community); for habitats a specific additional selection criterion is their ecological significance.

3.2.2 Initial OSPAR List of Threatened and/or Declining Species and Habitats

The development of the Initial OSPAR List drew on the development of the Texel-Faial criteria, which took place in parallel, but did not make exhaustive use of all the criteria. Priority was given to species and habitats for which, in addition to evidence of threat and/or decline, there was evidence that either:

a. a severe decline or threat occurs across most of its range within OSPAR;

b. occurrence within the OSPAR area is of global importance;

c. for habitats, for which information is much harder to obtain, in particular in the deep sea, indications of serious threats in combination with a limited occurrence and/or a small recoverability would therefore lead to a priority listing.

The Initial OSPAR List includes as regional priorities species and habitats that are severely declining or threatened within one or more of the OSPAR regions. In some cases separate populations of a certain species have been identified as threatened and/or declining where these populations are subject to significantly different pressures populations. Case Reports for each of the species and habitats on the Initial OSPAR List were published in a supporting publication (OSPAR 2005a).

In order to address the need for improved information on the distribution of the habitats on the Initial OSPAR List, OSPAR has been collating existing data on the distribution of the fourteen habitats on this list. An initial set of maps showing the distribution of the habitats on this list was published in 2005 and is accessible via a link from the biodiversity section of the OSPAR website (http://www.ospar.org).

Table 3.1 Overview of the Initial OSPAR List of threatened and/or declining species and habitats *(Fish species affected by fishing are marked with an asterisk (*))*

Species/Habitat	OSPAR Regions where the species or habitat occurs	OSPAR Regions where the species is under threat and/or in decline	Occurrence within OSPAR area is globally important	Main threats	Evidence of decline
INVERTEBRATES					
Arctica islandica (Ocean quahog)	I,II,III,IV	II	-	Disturbance to the sea bed particularly linked to bottom trawling	Relative abundance has declined in parts of the North Sea over the last 30 years.
Megabalanus azoricus (Azorean barnacle)	V	V	Yes	Overexploitation from fisheries	A significant decline has occurred over the last 2 decades following increased exploitation.
Nucella lapillus (Dog whelk)	I,II,III,IV,V	II,II,IV	-	Pollution: especially from tributyl tin	Known to have declined in certain locations in OSPAR Regions II, III, IV.
Ostrea edulis (Flat oyster)	I,II,III,IV	II	Yes	Overexploitation from fisheries, poor water quality and the introduction of other oyster species. Parasitic infection is also known to have increased mortality	Significant declines in abundances have occurred in European waters, particularly in the Greater North Sea region.
Patella ulyssiponensis aspera (Azorean limpet)	V	V	Yes	Overexploitation of the fishery	Decline of stocks in the mid to late 1980's. A collapse of the fishery occurred in 1988.
BIRDS					
*Larus fuscus fuscus (*Lesser black-backed gull)	I	I	-	Pollution, especially from synthetic substances (e.g. PCBs), decline in prey species and competition and predation by the Herring Gull	A marked decline has been observed in breeding numbers in northern Norway (approximately 90% since 1990).
*Polysticta stelleri (*Steller's eider)	I	I	-	Incidental capture in fishing gear and oil pollution	The Global population of Steller's Eider is believed to have decreased over the past 30 years although populations in the OSPAR area are thought to have become more stable during the 1990s.
*Puffinus assimilis baroli (*Little shearwater)	V	V	-	Increased predation from rats and cats at breeding sites	Evidence of decline based on poorly documented trends.
Sterna dougallii (Roseate tern)	II,III,IV,V	II,III,IV,V	-	Trapping at wintering grounds in West Africa; increased predation at colonies in the OSPAR area	Long-term declines in the numbers breeding in the OSPAR maritime area are well documented.
*Uria aalge (*Iberian guillemot)	IV	IV	-	Oil pollution and incidental take in fisheries. Collection of eggs and juveniles and increased predation from mammals in some areas	Numbers breeding in OSPAR Region IV have declined drastically and the species may now be extinct in Iberia.
FISH					
**Acipenser sturio* (Sturgeon)	II,IV	II,IV	Yes	Interruption of migration routes, damage to spawning grounds, pollution of lower river reaches and targeted commercial fisheries	Once widely distributed in European waters from the Barents Sea to the Black Sea but the last remaining population, which spawns in the River Gironde in France is in the coastal areas of OSPAR Regions II and IV. The remaining population shows evidence of decrease and it may be that a viable population no longer exists. Classified as critically endangered by IUCN.
**Alosa alosa (Allis shad)*	II,III,IV	II,III,IV	-	Obstruction to migration routes, pollution of lower river reaches and damage to spawning grounds	Loss of the species from many former spawning grounds especially in UK. Decline reported in Portugal.
**Cetorhinus maximus* (Basking shark)	I,II,III,IV	I,II,III,IV		Targeted fisheries and incidental capture	Declines in catches by basking shark fisheries are thought to indicate a decline in populations and there are a number of instances where basking shark fisheries have collapsed.
Coregonus lavaretus oxyrinchus (Houting)	II	II	-	Obstruction of migration routes, pollution of lower river reaches, incidental capture and damage to spawning grounds	Populations are known to have declined and the species is becoming increasingly rare in European rivers and estuaries (OSPAR region II).
**Dipturus batis* (Common Skate)	I,II,III,IV,V	I,II,III,IV,V	-	Targeted fisheries and by-catch	The decline of populations in shelf areas is well documented. In the Irish Sea it has been commercially extinct for a number of years. Classified by IUCN as endangered throughout its range and critically endangered in shelf seas.
**Raja montagui* (Spotted Ray)	II, III, IV, V	II, III, IV, V	-	Targeted fisheries and by-catch	Precise status of the species has been difficult to quantify with some populations decreasing and others have increasing.

Species/Habitat	OSPAR Regions where the species or habitat occurs	OSPAR Regions where the species is under threat and/or in decline	Occurrence within OSPAR area is globally important	Main threats	Evidence of decline
**Gadus morhua (Cod)* populations in the OSPAR regions II and III[2]	I,II,III,IV,V	II,III	-	Targeted fisheries	The stocks in the OSPAR Regions II and III are considered to be outside Safe Biological Limits and ICES have advised that fisheries that target Cod in the North Sea, Skagerrak, Irish Sea and to west of Scotland should be closed.
Hippocampus guttulatus (Long-snouted seahorse)	II,III,IV,V	II,III,IV,V	-	Targeted fisheries for the aquarium trade, by-catch and loss of habitat e.g. sea grass beds)	Strong circumstantial evidence of declining numbers.
Hippocampus hippocampus (Short-snouted seahorse)	II,III,IV,V	II,III,IV,V	-	Targeted fisheries for the aquarium trade, by-catch and loss of habitat e.g. sea grass beds)	Strong circumstantial evidence of declining numbers.
**Hoplostethus atlanticus* (Orange roughy)	I,V	I,V	-	Fisheries	Rapid declines in abundance have been documented for all areas where the Orange Roughy is fished and several populations have been overexploited.
Petromyzon marinus (Sea lamprey)	I,II,III,IV	I,II,III,IV	-	Disruption of migration routes, disturbance to spawning grounds	A decline in many parts of Europe over the last 30 years is well documented.
**Salmo salar* (Salmon)	I,II,III,IV	I,II,III,IV	Yes	Changes in water flow in rivers, obstruction of migration routes, poor water quality and targeted fisheries	Under half (43%) of the populations in rivers are considered to be healthy with the remainder considered to be vulnerable, endangered, critical or extinct.
**Thunnus thynnus* (Bluefin tuna)	V	V	-	Targeted fisheries	Loss of fisheries in Northern European waters during the 20th Century. A strong decline in the abundance of older fish in the eastern Atlantic has been documented since 1993.
REPTILES					
Caretta caretta (Loggerhead turtle)	IV,V	IV,V	-	Disturbance to nesting beaches outside the OSPAR maritime area (habitat loss and egg collecting), incidental capture from fisheries and marine litter and pollution	A historical decline in the numbers of loggerheads in several areas is generally accepted. Classified by IUCN as endangered.
Dermochelys coriacea (Leatherback turtle)	I,II,III,IV,V	I,II,III,IV,V	-	Exploitation of adult turtles and their eggs, disturbance to nesting beaches outside the OSPAR maritime area (habitat loss and egg collecting), incidental capture from fisheries; marine litter and pollution	A global population decline of around 60% since 1980 has been estimated. Losses of entire colonies have been observed. Classified by IUCN as critically endangered.
MAMMALS					
Balaena mysticetus (Bowhead whale)	I	I	-	Historically threatened by commercial whaling. Current threats include pollution by oil, synthetic toxins and noise	A severe decline in populations over the past 300 years is generally accepted The Spitsbergen stock, thought to comprise only a few tens of individuals is one of the four remaining global stocks.
Balaenoptera musculus (Blue whale)	I,II,III,IV,V	I,II,III,IV,V	-	Historically threatened by commercial whaling. Current threats include acoustic disturbance and habitat degradation	A severe decline in populations over the past 200 years is generally accepted with only a few hundred thought to remain in the North Atlantic. Classified by IUCN as an endangered species.
Eubalaena glacialis (Northern right whale)	I,II,III,IV,V	I,II,III,IV,V	-	Historically threatened by commercial whaling. Current threats include acoustic disturbance, pollution, entanglement in fishing gear and ship strikes	A severe decline in populations over the past 200 years is generally accepted with no more than the low tens of individuals remaining in the eastern Atlantic Classified by IUCN as an endangered species.
Phocoena phocoena (Harbour porpoise)	I,II,III,IV,V	II,III	-	Incidental capture and drowning in fishing nets. Marine pollution, acoustic disturbance and loss of prey species are additional threats	A decline over the latter part of the 20th Century is generally accepted. Now scarce in the southern North Sea, the English Channel, and Bay of Biscay.
HABITATS					
Carbonate mounds	I, V	V	-	Physical impacts associated with bottom trawling activities	Occurrence is not fully known therefore little evidence of changes in extent or quality. Further survey work is being undertaken to improve knowledge on the distribution.
Deep-sea sponge aggregations	I, III, IV, V	I, III, IV, V	-	Physical impacts associated with bottom trawling	Occurrence is not fully known therefore little evidence of changes in extent or quality.

2 That is, the populations/stocks referred to in ICES advice as the North Sea and Skagerrak cod stock, Kattegat cod stock, Cod west of Scotland, Cod in the Irish Sea, Cod in the Irish Channel and Celtic Sea.

Species/Habitat	OSPAR Regions where the species or habitat occurs	OSPAR Regions where the species is under threat and/or in decline	Occurrence within OSPAR area is globally important	Main threats	Evidence of decline
Oceanic ridges with hydrothermal vents/fields	V	V	-	Scientific research, seabed mining, tourism and bioprospecting	Full distribution is not known but human induced changes to vent communities have been documented.
Intertidal mudflats	I,II,III,IV	I,II,III,IV	-	Land claim from coastal developments, pollution	Decline in spatial extent of intertidal mudflats has been documented in many parts of the OSPAR maritime area.
Littoral chalk communities	II	II	-	Coastal defence and other works	56% and 33% of the coastal chalk in the English counties of Kent and Sussex respectively has been modified by coastal defence and other works.
Lophelia pertusa reefs	I,II,III,IV,V	I,II,III,IV,V	-	Physical disturbance from fishing gear	Changes in extent of the habitat are not yet clear although damage to reefs in Norway, the Faroe Islands and other areas has been reported.
Maerl beds	I,II,III,IV,V	III	-	Physical disturbance from dredging and fishing gear, poor water quality	Declines in the extent and quality have been reported, especially in western Scotland and the Irish Sea.
Modiolus modiolus beds	I,II,III,IV,V	II,III,	-	Physical disturbance from fishing trawls and dredges	Where decreases in the extent of the habitat in the Irish Sea and on the north-western coasts of the UK have been demonstrated over the period from 1950 to 1990.
Intertidal *Mytilus edulis* beds on mixed and sandy sediments	II, III	II, III	-	Overexploitation by fisheries and phytoplankton blooms, heavy metals and anti-fouling substances	Significant declines in the extent and biomass of such mussel beds have been reported during the last 50 years.
Ostrea edulis beds	II, III, IV	II, III, IV	-	Overexploitation by fisheries and additional threats from beam trawling, poor water quality, introduction of warm-water species and parasitic infection	A significant decline in abundance in European waters during the 20th Century is accepted, especially in the southern North Sea and the English Channel.
Sabellaria spinulosa reefs	I,II,III,IV,V	II,III	-	Physical disturbance from fisheries trawls and aggregate dredging, pollution	Loss of the habitat has been reported in at least five areas of the North-East Atlantic, including the German Wadden Sea and the coasts of the UK.
Seamounts	I, IV, V	I, IV, V	-	Physical disturbance from fisheries; exploitation of the commercially valuable fish, shellfish and corals associated with this habitat.	Extensive damage to seamount communities has been reported in some parts of the world but there is limited information on seamounts in the OSPAR maritime area.
Sea-pen and burrowing megafauna communities	I, II, III, IV	II, III	-	Physical disturbance from trawling, marine pollution (e.g. in sea lochs and fjords)	Lack of sensitive species in areas affected by bottom trawling.
Zostera beds	I, II, III, IV	I, II, III, IV	-	Physical disturbance, nutrient enrichment, increase in turbidity and disease	Declines in the extent of Zostera beds have occurred historically as a result of a wasting disease. More recent declines in the extent have been reported in the Wadden Sea and along the coasts of the UK. The recovery of affected areas is slow.

3.2.3 Progress with regard to protection

OSPAR is currently working to analyse and identify a programme of appropriate actions and measures to ensure the protection of the entire range of species and habitats on the Initial OSPAR List. This has already produced first results. For example, in 2004, echoing OSPAR ministers, who have expressed their determination to improve the protection of the cold-water coral reefs in the OSPAR area against threats from fisheries and other threats, OSPAR drew the attention of the North-East Atlantic Fisheries Commission (NEAFC) to the need for action to protect the biological diversity of cold-water coral reefs on the western slopes of the Rockall Bank. Consequently, NEAFC have taken a measure recommending the closure of five areas in the High Seas in its Regulatory Area to demersal trawl and static gear for a period of three years. NEAFC have asked ICES to review the scientific relevance of these areas and to provide information on the distribution of cold-water corals on the Western slopes of the Rockall Bank. In the same context the EC

Regulation temporarily protecting the Darwin Mounds has included in its recitals an explicit reference to the Initial OSPAR List.[3]

3.3 Non-indigenous species

Non-indigenous species can be introduced into the marine environment of the OSPAR maritime area as a result of climate change, allowing the ingress of species from colder or warmer water, or due to introductions from mariculture or during ballast water exchange from ships.

In 2004, the International Maritime Organization (IMO) adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Convention) to control the transfer of non-indigenous organisms in ships' ballast water. The Convention will in the short term require ships to exchange their coastal ballast water with that of cleaner oceanic water, taken from waters at least 200 nautical miles offshore with a depth of 200m, or in exceptional circumstances, from waters 50 nautical miles offshore and in a depth of 200m. In the longer term, water quality standards have been set which will come into effect between 2009 and 2016, depending on the size and age of the ship. The standards have been designed to drive science and technology to produce a more environmentally defensible solution to address this issue.

OSPAR is currently developing a regional strategy to implement elements of the IMO Ballast Water Management Convention in North West Europe prior to the IMO Convention coming into force. As a part of this strategy a list of non-indigenous species and species of concern will be identified and collated on an OSPAR, country by country, bio-province and coastal-area by coastal-area basis by 2007.

3.4 Marine protected areas

The Bremen Statement, adopted by the second Ministerial Meeting of OSPAR in 2003, included the commitment to identify the first set of Marine Protected Areas (MPAs) by 2006, establish what gaps then remain and complete, by 2010, a joint network of well-managed MPAs that, together with the NATURA 2000 network, is ecologically coherent (the "OSPAR Network of MPAs"). For this purpose OSPAR 2003 adopted a recommendation on a network of Marine Protected Areas, and related guidelines for the identification and selection of MPAs and for their management. The first evaluation of whether the components of the OSPAR Network of MPAs that have been selected so far will be sufficient to make that network an ecologically coherent network of MPAs for the maritime area was undertaken in 2006 (OSPAR 2006a).

3.4.1 Selection criteria

The OSPAR Guidelines on the identification and selection of marine protected areas in the OSPAR Maritime Area (OSPAR agreement 2003-17) sets out ecological criteria and considerations that should be applied in the identification of areas for protection. An area qualifies for selection as an MPA if it meets several but not necessarily all of the following criteria: (a) threatened or declining species and habitats/biotopes; (b) important species and habitats/biotopes; (c) ecological significance; (d) high natural biological diversity (e) representativity; (f) sensitivity; and (g) naturalness.

In prioritising sites for protection, a further set of practical criteria/considerations should be applied, in conjunction with the ecological criteria/considerations. These are: (a) size; (b) potential for restoration; (c) degree of acceptance; (d) potential for success of management measures; (e) potential damage to the area by human activities; and (f) scientific value.

3.4.2 Status of the OSPAR Network of Marine Protected Areas in 2006

The first set of OSPAR MPAs identified by 2006 is presented in Figure 3.1. This shows the 81 sites reported as initial components of the OSPAR Network of MPAs by France, Germany, Norway, Portugal, Sweden, and the United Kingdom. These sites cover in total approximately 25 thousand square kilometres. The remaining Contracting Parties are in the process of selecting initial MPAs.

The MPAs reported so far include a number of cold-water coral reefs (eg. Røstrevet, Seligrunnen), sites of importance in Sweden for sea grasses and Atlantic salmon, important areas for seabirds on the German coast and seamounts in the Azores. The UK have reported 53 sites for the protection of a wide range of

[3] Council Regulation (EC) No 602/2004 of 22 March 2004 amending Regulation (EC) No 850/98 as regards the protection of deepwater coral reefs from the effects of trawling in an area north west of Scotland, OJ L 97, 1.4.2004, p. 30 et seq.

features. Of the 75 sites reported by EU Member States, all are NATURA 2000 sites. For the Portuguese nomination, the NATURA 2000 site is contained within a much larger OSPAR designation, and for the Swedish nominations, the OSPAR sites were sometimes smaller.

The MPAs reported so far represent 7 of the 22 bio-geographic zones within the OSPAR maritime area defined by Dinter (2001). These sites do not yet represent an ecologically coherent network – which is not unexpected at the beginning of the process. However, in order to achieve this goal by 2010, considerable effort is still required. It is expected that the ecological coherence of the network will have to be evaluated on an annual basis in the period up to 2010, and that such evaluations will need to become more sophisticated over time, as better data become available. Work is on-going to develop practical criteria to support such evaluations.

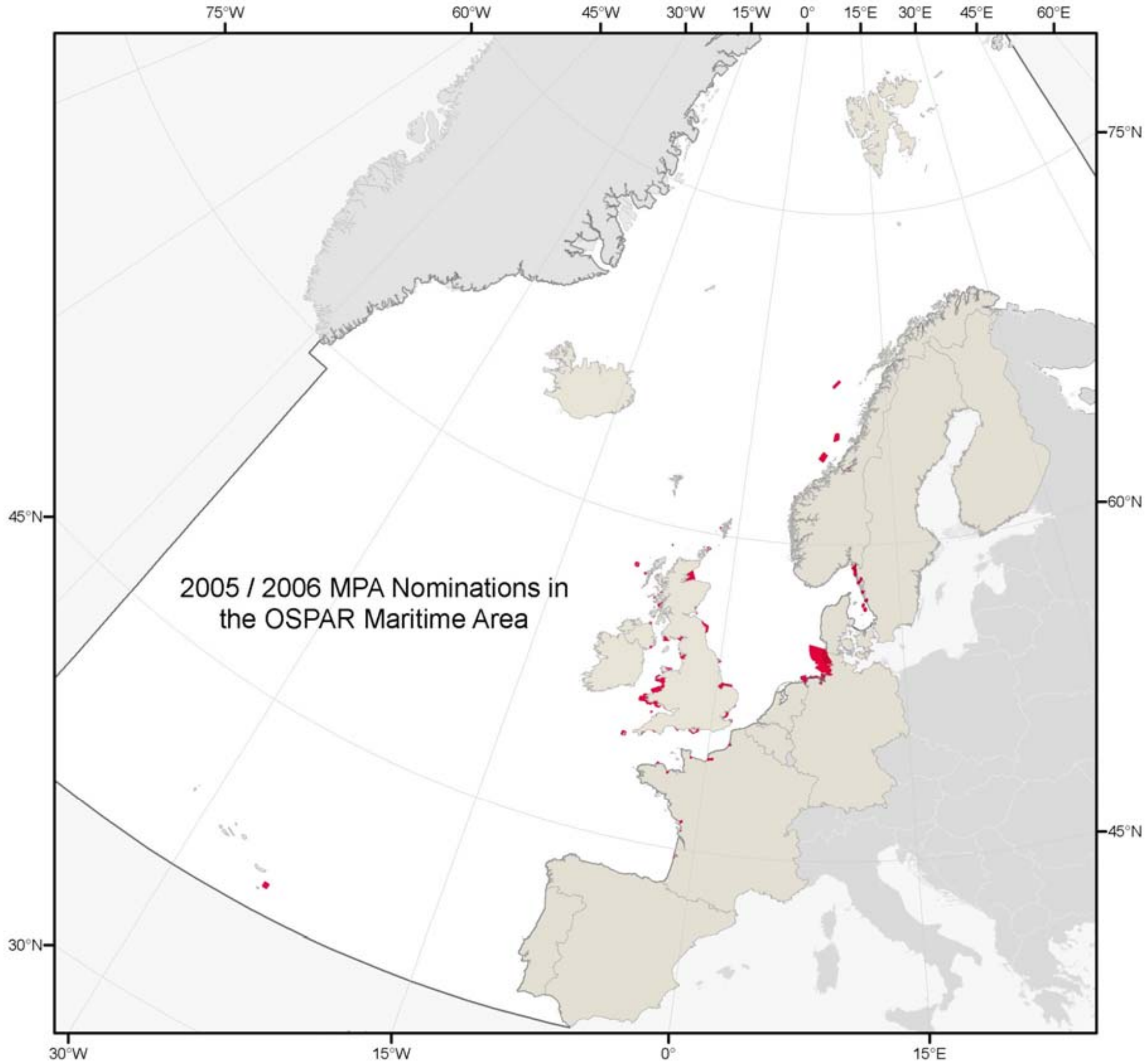


Figure 3.1 Map showing Marine Protected Areas (MPAs) reported by Contracting Parties as components of the OSPAR Network of MPAs by the time of the 2006 OSPAR Commission meeting. (French data are © MNHN). Source: OSPAR 2006a

4. Hazardous substances

4.1 Aims of the Hazardous Substances Strategy

The aim of the Hazardous Substances Strategy is to prevent pollution of the maritime area by continuously reducing discharges, emissions and losses of hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances. The OSPAR Commission is obliged to implement the Strategy progressively by making every endeavour to move towards the target of the cessation of discharges, emissions and losses of hazardous substances by the year 2020.

Prior to the Ministerial Meeting in Sintra in 1998, programmes and measures to control, i.e. prevent, reduce and/or eliminate emissions, discharges and losses of hazardous substances focused on specific sectors and activities that resulted in releases to the environment of hazardous substances in general. With the adoption of the Hazardous Substances Strategy in 1998, and its revision in 2003, the focus of OSPAR work has shifted to chemicals identified by OSPAR for priority action.

4.2 OSPAR List of Chemicals for Priority Action

The commitments of the Hazardous Substances Strategy apply to "hazardous substances", which are defined for this purpose as substances which are either persistent, liable to bio-accumulate and toxic (PBT) in that they meet agreed PBT cut-off values, or which, even if they do not meet all the PBT criteria, are assessed by the OSPAR Commission to give rise to an equivalent level of concern (the "safety net" process) for example because of endocrine disruptive properties.

For the purpose of identifying those hazardous substances to which OSPAR should give priority in its work, OSPAR has developed a dynamic selection and prioritization mechanism (DYNAMEC). This has resulted in a OSPAR List of Chemicals for Priority Action which currently lists 43 substances or groups of substances (OSPAR agreement 2004-12). A large number of these are common with the list of priority (hazardous) substances of the EC Water Framework Directive (Table 4.1). The differences between the two lists can be explained by the fact that the Water Framework Directive and OSPAR used slightly different selection and prioritisation criteria weighted to reflect occurrence of hazardous substances in fresh waters or the marine environment, respectively. In 2004, the continuation of work on the selection and prioritisation of substances has been put on hold by OSPAR for the time being, since the main body of this work will be carried out in future under relevant EC initiatives such as for example the Water Framework Directive or the proposed legislation for registration, evaluation and authorisation of chemicals (REACH). OSPAR has retained, however, the option to work on specific hazardous substances not covered or not adequately addressed within the EC framework with regard to their concern for the marine environment. To this end, further work will be carried out on substances on the OSPAR List of Substances of Possible Concern (OSPAR agreement 2002-17).

For 29 (groups of) substances identified by OSPAR for priority action to which the OSPAR maritime area is exposed because they are produced and/or in use in the Convention area and have not been proved to be exclusively used in closed systems, Background Documents have been prepared. These identify the sources and the pathways by which the substance could reach the sea, gives an overview of the inputs and concentrations in the environment, assesses their associated risks to the marine environment, and agrees on the action that should be taken either by OSPAR or by other relevant organizations to address the risks identified. For each of these (groups of) substances, a monitoring strategy has been or is being prepared setting out the most appropriate means for measuring progress towards OSPAR's objectives.

Table 4.1 Substances included in the OSPAR List of Chemicals for Priority Action for which Background Documents have been prepared because they are currently in use in the OSPAR Convention area other than in closed systems.

(Groups of) Chemicals for Priority Action *(OSPAR function or use category)*	**OSPAR measures, information collection and monitoring programmes**							**Priority (PS) and priority hazardous (PHS) substances under the Water Framework Directive**
	Substance specific measures (various sources)	**Industry specific BAT/ BEP**	**Industry specific emission/ discharge limit values**	**Informa-tion collection (one-off surveys and activities)**	**OSPAR Monitoring**			
					CEMP compartment	**RID component**	**CAMP component**	
Brominated flame retardants (PBDEs; PBBs, HBCD) *(organohalogen)*		X	X	X	Under development			PBDEs: PHS other: PS
Cadmium *(metal)*	X	X	X	X	Sediment and biota	Mandatory	Mandatory	PHS
Clotrimazole *(pharmaceutical)*				X				
Dicofol *(pesticide)*		X		X				
4-(dimethylbutylamino)Diphenylamin (6PPD) *(organic nitrogen compound)*								
Endosulphan *(pesticide)*		X		X				PHS (under review)
Hexachlorocyclohexane isomers (HCH) *(pesticides)*		X		Lindane		Lindane – mandatory	Lindane – mandatory	PHS
Hexamethyldisiloxane (HMDS) *(organosilicane)*								
Lead and organic lead compounds *(metal/organometallic compounds)*		X	X	X	Sediment and biota	Mandatory	Mandatory	PHS (under review)
Mercury and organic mercury compounds *(metal/organometallic compounds)*	X	X	X	X	Sediment and biota	Mandatory	Mandatory	PHS (under review)
Methoxychlor *(pesticide)*		X		X				
Musk xylene *(synthetic musk)*				X				
Neodecanoic acid, ethenyl ester *(organic ester)*	Background Document and monitoring strategy still under preparation							
Nonylphenol/ethoxylates (NP/NPEs) and related substances *(phenols)*	X							PHS
Octylphenol *(phenols)*								PHS (under review)
Organic tin compounds *(organometallic compounds)*	X	X		X	Sediment and biological effects; biota under development			TBT: PHS
Phthalates: dibutylphthalate, diethylhexyl-phthalate (DEHP) *(phthalate esters)*								DEHP: PHS (under review)
Pentachlorophenol (PCP) *(pesticide)*		X						PHS (under review)
Perfluorooctanyl sulphonamide and sulfonyl compounds and derivatives (PFOS) *(organohalogens)*								
Polyaromatic hydrocarbons (PAHs) *(polycyclic aromatic compounds)*		X	X	X	Sediment and biota	Voluntary	Voluntary	PHS
Polychlorinated biphenyls (PCBs) *(organohalogens)*	X	X	X	X	Sediment and biota	Voluntary	Voluntary	
Polychlorinated dibenzodioxins and dibenzofurans (PCDDs, PCDFs) *(organohalogens)*		X	X	X	Under consideration			
Short chained chlorinated paraffins (SCCP) *(organohalogens)*	X			X				PHS
Tetrabromobisphenol A (TBBP-A) *(organohalogens)*				X				
1,2,3-, 1,2,4-, and 1,3,5-Trichlorobenzenes *(organohalogens)*				X				PHS (under review)
Trifluralin *(pesticide)*		X		X				PHS (under review)
2,4,6-Tri-*tert*-butylphenol *(phenols)*				X				

4.3 Emissions, discharges, losses

4.3.1 Reductions in emissions, discharges and losses

To achieve the objectives of the OSPAR Hazardous Substances Strategy, emissions, discharges and losses of hazardous substances from point sources and diffuse sources are targeted by OSPAR control measures.

The control of point sources mainly requires the application of Best Available Techniques (BAT) and/or discharge and emission limit values (Table 4.2). In most cases, such measures target a number of hazardous substances which can be released in the production process.

Table 4.2 OSPAR measures to cut emissions and discharges of hazardous substances from point sources (R = PARCOM or OSPAR Recommendation, D = PARCOM or OSPAR Decision)

Sector (point sources)		Measure	BAT/BEP	Limit values for emissions and discharges	Targeted substances
Iron and Steel Industry (primary and secondary)		R92/2 R93/1	X	X	Phenol, PAHs, nitrogen
		R92/3	X	X	Hydrocarbons, cadmium, chromium, nickel, zinc, nitrogen dioxides
		R91/3	X		Cadmium, mercury, chlorinated oils, other chlorinated compounds, dioxin
		R90/1	X		Metals, PAHs, nitrogen oxides
		R91/2	X		Metals, PAHs, sulphur dioxides, nitrogen oxides, fluorides
Non-ferrous metal industry (primary and secondary)		D96/1			Phase-out of the use of hexachloroethane
		R2002/1		X	PAHs
		R98/2		X	Fluoride, PAHs
		R92/1	X	X	PAHs, fluorides
		R94/1	X		PAHs, fluorides, fluorocarbon gases, sulphur dioxides
		R96/1	X		Fluorides, sulphur dioxides
		R98/1	X		Copper, lead, nickel, zinc
Surface treatment of metals		R92/4	X	X	Chromium, copper, lead, nickel, silver, tin, zinc, unbound cyanide, volatile organic halogens
Chlor-alkali industry		D80/2, D81/1, D81/2, D90/3 R85/1		X	Mercury
		D82/1	X		Mercury
Textile industry		R97/1		reference values	Antimony, arsenic, cadmium, chromium, cobalt, copper, lead, nickel, tin, zinc, organohalogen substances (e.g. PCBs, chlorine), organochlorine pesticides, organophosphorous pesticides
		R94/5	X		
Pharmaceutical industry		R92/5	X		Heavy metals, halogenated and aromatic hydrocarbons, nutrients
Organic chemical industry		R94/4	X		Hydrocarbons, PAHs, organoholgens, heavy metals
Large Combustion Plants		R97/2	X		Heavy metals, PAHs and other POPs
Pulp and Paper industry		D96/2			Phase-out of the use of molecular chlorine in bleaching
		D92/1		X	Chlorinated organic substances
		D95/2		X	Nitrogen oxides, sulphur dioxides
		D95/3		X	Nitrogen oxides, gaseous sulphur, organic sulphuric compounds (methyl-mercaptan, di-methyl-sulphide, di-methyl-disulphide)
		R94/2 R94/3	X		Nitrogen oxides, sulphur dioxides, organic substances
Vinyl chloride monomer (VCM) industry	VCM, 1,2-dichloroethane	D98/4		X	Vinyl chloride monomer, 1,2-dichloroethane, polychlorinated dibenzo-p-dioxins and dibenzofuarnes, hydrogen chloride, chlorinated hydrocarbon, copper, organohalogen substances
		R96/2	X		
	Suspension PVC	D98/5		X	Vinyl chloride monomer, organohalogen substances
		R96/3	X		
	Emulsion PVC	R2000/3		X	Vinyl chloride monomer, organohalogen substances
		R99/1	X		
Refineries		R83/1 R89/5	X		Hydrocarbons

A substance-specific approach is taken by OSPAR measures addressing diffuse emission and discharge sources. These are mainly controlled by applying Best Environmental Practice (BEP) and controls and/or restrictions of their marketing and use (Table 4.3).

Table 4.3 OSPAR measures to cut emissions and discharges of hazardous substance from diffuse sources

Substance	Uses (diffuse sources)	Measure	BEP/BAT	Restriction
Organic tin compounds	Antifouling paints for use on sea-going vessels and underwater structures	R87/1		X
	Docking activities (sand-blasting etc)	R88/1	X	
PAHs	One-component coal tar coating systems for inland ships	R96/4		Phase-out
Mercury and organic mercury compounds	Discharges from various sources	R89/3	X	Use of alternatives
	Discharges from dentistry	R93/2	X	
	Dispersal from crematoria	R2003/4	X	
	Thermometers, batteries, dental filters	R81/1	X	
Cadmium	Various sources	D85/2		Emission/discharge limit values
Heavy metals	Cadmium and mercury in batteries	D90/2	X	X
PCBs	Any use	D92/3		Phase-out
Nonylphenol-ethoxylates	Cleaning agents	R92/8		Phase-out
DTDMAC, DSDMAC, DHTDMAC	Cationic detergents in fabric softeners	R93/4		Phase-out
Short chained chlorinated paraffins	Plasticiser in paints, coatings and sealants, use in metal work fluids and as flame retardants in rubber, plastics and textiles	D95/1		Phase-out
Hazardous substances	Aquaculture	R94/6	X	
Pesticides	Agricultural uses	R94/7	X	
	Integrated crop management	R2000/1	X	
	Use on amenity areas	R2000/2	X	

The effectiveness of OSPAR measures to reduce the emissions and discharges of heavy metals and organic substances from point and diffuse sources have so far been periodically assessed on the basis of national implementation reports. Assessments of these implementation reports prepared in the period 1998 – 2006 showed that Contracting Parties have made considerable efforts to successfully implement OSPAR measures. Although OSPAR measures made an important contribution to reducing emissions and discharges, quantification is difficult to achieve in many cases on the basis of the implementation information reported by Contracting Parties. In the meantime, other international organisations, such as OECD or UNECE and, in particular, the European Community, have adopted similar initiatives in regulating releases of hazardous substances to the aquatic environment as well as their production and marketing through which more data on discharges, emissions and losses are, and will become, available. Specifically EC Council Directive 96/61/EC concerning integrated pollution prevention control (IPPC Directive) pursues reductions of discharges and emissions from most industries covered by OSPAR measures through the use of best available techniques and makes provision for an inventory of discharges and emissions which is available in form of the European Pollution Emission Register (EPER). Further reductions in emissions, discharges and losses of heavy metals and organic pollutants from relevant industries (metal industry, cement and energy sector etc.), could be achieved by applying the most ambitious BAT recommended by the relevant reference documents on best available techniques (BREFs) under the IPPC Directive and by aiming at emission levels which are associated with their use.

In the light of the achievements by Contracting Parties in giving effect to OSPAR measures and of similar actions taken in particular by the EC, the assessment of the implementation and effectiveness of OSPAR measures, which has been a considerable achievement at a time when no similar arrangements were in place in other international forums, may be considered mostly completed and this important work of OSPAR to cease except for those measures for which OSPAR identified a need for Contracting Parties to continue reporting on their implementation. For OSPAR chemicals for priority action, monitoring strategies have been established in the period 2003 – 2006 which capture most of the information needed by OSPAR to assess progress towards the objectives of the Hazardous Substances Strategy (OSPAR agreement 2004-14). The monitoring strategies require a systematic collection of consistent data and information on the production, sales, import or export in the OSPAR Convention area of chemicals for priority action and their discharges, emissions and losses by Contracting Parties. This includes for example compiling of data held by EPER or the Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutant in Europe (EMEP) under the UNECE Convention on Long-range Transboundary Air Pollution, or of information on emission reductions and levels achieved by Contracting Parties through national measures and programmes in the framework of the IPPC Directive. This will supplement other information collected by

OSPAR for example under its monitoring programmes (RID and CAMP), one-off surveys, or implementation reporting where this continues. Based on this information collection a first assessment of emissions, discharges and losses of substances identified by OSPAR for priority action will be undertaken in 2008. This will close an important gap in knowledge for the QSR 2010.

4.3.2 Trends in waterborne and atmospheric inputs

An indication of achievements made in reducing discharges, emissions and losses is given by observations of inputs of some hazardous substances to the marine environment via waterborne or airborne pathways. These are subject to long-term trend monitoring under the OSPAR Study on Riverine Inputs and Direct Discharges (RID) (OSPAR agreement 1998-5) and the Comprehensive Atmospheric Monitoring Programme (CAMP) (OSPAR agreement 2001-7), and related trend assessments. The hazardous substances subject to mandatory and voluntary monitoring under both programmes are summarized in Table 4.4.

Table 4.4 Hazardous substances subject to mandatory and voluntary monitoring under CAMP and RID

Substance (determinand)	Monitoring under CAMP				Monitoring under RID	
	Mandatory		Voluntary		Mandatory	Voluntary
	Precipitation	Ambient air	Precipitation	Ambient air		
Arsenic	X			X		
Cadmium	X			X	X	
Chromium	X			X		
Copper	X			X	X	
Lead	X			X	X	
Mercury	X			X	X	
Nickel	X			X		
Zinc	X			X	X	
Lindane	X			X	X	
Hydrocarbons						X
PAHs			X	X		X
PCBs			X	X		including other organohalogen compounds

WATERBORNE INPUTS OF HEAVY METALS

The assessment in 2005 (OSPAR 2005b) of data on riverine inputs and direct discharges collected under RID in 1990 – 2002 for OSPAR Regions I, II and III showed, in general, a significant reduction in inputs of the heavy metals cadmium, mercury and lead in the OSPAR Convention area. Total inputs of all three metals were substantially lower in 2002 compared to 1990. Inputs to Arctic Waters (Region I) are based on Norwegian data only and are considerably smaller than the inputs to both the Greater North Sea (Region II) and Celtic Seas (Region III). Inputs to the Greater North Sea are ten to ninety times higher than to the Arctic Waters and two to fifteen times higher than to the Celtic Seas.

Shortcomings in data availability and quality for the assessed OSPAR Regions made it difficult in some cases to detect statistically significant trends. This is true in particular for mercury and, to a lesser extent, for lead. There are differences and changes in completeness of reported data not only between Contracting Parties but also within time series of individual Contracting Parties making it difficult to compare inputs over the assessed period. Changes in national monitoring programmes for RID such as frequency and season of sampling, limits of detection, or changes in analytical methods or laboratories contribute to uncertainties in the assessment. Where concentrations are low, small changes in inputs can be reflected as huge percentage decreases or increases, and chemical analysis becomes more difficult with concentrations close to the limit of detection.

The assessment showed a general significant downward trend in total inputs (riverine inputs and direct discharges) of cadmium with reductions in inputs of 89% in the Arctic Waters, 49% in the Greater North Sea and 68% in the Celtic Seas. For mercury, the outcome was less clear: there has been a significant downward trend in total inputs of mercury in the Greater North Sea (down 73%). The decrease of total inputs by 93% to the Celtic Seas is questionable due to lack of data. The total inputs of mercury to Arctic Waters were lower than in 1990, but calculations show an upward trend (up 125%), although not a statistically significant one. This suggested increase is due to a change in Norway of the analytical method for mercury showing higher concentrations. Against this background, it is expected that total inputs of mercury to Arctic Waters have also decreased in the assessment period. The statistically significant overall trends for lead are comparable to those for cadmium: total inputs of lead went down by 87% in the Arctic Waters and by 33% in the Greater North Sea. No satisfactory statistical results could be established for the Celtic Seas for which not sufficient and reliable data were available.

Considering trends in direct discharges and riverine inputs separately, their directions were, in general, comparable. However, trends in direct discharges were more pronounced than those for riverine inputs although less often statistically significant. Generally speaking, direct discharges in the Greater North Sea and the Celtic Seas were the smaller and progressively diminishing component of overall inputs for each substance. For cadmium, the direct discharges in all three OSPAR Regions showed a statistically significant decrease (down 55 – 89%). For direct discharges of mercury, statistically significant downward trends were found for the Greater North Sea (down 75%) and for the Arctic Waters (down 91%). For riverine inputs to the Arctic Waters, however, a statistically non-significant increase was detected. For the direct discharges of lead a statistically significant downward trend could be established for the Greater North Sea (down 75%) which is contrasted by an upward trend in riverine inputs (up 6%). For the Celtic Seas there is a statistically significant downward trend for both direct discharges (down 60%) and riverine inputs (down 25%). While in the Arctic Waters a statistically significant decrease in riverine inputs of lead (down 93%) was detected over the assessed period, the downward trend for direct discharges (down 10%) was not statistically significant.

ATMOSPHERIC INPUTS OF HEAVY METALS AND LINDANE

The Comprehensive Atmospheric Monitoring Programme (CAMP) measures concentrations for a variety of contaminants in rain or other precipitation and in air, either attached to particles suspended in air (aerosols) or in gaseous form. A trend assessment for data collected under the CAMP in the period 1987 – 2002 was confined to the heavy metals arsenic, cadmium, chromium, copper, mercury, nickel, lead and zinc, and to lindane (OSPAR 2005c).

In general, a decreasing trend both in precipitation and on aerosols could be established for the heavy metals. However, of the 108 time-series assessed for concentrations in precipitation, only 38 showed statistically significant trends (this dropped to 14 when normalised by the annual amount of precipitation). All but one of the trends were downward. Of the 60 time-series for concentrations in aerosol, 29 showed statistically significant trends which all, except one, were downward. The two upward trends (at different locations) were for zinc.

For the main body of the North Sea, the atmospheric deposition of cadmium and lead is estimated to be roughly of the same magnitude as the total of riverine inputs and direct discharges. There are statistically significant downward trends in the total amounts of copper and lead estimated to have been deposited. With one partial exception (zinc), the other heavy metals monitored also showed downward trends in the amounts estimated to have been deposited, but these are not statistically significant.

For lindane suitable time-series are only available for stations in Iceland, Norway (for precipitation and aerosols) and Sweden (aerosols only). Statistically significant downward trends are present in five of the six time-series. This is consistent with other work in the Netherlands, and is to be expected given the increasing controls on the use of the substance.

4.4 State of the marine environment with regard to hazardous substances

4.4.1 Assessment criteria

To assess progress towards the objectives of the OSPAR Hazardous Substances Strategy with respect to concentrations in the marine environment, two types of assessment tools have been developed: Background Concentrations (BCs) and associated Background Assessment Criteria (BACs), and Environmental Assessment Criteria (EACs).

Background Concentrations (BCs), formerly Background/Reference Concentrations (B/RCs), are intended to represent the concentrations of certain hazardous substances that would be expected in the North-East Atlantic if certain industrial developments had not happened. They represent the concentrations of those substances at “remote” sites, or in “pristine” conditions based on contemporary or historical data respectively, in the absence of significant mineralization and/or oceanographic influences. In this way they relate to the background levels referred to in the OSPAR Hazardous Substances Strategy and are used to assess if the concentrations in the marine environment are at, or approaching, background levels for naturally occurring substances and close to zero for man made substances. Background Assessment Criteria (BACs) are statistical tools, defined in relation to the background concentrations and on the basis of the variability within the monitoring datasets, which enable precautionary testing of whether mean observed concentrations can be considered to be near background concentrations. In the absence of sufficiently large datasets (containing levels that can be considered at, or near, background) the review of the BCs in 2005 did not cover all substances and did not finalise BCs for metals in biota. In the latter case B/RCs agreed by OSPAR in 1997 apply while further development work is taking place.

Environmental Assessment Criteria (EACs), formerly ecotoxicological assessment criteria, are used to identify potential areas of concern and to indicate which substances could be considered as a priority. They should not be used as firm standards or as triggers for remedial action. EACs link chemical monitoring data and/or joint chemical/biological effects monitoring data and are based on toxicity tests for individual substances. They particularly relate to the questions of whether there are any unintended/unacceptable biological responses, or unintended/unacceptable levels of such responses, being caused by exposure to hazardous substances. A set of EACs were adopted in 1997 on a provisional basis and work on their further refinement and updating is still ongoing, taking into account the approach taken for the development of Quality Standards for the purpose of the EC Water Framework Directive.

An overview of the currently applicable BCs/BACs (OSPAR agreement 2005-6) and EACs (OSPAR agreement 1997-14) are given in Tables 4.5 and 4.6 for metals and organic pollutants, respectively.

Table 4.5 Background concentration (BC), range of background reference concentrations (BRCs), provisional background assessment criteria (BACs), and provisional environmental assessment criteria (EACs) for metals in sediment, blue mussel and fish. Bold text indicates metals that are OSPAR chemicals for priority action

Parameter	SEDIMENT (mg/kg dry weight; normalised to 5% Al for BC/BAC)				BIOTA – blue mussel (mg/kg wet weight)			BIOTA – fish (mg/kg wet weight)		
	Range of BRC	BC	BAC	EAC	Range of BCs	BAC	EAC	BRC-fillet*	BAC-fillet	EAC-whole
Arsenic		15	25	1-10						
Cadmium		**0,2**	**0,31**	**0.1-1**	**0.07-0.11**					**7.35**
Chromium		60	81	10-100						
Cobalt	7-23									
Copper		20	27	5-50	0.76-1.1					
Iron	0.6-6.3									
Lead		**25**	**38**	**5-50**	**0.01-0.19**					
Lithium	22-44									
Mercury		**0.05**	**0.07**	**0.05-0.5**	**0.005-0.01**			**10-50**[1] **30-70**[2]		
Nickel		30	36	5-50						
Titanium	0.2-0.35									
Vanadium	60-110									
Zinc		90	122	50-500	11.6-30					

[1] BRC for round fish; [2] BRC for flat fish

Note: BRC values are those adopted in 1997 with a conversion to the appropriate units and are part of OSPAR agreement 2005-6 on background concentrations for contaminants in seawater, biota and sediment. EACs are those agreed by OSPAR in agreement 1997-15.

Table 4.6 Background concentration (BC) and provisional background assessment criteria (BAC) (OSPAR agreement 2005-6) and provisional environmental assessment criteria (EAC) for organochlorines and PAHs in sediment, blue mussel and fish (OSPAR agreement 1997-15)

Parameter	SEDIMENT (µg/kg dry weight normalised to 2.5% carbon)			BIOTA – blue mussel (µg/kg dry weight)			BIOTA – fish (µg/kg wet weight)		
	BC	BAC	EAC	BC	BAC	EAC	BC-liver	BAC-liver	EAC-whole
DDE			0.5-5			5-50			5-50
Dieldrin			0.5-5			5-50			5-50
Lindane									0.5-5
TBT						1-10			
CB 153	0	0.2		0	1.1		0	0.2	2.5
ΣCB_7[1]	0	1.5		0	4.6	5-50	0	1.2	1-10
Naphthalene	5	8	50-500	1	81.2	500-5000			
Phenanthrene	17	32		4.5	12.6	5000-50000			
Anthracene	3	5		1	2.7	5-50			
3 rings (PA+ANT)									
Fluoranthene	20	39		7	11.2	1000-10000			
Pyrene	13	24		5.5	10.1	1000-10000			
Benz[a]anthracene	9	16		1.5	3.6				
Chrysene	11	20		6.5	21.8				
4 rings (FLU+PYR+BAA+CHR)									
Benoz[a]pyrene	15	30		1	2.1	5000-50000			
5 rings (BAP+BKF)									
Benzo[ghi]perylene	45	80		2.5	7.2				
Indeno[123-cd]pyrene	50	103		2	5.5				
6 rings (BGHIP+ICDP)									

[1] Sum of chlorinated biphenyl congeners CB 28, CB 52, CB 101, CB 118, CB 138, CB 153, CB 180

4.4.2 Status of concentrations and trends

In 1999, OSPAR Contracting Parties committed themselves to monitor concentrations of metals (cadmium, mercury and lead), polycyclic aromatic hydrocarbons (PAHs), chlorinated biphenyls (CBs) and tributyltin (TBT) in the marine sediments and biota (soft tissue of fish and biota) under the OSPAR Co-ordinated Environmental Monitoring Programme (CEMP) and to report their data to the International Council for the Exploration of the Sea (ICES) who act as the data centre on behalf of OSPAR in this respect (OSPAR agreement 2005-5). This agreement acts to co-ordinate the extensive marine monitoring programmes for key hazardous substances which many Contracting Parties have in practice maintained since the late seventies. As a result of these programmes and the commitments under the CEMP a substantial dataset has been built up. In 2005 and 2006 OSPAR has assessed the trends in the time series in this dataset and the concentrations in the most recent year in each time series in relation to the BCs and the EACs described in section 4.4.1.

These assessments are the outcome of over 25 years' detailed international collaboration between all OSPAR Contracting Parties. Novel approaches for data treatment and analysis developed by OSPAR were applied. These include procedures to weight data according to the availability of quality assurance information allowing a more inclusive approach to data inclusion in the assessments thus preserving the integrity of some longer time series.

A total of 2772 time series were examined for hazardous substances in biota (fish and shellfish), and a total of 9151 time series for hazardous substances in sediments, that varied in length from 3 to 25 years. The hazardous substances assessed include metals, PAHs, CB compounds, and selected pesticides. Although the time series covered the entire OSPAR area, most time series were situated in Region II, the Greater North Sea (Figure 1.1). The results discussed below are therefore primarily valid for this Region but the results are similar in all four OSPAR Regions.

The large number of time series that were assessed in 2005 does not result in a clear picture of the distribution and trends of hazardous substances in the OSPAR area (OSPAR 2005d). For the large majority of time series, no statistically significant trends could be detected. Statistically significant trends, showing either increasing (28%) but mostly decreasing concentrations (72%), were only found in 962 time series (Figure 4.1).

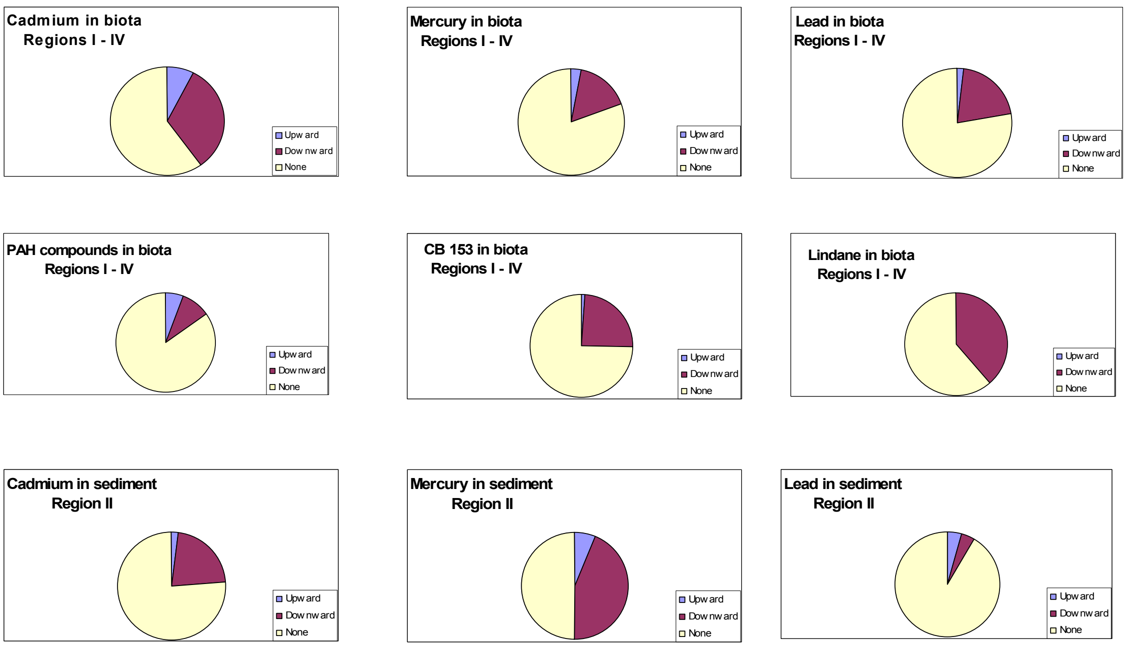


Figure 4.1 Summary of the temporal trends in concentrations of hazardous substances (metals and organic contaminants) in fish, shellfish and sediments in the OSPAR area. Source: OSPAR 2005d

Nevertheless, some very relevant conclusions could be drawn from this analysis:

- the large majority of the statistically significant trends of concentrations of mercury (28 out of 34), cadmium (53 out of 67) and lead (33 out of 37) in biota show decreasing concentrations. Remarkably, cadmium levels in the German Bight and off the Belgian coast, mercury in the inner German Bight and lead in the open North Sea and on the Belgian coast show an increasing trend;
- all the statistically significant trends for lindane (56), and the large majority (49 out of 51) of those for CB 153 (representative of the CB group), in biota show decreasing concentrations. However, the rate at which concentrations of CBs in biota are decreasing was less than that determined in a previous assessment suggesting that there may be a residual problem. Also, PCB levels in cod at some Norwegian and some UK sites are increasing;
- the numbers of statistically significant increasing (33) and decreasing (54) trends for PAH compounds in biota did not show the clear move towards downward trends visible for other contaminants. More so, PAHs in the North Sea seem to be increasing, although further monitoring at a number of sites is needed to build a more comprehensive picture;
- a substantial majority of the statistically significant trends of concentrations of metals in sediments were decreasing, particularly for cadmium (19 out of 23) and mercury (44 out of 44);
- although there were relatively fewer significant trends for organic compounds (PAH, CBs and lindane) in sediment, the majority of those were decreasing.

The difficulty in detecting significant trends results in part from the high proportion of shorter time series. Approximately 30% were of 3 – 4 years in length. The optimum for trend detection is greater than 7 years. Another factor is the total variability of the data, which at the current environmental levels and with the current monitoring programmes and methodologies, confounds the detection of real trends (Figure 4.2).

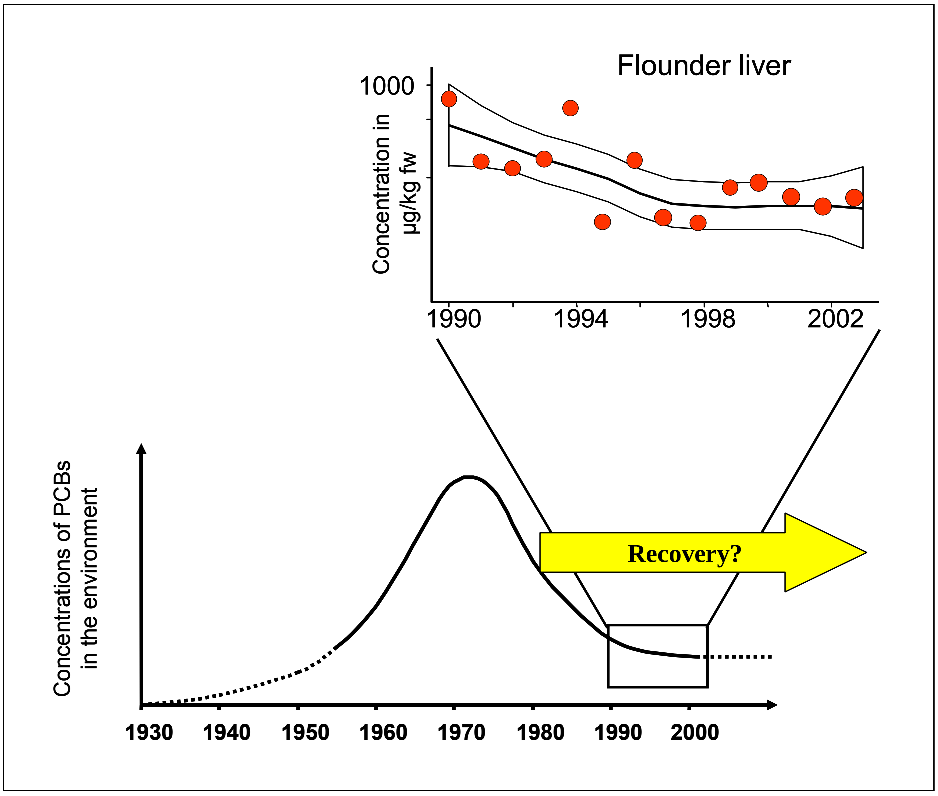


Figure 4.2 Total variability of long-term observations in relation to medium-term trends for CB 153 in flounder liver. Source: Roose 2005

The reasons for this high variability can be described as:

- a high interannual variability in substance inputs from point sources (including river mouths) or from atmospheric inputs which depend on the regional scale wind circulation patterns. Extremely long time series are necessary to reach conclusions based on the present sampling frequency. A higher sampling frequency would be necessary to conclude definitively on trends in shorter time series;
- a high interannual variability in concentrations can occur in sea areas with contrasting and rapidly changing physical conditions. In such cases, a high sampling frequency is necessary too, to conclude on trends in shorter time series.

Assessment of the observed concentrations in the most recent year of each time series in comparison with the agreed Background Concentrations (BCs) showed that in the majority of cases concentrations of heavy metals are above background levels. For example: in biota, over 85% of concentrations in blue mussels in the last year of each time series were above BCs for lead and cadmium. For mercury, 99% of concentrations in blue mussels in the last year of each time series were above BCs, as were 79% of concentrations of mercury in fish. Similarly, in sediments, 85% of the concentrations in the last year of each time series were above BCs for cadmium. Unfortunately, for lead and mercury, concentrations in sediments could only be assessed in the small number of cases where it was possible to normalise for aluminium. In these cases, concentrations were above background levels.

The picture was rather different for PAHs and CBs. For the various PAHs assessed, up to 46% of the concentrations were at background levels, depending on the PAH compound concerned. For sediment, up to 59% of concentrations were at background levels. For PCBs, only in 11% of the time series for blue mussel and none of the time series for sediments, concentrations could be considered to be at or near background.

The results of assessments against Ecological Assessment Criteria (EACs) are somewhat less clear as these criteria require further development but some preliminary conclusions could already be drawn. For metals, the concentrations in the OSPAR area are virtually all above the agreed EACs both for sediments and biota. The only exception is lead in organisms. For the organic contaminants, the concentrations are at or near the current EACs, and levels in Region I are always below the EACs.

Finally, OSPAR has been particularly concerned about tributyltin, which has been used as an antifouling paint on ships, and which has an endocrine disrupting effect, particularly on shellfish. An initial assessment has been made of the monitoring of the biological effects of tributyltin in Denmark, Norway and the United Kingdom. In these areas, strong effects were found in and around ports and related facilities, with much weaker effects in remote areas, for example in parts of northern Scotland and Norway.

In 2006, a further assessment of CEMP data for selected contaminants was undertaken as part of a series of annual assessments aimed to operationalise the assessment procedures (OSPAR 2006b). The results partly confirmed the conclusions of the 2005 assessment. Approximately 21% (330) of the assessed time series showed significant trends, over 90% were downward trends. The highest proportion (20%) of significant downward trends were found for lindane. High concentrations were generally found in the vicinity of known point sources such as industry (e.g. Sørfjord in Norway, Roskilde in Denmark, or Ponteverdra in Spain), harbours (e.g. Oslo) or river outflows (e.g. Seine, Rhine, Elbe, or Thames). But also in these areas many downward trends were found. Although downward trends are positive signs and underline the effectiveness of measures taken, the latest measurements in most time series are still well above background concentrations. Notable upward trends were found for the German Bight (lead) and the Sørfjord (mercury and cadmium).

To conclude, these assessments show that progress is being made towards the ultimate aim of the OSPAR Hazardous Substances Strategy of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man made, synthetic substances. However, further scrutiny is needed both of the distribution of sampling and the length and intensity of the time series. A further development of assessment tools is also required to enable the assessment of a wider range of hazardous substances.

5. Eutrophication

5.1 Aims of the Eutrophication Strategy

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

To fulfil this commitment, the Strategy requires the implementation of:

a. PARCOM Recommendations 88/2 on the reduction in inputs of nutrients to the Paris Convention Area;

b. PARCOM Recommendation 89/4 on a coordinated programme for the reduction of nutrients, and;

c. 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.

These measures request Contracting Parties to put in place effective national steps to achieve a substantial reduction, of the order of 50% compared to input levels in 1985, in inputs of phosphorus and nitrogen into areas where these inputs are likely to cause pollution, and to apply best available techniques to specifically reduce nutrient inputs from agriculture.

To set priorities for implementing these measures and to assist Contracting Parties in identifying those areas where nutrient inputs are likely, directly or indirectly, to cause pollution, marine areas are characterized by the Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area (the "Common Procedure"), adopted by OSPAR in 1997 and revised in 2005, in terms of problem areas, potential problem areas and non-problem areas (OSPAR agreement 2005-3).

Progress towards achieving the aims of the OSPAR Eutrophication Strategy is reviewed on a regular basis. This is done by means of assessments of the eutrophication status of the OSPAR Convention area under the Common Procedure, the status of implementation of PARCOM Recommendations 88/2, 89/4 and 92/7 drawing on national reports based on harmonised quantification and reporting procedures, and model-based assessments of the expected eutrophication status following implementation of the agreed measures.

5.2 Emissions, discharges, losses

Eutrophication is caused by excessive nutrient enrichment of water from a variety of point sources (for example sewage plants or industry) and diffuse sources (for example agriculture, households not connected to sewerage, overflows, natural background losses or atmospheric inputs). This is addressed by OSPAR measures to reduce anthropogenic emissions, discharges and losses at source. In 2003, Contracting Parties reported under PARCOM Recommendation 88/2 losses and discharges of nitrogen and phosphorus which totalled roughly 1080 kt of nitrogen and 80 kt of phosphorus (OSPAR 2006c).

In 2003, Denmark was the only Contracting Party having achieved the overall reduction in nutrient inputs by 50% compared to the input levels in 1985. Most other Contracting Parties attained this objective for phosphorus but not for nitrogen.

Reductions in nutrient inputs have mainly been achieved by improvements at point sources. Connecting households and industry to waste water treatment facilities with secondary and tertiary treatment, for example, has resulted in considerable reductions in nutrient inputs. For the period 1985 to 2003, Contracting Parties reported reductions in discharges of phosphorus and nitrogen from sewage treatment works and sewerage ranging from 32 – 91% and 14 – 75%, respectively. For discharges from industry, a number of Contracting Parties have attained reductions at source in the order of 75 – 93% for nitrogen and 82 – 99% for phosphorus in 2003 compared to 1985. A large part of the reduction is due to the shut down of industrial plants.

In addition, the growing aquaculture industry has become a relevant point source in some Contracting Parties. While nutrient inputs from aquaculture are decreasing in most Contracting Parties, Norway reported an increase of inputs to the Skagerrak coast of nitrogen to 28 tonnes and of phosphorus to 6 tonnes compared to 12 tonnes and 3 tonnes in 1985, respectively. This increase is very low and considered negligible for eutrophication. Aquaculture is not considered a significant contribution to problem areas and potential problem areas in the UK. In Scotland, where most of aquaculture activities take place, the total nitrogen releases from salmon farming in 2004 were estimated to be 7.2 kt, the total releases of dissolved phosphorus 1.5 kt. An overview of the percentage reductions achieved in 2003 (compared to 1985) is given in Figure 5.1.

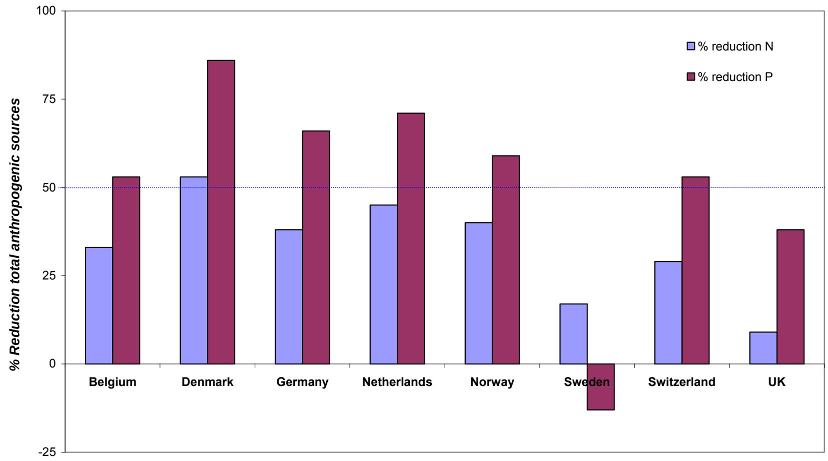


Figure 5.1 Total percentage reductions in anthropogenic discharges / losses of nitrogen and phosphorus between 1985 and 2003. Note that the German figures are the same as for 2000 when modelling of discharges was last carried out. UK data are RID data. The indicated increase in discharges/losses of phosphorus in Sweden since 1985 is caused by the change in methodology for calculating losses of phosphorus from agricultural soils. Source: OSPAR 2006c

As a consequence of the reduction of inputs at source between 1985 and 2003 the relative share of the total anthropogenic nitrogen inputs from diffuse sources like agriculture and atmospheric deposition on inland surface waters increased (Figure 5.2).

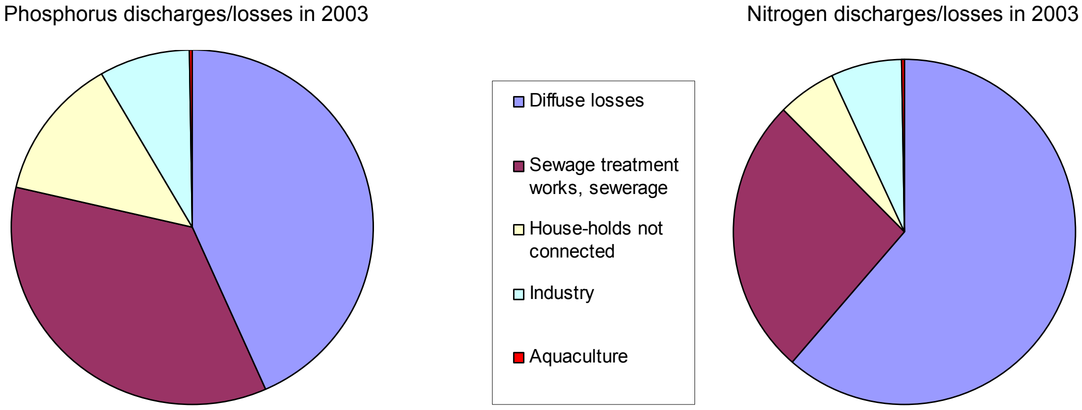


Figure 5.2 Contribution of the different anthropogenic sources to the total losses and discharges of nutrients in 2003. Source: OSPAR 2006c

In 2003, agriculture was still a main diffuse source for nitrogen releases to the environment (mainly drainage and leaching via groundwater). The measures to reduce the losses from the agriculture sector are progressing much slower than expected and this has so far delayed the accomplishment of the 50% reduction target. In 2003, the achievement in reduction of losses of nitrogen from agriculture (including natural background losses) ranged between 5 – 37%, with Denmark as the only country reporting a reduction close to the target (48%). The retention of nitrogen within catchments is responsible for a considerable time lag before reductions at source will be reflected in further decreased loads of nitrogen reaching the marine environment.

The portion of atmospheric inputs (i.e. deposition) of nitrogen from land based and sea based (e.g. shipping) sources into the OSPAR maritime area account for one third of the total nitrogen inputs in the period 1990 – 2001 (see Table 5.1).

Table 5.1 Riverine inputs, direct discharges and atmospheric inputs of nitrogen to the Greater North Sea in kilotonnes per year (kt N/y). Source: OSPAR 2005e

Year	Direct discharges	Riverine inputs	Riverine inputs and direct discharges	Atmospheric inputs	Total inputs	Portion of atmospheric N
1990	85	720	805	524	1,329	39 %
1995	63	1,100	1,163	483	1,646	29 %
1996	57	687	744	562	1,306	43 %
1997	58	659	717	513	1,230	42 %
1998	55	894	949	523	1,472	36 %
1999	55	893	948	469	1,417	33 %
2000	61	875	936	550	1,486	37 %
2001	59	889	948	486	1,434	34 %

A model-based assessments of the distribution of emissions of nitrogen and ammonium among sectors and their relative significance (in percentage) identified road transport (42%), combustion in energy and transformation industries (24%) and other mobile sources and machinery (including ship traffic) (14%) as some of the main emission sources of oxidized nitrogen to the OSPAR Convention area. International ship traffic in the OSPAR area has become the fastest growing single source of NO_2 emissions and an increasing trend is expected. For ammonia, the most important emission sectors are agriculture (84%), waste treatment and disposal (7%), production processes (4%) and other sources and sinks (4%). The higher annual modeled deposition of oxidized nitrogen compared to reduced nitrogen indicates that mobile sources, including shipping, contribute more to deposition than emissions from sources related to agriculture.

The estimated relative contribution of Contracting Parties to the deposition of nitrogen in the OSPAR Regions is shown in Figure 5.3. The relative contribution is estimated as the deposition caused by emissions in the specified country relative to the deposition in the area caused by all sources. It depends on the total emissions within the country and its orientation to the receptor area (distance and orientation with respect to the prevailing wind direction are the most important factors).

The assessment of trends of nutrient inputs to the OSPAR regions based on RID data (OSPAR 2005b) and CAMP data (OSPAR 2005c) show for the Arctic Waters that atmospheric deposition of nitrogen is predominant (six to ten times the riverine and direct discharges), although its level is estimated to have gone down by 25% between 1990 and 2001. There is a substantial increase in total waterborne inputs of both nitrogen (up 32%) and phosphorus (up 135%) as a result of significant increases in direct discharges. Riverine inputs, being largely natural, have remained more or less constant for phosphorus and slightly declined for nitrogen.

For the Greater North Sea atmospheric deposition of nitrogen is estimated to amount to one third of all nitrogen inputs. Although riverine and direct inputs of nitrogen have reduced substantially between 1990 and 2001 by about 10% and 30% respectively, there has been no similar reduction in the total amount of nitrogen deposited from the atmosphere. There was also a substantial reduction in direct discharges of phosphorus (down 33%), but no statistically confirmed conclusions could be reached on riverine inputs. For smaller areas of the Greater North Sea, the situation with regard to trends in waterborne inputs varies considerably with some significant upward trends in riverine inputs and/or direct discharges of nitrogen (Channel, Belgian and Dutch coast, Norwegian West coast) and of phosphorus (Channel, UK East coast, Skagerrak, Norwegian West coast) which still need to be confirmed and their reasons established.

In the Celtic Seas, atmospheric deposition of nitrogen is also estimated to provide about one-third of all inputs of nitrogen. There are, however, no significant trends in inputs of nitrogen by any route. Still, total waterborne inputs of nitrogen can be considered to be lower in 2002 compared to 1990. In the same period, there was a significant reduction of 33% in phosphorus.

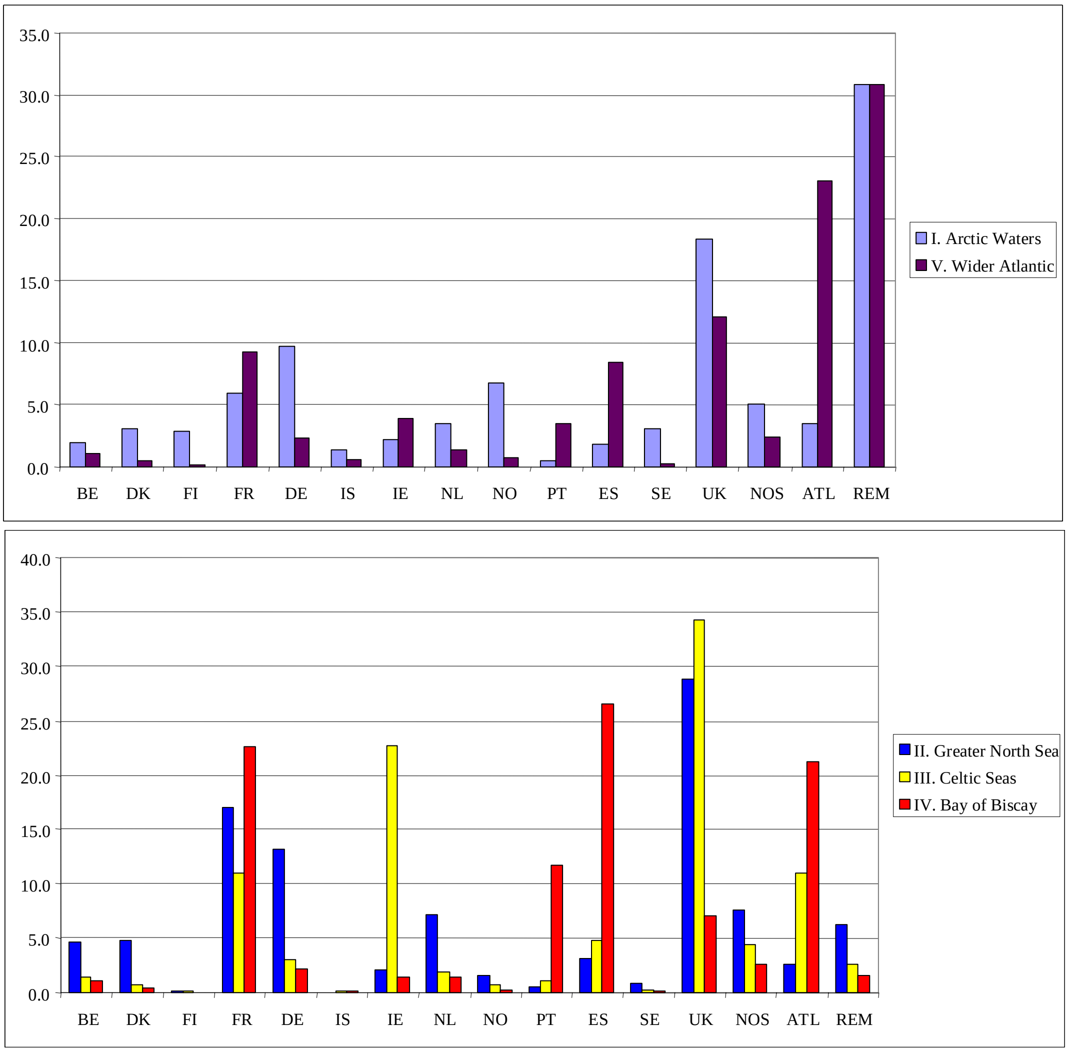


Figure 5.3 Relative contribution (in % of total deposition) of Contracting Parties in 2000 to the total deposition of nitrogen in the OSPAR Regions I – IV. The contributions of ship traffic emission on North Sea and Wider Atlantic are indicated by NOS and ATL, respectively. REM stands for all other European countries and for undefined sources. Source: OSPAR 2005c

5.3 Eutrophication status

For the purposes of the OSPAR Eutrophication Strategy, eutrophication is defined as the anthropogenic 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 as described in the Common Procedure (OSPAR agreement 2005-3). The assessment of the eutrophication status and the related water quality is essentially expressed through the classification of the water body concerned as problem area or non-problem area defined by the Eutrophication Strategy as follows:

a. “problem areas with regard to eutrophication” are those areas for which there is evidence of an undesirable disturbance to the marine ecosystem due to anthropogenic enrichment by nutrients;

b. “non-problem areas with regard to eutrophication” are 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.

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 but where data are not sufficient to support firm conclusions, are classified as “potential problem areas with regard to eutrophication”. Within five years of an area being characterised as a potential problem area there should be urgent implementation of monitoring and research in order to enable a full assessment of the eutrophication status.

5.3.1 Assessment criteria

The Common Procedure provides a set of qualitative assessment criteria for nutrient enrichment and its direct and indirect effects which are linked in the assessment to reflect the main cause/effect relationships in the eutrophication process (see Figure 5.4). This process involves, as the direct response to excessive nutrient enrichment, augmented algae growth. This in turn affects the marine ecosystem by limiting sunlight to benthic algae which reduces photosynthesis and increases consumption of oxygen through algae respiration. Oxygen depletion is accelerated by respiration of micro-organisms feeding on the growing mass of dead algae sinking to the sea bottom. Death of fish and other organisms can not only be caused by lack of oxygen but also by toxins produced by certain algae species which might out-compete other species under eutrophic conditions, possibly causing a shift in the composition of algae species.

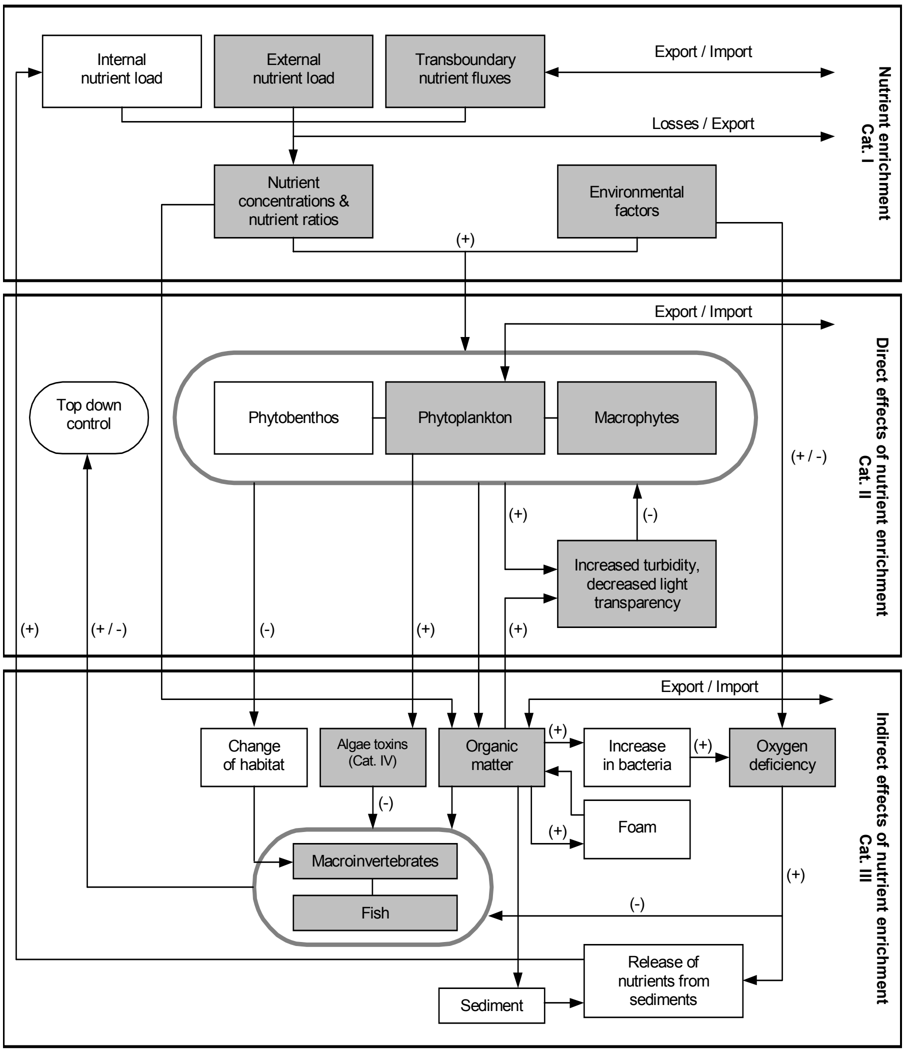


Figure 5.4

Generic conceptual frame-work to assess eutrophication in all categories of surface waters

Note: Shaded boxes indicate components relevant for the Comprehensive Procedure.

'+' indicate enhancement;

'-' indicate reduction;

Cat. I = Category I. Degree of nutrient enrichment (causative factors);

Cat. II = Category II. Direct effects of nutrient enrichment;

Cat. III = Category III. Indirect effects of nutrient enrichment;

Cat. IV = Category IV. Other possible effects of nutrient enrichment.

From a list of potential qualitative assessment criteria, ten parameters indicating the chemical, physical and biological water quality and biological effects resulting from nutrient enrichment have been selected in the Common Procedure for their harmonised application. The harmonised assessment parameters are:

a. for nutrient enrichment: levels and trends in riverine inputs and direct discharges, winter concentration of the total of dissolved inorganic nitrogen compounds (DIN) and ortho-phosphate (DIP), and the ratio of concentrations of nitrogen and phosphorus;

b. for direct eutrophication effects during the growing season: mean and maximum concentration of chlorophyll *a*, levels of nuisance/toxic phytoplankton indicator species and their duration of blooms, and shifts from long-lived to short-lived nuisance species measured in biomass and area coverage;

c. for indirect eutrophication effects during the growing season: levels of oxygen deficiencies and saturation, kills in zoobenthos and fish in relation to oxygen deficiency and/or toxic algae and long-term area-specific changes in zoobenthos biomass and species composition, and levels of organic carbon/organic matter (mainly in sedimentation areas);

d. for other eutrophication effects during the growing season: level of algal toxins measured as incidence of DSP/PSP mussel infection events.

The assessment procedure is based on area-specific background levels which serve as an anchor for the comparison with the associated area-specific assessment levels agreed by OSPAR for each assessment parameter. Assessment levels define the desired level of the ecological quality and quantify the impact of eutrophication on the marine environment. They are area-specific to reflect the potential sensitivity of a water body to nutrient enrichment which varies depending on its chemical, physical and hydrological characteristics (for example salinity gradients and regimes, depth, temperature, mixing characteristics, sedimentation, turbidity, residence/retention time etc.).

Assessment levels are set in relation to the relevant area-specific background conditions and may deviate from this taking into account the natural variability and reflecting good ecological conditions. The background condition is defined, in general, as salinity-related and/or specific to a particular area, and has been derived from data relating to a particular (usually offshore) area or from historic data. For concentrations, the assessment level is generally defined as a justified area-specific % deviation from background not exceeding 50%. Assessment parameters observed at levels above their associated area-specific assessment levels are considered to be elevated. Elevated parameters for nutrient enrichment indicate nutrient levels which may be capable of causing, directly or indirectly, eutrophication effects. Elevated parameters for eutrophication effects may indicate an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned, in the meaning of the OSPAR Eutrophication Strategy.

The results of the comparison of monitoring data for the harmonised assessment parameters with their area-specific assessment levels are scored and integrated for an initial area classification in accordance with the definition of the eutrophication status of an area set out in the OSPAR Eutrophication Strategy (Table 5.2).

Table 5.2 Examples of the integration of categorised assessment parameters for an initial classification

	Category I Degree of nutrient enrichment Nutrient inputs ***Winter DIN and DIP*** Winter N/P ratio	Category II Direct effects ***Chlorophyll a*** ***Phytoplankton indicator species*** Macrophytes	Categories III and IV Indirect effects/other possible effects ***Oxygen deficiency*** ***Changes/kills in zoobenthos***, fish kills Organic carbon/matter Algal toxins	Initial Classification
a	+	+	+	problem area
	+	+	-	problem area
	+	-	+	problem area
b	-	+	+	problem area[1]
	-	+	-	problem area[1]
	-	-	+	problem area[1]
c	+	-	-	non-problem area[2]
	+	?	?	potential problem area
	+	?	-	potential problem area
	+	-	?	potential problem area
d	-	-	-	non-problem area

[1] For example, caused by transboundary transport of (toxic) algae and/or organic matter arising from adjacent/remote areas.
[2] The increased degree of nutrient enrichment in these areas may contribute to eutrophication problems elsewhere.

Note: Parameters in ***bold italics*** indicate the five corresponding ecological quality objectives for eutrophication for the North Sea. 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 level, shift or change.

(+) = Increased trends, elevated levels, shifts or changes in the harmonised assessment parameter concerned
(-) = Neither increased trends nor elevated levels nor shifts nor changes in the harmonised assessment parameter concerned
? = Not enough data to perform an assessment or the data available is not fit for the purpose

Following the initial classification, an appraisal of all relevant information including additional assessment criteria and other relevant environmental factors which can support the assessment and help to explain certain observations is carried out to determine in a transparent and scientifically justified way the final eutrophication status of an area.

There are similarities between the biological quality elements for transitional and coastal waters under the Water Framework Directive and the harmonised assessment parameters. For their assessment, the WFD Guidance Document on Eutrophication Assessment in the Context of European Water Policies under the Water Framework Directive builds on the assessment approach and criteria developed under the Common Procedure.

5.3.2 Overview of eutrophication status [4]

The first assessment under the Common Procedure in 2002 showed widespread eutrophication in Region II, in particular in the estuaries, fjords and coastal areas of the southern and eastern part of the North Sea, the Kattegat, the Skagerrak and, to a smaller extent, in the Channel (OSPAR 2003a). Elevated concentrations of nitrogen and phosphorus were consistent with data showing significant riverine inputs but also pointed to relevant transboundary nutrient fluxes from adjacent or other marine areas contributing to nutrient enrichment in some fjords, in areas off the southern and eastern coast of the North Sea and also in offshore sedimentation areas. Assessment tools for identifying the significance of transboundary nutrient transport are under development in OSPAR to assist future assessment under the Common Procedure. Furthermore, the first application of the Common Procedure has shown that atmospheric nitrogen inputs (i.e. atmospheric deposition) can play a significant role with regard to nutrient inputs. On the basis of a co-operation with EMEP, data will become available for OSPAR Contracting Parties to assist the second assessment of the eutrophication status under the Common Procedure in 2007/2008.

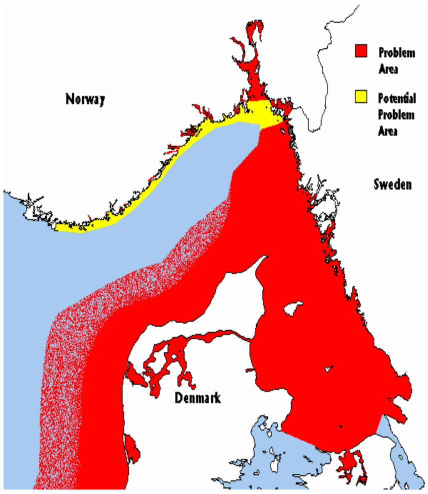


Figure 5.5 Kattegat, Skagerrak and eastern North Sea

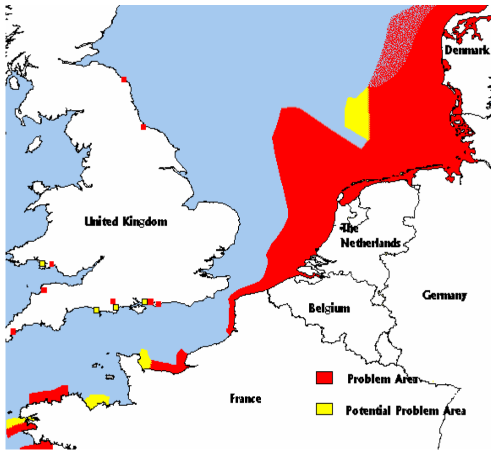


Figure 5.6 Southern North Sea and Channel

In OSPAR Region II, the main eutrophication effects determinant for the classification of maritime areas as problem areas (Figures 5.5 and 5.6) were elevated chlorophyll *a* concentrations and low oxygen levels. Some areas showed changes in phytoplankton community structures towards an increased trend in the occurrence of nuisance and toxic species either as a result of increased nutrient inputs or changes in the N/P ratio of inputs. Effects on macrophytes were relevant only in specific regions like the Wadden Sea and difficult to establish in the absence of more extensive monitoring. A shift from long-lived macrophyte species

4 The European Commission is currently unable to endorse the classification as ‘Non Problem Area’ of certain marine areas of France, Ireland, Portugal, Spain and the United Kingdom. In addition, the assessment under the Nitrate Directive of waters affected, or at risk from, nitrate pollution and the designation of nitrate “vulnerable zones”, and the identification under the Urban Wastewater 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.

(like *Zostera,* common name: eel-grass) to short-lived nuisance species (like *Ulva*, commonly known as sea salad or green laver) due to nutrient enrichment was observed in some coastal areas and estuaries.

Eutrophication effects in OSPAR Region II showed a decreasing gradient from the coast to offshore waters. Problem areas therefore appear, in principle, close to the coast with offshore waters rather qualifying as potential problem areas or non-problem areas.

In OSPAR Region III (Figure 5.7), some coastal embayments and estuaries were classified as problem areas following their review under the Urban Waste Water Treatment Directive (91/271/EEC) or the Nitrates Directive (91/676/EEC). Other areas like for example the Liverpool Bay/Mersey Estuarine area or the South East England coastal waters showed some signs of elevated nutrients. However, there were no impacts to the balance of organisms, despite elevated nutrient ratios, and there was no impact on water quality (dissolved oxygen). As the areas did not exhibit undesirable disturbance, they were classified as a non-problem areas.

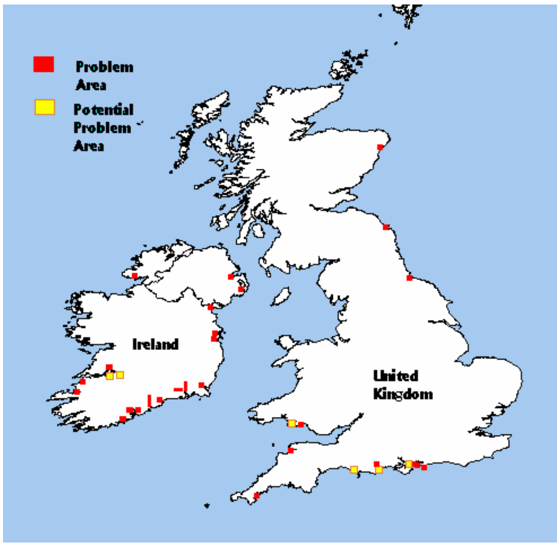


Figure 5.7 Coastal water of Ireland and the UK

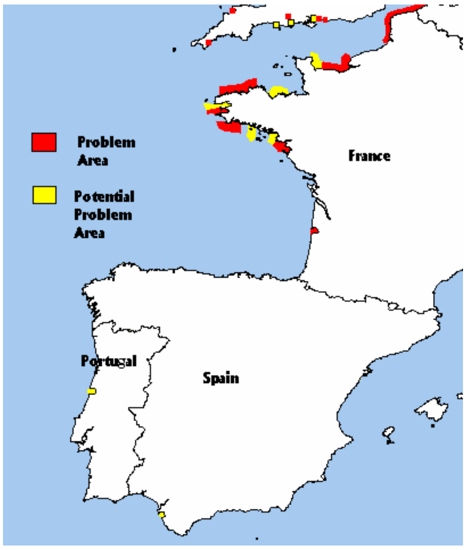


Figure 5.8 Channel, Bay of Biscay and Iberian coastline

In OSPAR Region IV (Figure 5.8), some areas showed elevated nutrient concentrations. In the Mondego Estuary area, the observed shifts in macrophyte species were mainly attributable to the hydromorphological properties of the estuary leading to doubts over the causative contribution of anthropogenic nutrient enrichment. The availability of monitoring data for eutrophication effects was limited in OSPAR Region IV.

It is expected that the implementation of the 50% reduction of nutrient inputs will result in a substantial decrease in the concentrations of nitrogen and phosphorus in OSPAR Convention waters, in particular in coastal waters with an estimated reduction of up to 25% - 30%. As a result a minimization of direct and indirect eutrophication effects can be expected such as, for example, fewer and shorter algae blooms, improvement in occurrence and depth limits for long living macrophyte species or decreased risk for benthic life due to the absence of pronounced oxygen depletion in normal climatic years. A model-based assessment of the effectiveness of OSPAR measures for the reduction of nutrient inputs will be undertaken in 2007/2008 in order to predict the expected eutrophication status of the OSPAR maritime area in 2010 based on nutrient reduction scenarios.

6. Radioactive substances

6.1 Aims of the Radioactive Substances Strategy

The objective of the OSPAR Radioactive Substances Strategy is to prevent pollution of the maritime area from ionising radiation through progressive and substantial reductions of discharges, emissions and losses of radioactive substances with the ultimate aim of concentrations in the environment near background values for naturally occurring radioactive substances and close to zero for artificial radioactive substances. In achieving this objective, the following issues should, *inter alia*, be taken into account: legitimate uses of the sea; technical feasibility; radiological impacts on man and biota.

The Strategy provides that, by the year 2020, the Commission will ensure that discharges, emissions and losses of radioactive substances are reduced to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, emissions and losses, are close to zero. The Strategy is being implemented in accordance with the Programme for More Detailed Implementation of the Strategy (OSPAR agreement 2001-3).

The radioactive substances covered by the OSPAR Radioactive Substances Strategy include all naturally occurring and artificial radionuclides. Accordingly, all radionuclides are covered by OSPAR actions to monitor discharges and losses. For assessment purposes, OSPAR has selected certain (groups of) radionuclides (“marker radionuclides”) for each of the relevant discharge and emission sectors as the most significant for the purpose of evaluating progress towards the objective of the Radioactive Substances Strategy (see Table 6.1).

Table 6.1 (Groups of) radionuclides selected by OSPAR for assessment purposes. Source: OSPAR 2006d

Sector	Marker radionuclides
Nuclear sector	Total α, total β (excluding tritium), Tc-99, Cs-137, Pu-239/240
Off-shore oil and gas industry	Pb-210, Ra-226, Th-228
Medical sector	Tc-99, I-131

Programmes and measures to control, i.e. to prevent, reduce and/or eliminate emissions, discharges and losses of, radioactive substances address the different sectors and activities with the potential to discharge radioactive substances to the OSPAR Convention area. Contracting Parties are committed to implement OSPAR measures to control point sources through discharge authorisation procedures, related technical requirements for the application of Best Available Techniques (BAT) and the prohibition of dumping of radioactive substances and waste at sea.

In implementing the Strategy, the OSPAR Commission will take account of all recommendations and methodologies, as well as legally binding documents, that have been developed in other international forums, and which are relevant to the OSPAR Radioactive Substances Strategy. Examples of relevant documents are the recommendations of the International Commission on Radiological Protection, the Safety Series 111 of the International Atomic Energy Agency, the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management, and the Euratom Basic Safety Standards.

Progress towards achieving the aims of the Radioactive Substances Strategy is reviewed on the basis of a suite of periodic progress evaluations concerning:

a. in 2006, the progressive and substantial reductions in discharges of radioactive substances;

b. in 2007, the concentrations in the environment including an assessment where information is available of the exposure of humans to radiation from pathways involving the marine environment;

c. in 2008, for those regions where information is available, the impact on marine biota of anthropogenic sources of (past, present and potential) radioactive substances, and;

d. in 2009, an overall assessment.

To enable such evaluations, a method has been agreed for establishing a baseline consisting of three baseline elements for discharges, concentrations and doses against which progress with implementation of the Strategy can be assessed.

6.2 Emissions, discharges, losses

6.2.1 Overview of sources

Since 1986, OSPAR has collected information on liquid discharges of radioactive substances from nuclear installations (the nuclear sector). Initially this covered two sub-sectors: nuclear power stations and nuclear-fuel reprocessing plants. It has since been extended to cover all nuclear-fuel fabrication and enrichment plants, and nuclear research and development facilities.

The main observations in all four sub-sectors have been on "total-α" (a summary statistic for all α radiation) and "total-β" (a similar summary statistic for all β-radiation). In addition, detailed statistics are collected on the most significant individual radionuclides in the discharges, including comprehensive details of individual radionuclides for the two nuclear-fuel reprocessing sites.

In the recent assessment of progress on the implementation of the OSPAR Radioactive Substances Strategy (OSPAR 2006d), particular attention was paid, in addition to total-α and total-β, to the following radionuclides:

a. nuclear power-plants: caesium-137;

b. nuclear-fuel production and enrichment plants: technetium-99;

c. nuclear-fuel reprocessing plants: technetium-99, caesium-137 and plutonium-239/240.

Discharges of radioactive substances from the non-nuclear sector mainly arise from mining and ore processing, burning of coal, oil or natural gas in thermal power stations, the production of phosphate fertilisers and other miscellaneous industries (for example, concrete and ceramics production).

In 1993, the phosphate fertiliser industry, which used phosphate ore containing natural radionuclides (principally potassium 40, radium 226, thorium 232 and uranium 238, but also including lead 210 and polonium 210) to produce ammonium phosphate and triple superphosphate for agricultural use, still contributed 28% to the total discharges by OSPAR Contracting Parties of radionuclides other than tritium. By 2005 all discharges from this industry had ceased following the closure of the plants involved.

Discharges from most non-nuclear sectors (other than the oil and gas industry) are made to public sewers which then discharge, after sewage treatment, to rivers or directly to the sea. Data indicate that the medical sector is dominant in terms of the overall activity in discharges. The most significant radionuclides entering the marine environment are technetium-99m used to produce images for diagnostic purposes and iodine 131 used in therapeutic treatment.

The longer-lived radionuclides are those of natural origin such as radium 226 and radium 228, lead 210 and polonium 210. The premises discharging these are in the extractive (or related) sector, in particular from the offshore oil and gas exploration and production facilities. Inputs of radioactive substances from the offshore sector almost entirely arise from produced water and de-scaling operations. Radioactivity in produced water is from naturally occurring radionuclides in the U-238 and Th-232 decay chains – particularly the long-lived radionuclides Pb-210, Po-210, Ra-226 and Ra-228. These radionuclides come up from the oil/gas reservoir either in solution or as fine mineral suspended solids. "Scale" is deposited on the insides of pipes and tanks through which the oil or gas and produced water passes, as a result of chemical reaction of barium with sulphate ions in sea water. Because of the chemical similarity to barium, radium is co-deposited in this scale. These substances are released to the marine environment through periodic de-scaling necessary to prevent pipes and tanks becoming obstructed by the scale.

The MARINA II study of the European Commission showed that discharges from the nuclear industry to the OSPAR maritime area are back at the levels of the early 1950s (MARINA II 2003). The principal contribution to the total discharge from the nuclear industry, up to the year 2000, is from reprocessing plants (83%) followed by the nuclear power stations (13%). Naturally occurring radioactive material (NORM) now dominates doses to the European Union population from industrial discharges, both in terms of alpha activity and overall impact (collective dose) (Figure 6.1). As a result, oil production currently is the major contributor to the collective dose to the population and is estimated to have accounted for 90% of all releases of α emitters in 1999. Its relative share in the total collective dose rate from NORM industries was about 39% in 2000. Since the Marina II study was produced, UK and Norwegian studies have indicated that the radioactive contribution from produced water has been overestimated and this should be borne in mind (OSPAR 2006d).

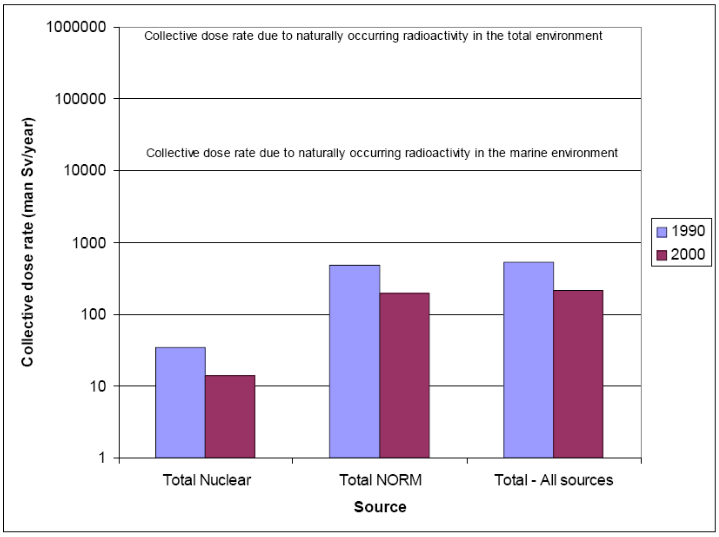


Figure 6.1 Collective dose rates to the European Union population from major sources compared with naturally occurring radioactivity. NORM stands for naturally occurring radioactive material. Source: MARINA II 2003

Because of the significant contribution of discharges of radioactive substances from non-nuclear sources, OSPAR 2005 instituted a system for collecting data on these discharges, in order to ensure the application of the Radioactive Substance Strategy to the non-nuclear sector.

6.2.2 Assessment criteria

The Second Ministerial Meeting in 2003 agreed on formulations for establishing a baseline against which progress towards the objective of the Radioactive Substances Strategy can be evaluated in the period 2003 - 2020. The baseline consists of three elements – one for discharges, one for concentrations in the marine environment and one for radiation doses to members of the public. The baseline elements should each draw on the relevant associated data for the years 1995 – 2001 and on the annual OSPAR reports on liquid discharges from nuclear installations, including their expert assessments, in particular the report of 1998, the year the OSPAR Strategy with regard to Radioactive Substances was adopted. Each of the baseline elements may contain more than one component (relating to different sectors, areas and/or radionuclides or to other means of differentiation). Values may be established for a component. Assessments can be made of the implications of the values established for one or more components without it being necessary to establish values (or the means of establishing them) for all components of that baseline element.

For the first of the series of assessments, a baseline element for discharges of selected (see Table 6.1) radionuclides has been developed building on OSPAR reports on data collected by OSPAR and other international sources. A considerable amount of data on radioactive discharges from nuclear installations, particularly total α, total β and tritium, has been collected by OSPAR. Less information of comparable quality on discharges from the non-nuclear sector is available. Because of the significance of the contribution of the non-nuclear sector to discharges of radioactive substances, OSPAR set in place a system for collecting information on discharges of significant radionuclides from the various non-nuclear sectors in 2005. Against this background it is therefore currently difficult to compile an overall accurate baseline element for all the required components. More accurate quantification of the non-nuclear discharges has to be established through data collection to develop quantitative starting points. As a consequence, the evaluation of progress towards the objective for discharges from the non-nuclear sector is at this stage only qualitative.

The baseline element for discharges from the nuclear sector should contain two parts, based on the run of annual figures for discharges from nuclear installations in terabequerels (TBq) per year for the years 1995 – 2001 (see Table 6.3):

a. the first part is the average of the range of these years (arithmetic mean) presented as “point value”;

b. the second part allows for the inherent variability of the processes giving rise to the discharges. This is presented as a “bracket” (for an explanation see OSPAR 2006d, chapter 3);

c. both these parts relate to total α, total β and tritium[5] discharges from all sources in the nuclear sector to the OSPAR maritime area as a whole.

The so-calculated baseline-element components for total α and total β for the entire nuclear industry is shown in Table 6.2.

Table 6.2 Baseline element for discharges of total α and total β from the nuclear industry (terabequerels (TBq) per year). Source: OSPAR 2006d

Time period	Total α		Total β	
	Point value	Bracket	Point value	Bracket
1995-2001	0.460	0.222 – 0.698	276	147-406

Comparisons made between this baseline-element component and discharge figures for periods after 2001 will only give an approximate and partial view of the progress that is being made, but will ensure that progress is shown against a fixed starting point. Discharge figures will need to be re-examined by means of trend analysis using trend detection techniques of the kind used in other fields by OSPAR.

6.2.3 Assessment of discharges

NUCLEAR SECTOR

The observations considered for the nuclear sector as a whole are total-α and total-β (excluding tritium). The individual radionuclides cannot sensibly be aggregated for the nuclear sector as a whole, since they only appear in some sub-sectors (nuclear power plants, nuclear fuel production and enrichment plants, nuclear fuel reprocessing plants and nuclear research and development facilities). Individual radionuclides are part of the assessment of sub-sectors, but the results are not presented here.

For total-α, nuclear power plants is not a relevant sub-sector, since discharges are, in many cases, below the detection limit, which makes the production of data on total-α for this sub-sector impracticable.

For the other three sub-sectors, the aggregate total-α discharges, and for all four sub-sectors the aggregate total-β discharges, have been as follows (Table 6.3):

Table 6.3 Annual discharges of total α and total β from the nuclear sector (terabequerels (TBq) per year). Source: OSPAR 2006d

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total-α	0.68	0.57	0.38	0.43	0.42	0.33	0.41	0.61	0.62	0.54
Total-β	365	332	315	265	256	173	231	235	198	204

For total-α, there has in fact been an increase of 28% in the average discharges in 2002 – 2004 over the average for the baseline period. This is not outside the baseline bracket. No indication can therefore be gained from a simple comparison whether there has been an increase.

For total-β, there has been a decrease of 23%, but the average level of discharges in 2002 – 2004 is within the baseline bracket. Again, no conclusion can be drawn from a simple comparison.

For the nuclear sector, the general conclusion of the recent assessment is that there is a spectrum, both within countries and between countries:

a. for some categories of discharges, discharge levels in 2002 – 2004 were still above the average of the baseline period (1995 – 2001); for some other categories of discharges, there is statistically significant evidence of reductions and, in a few cases, of substantial reductions; most other categories of discharges lie in between;

b. the substantial decreases include the very welcome decreases in discharges of technetium-99 since 2002, which are expected to continue. Technetium-99 was an issue to which both the 1998 and 2003 OSPAR Ministerial Meetings drew especial attention;

c. since the evaluation is based on data for only three years (2002 – 2004), it is not possible to say generally whether the aims of the OSPAR Radioactive Substances Strategy are being delivered.

5 The role of tritium in both parts is subject to further agreement.

OFFSHORE OIL AND GAS INDUSTRY

The number of installations in the OSPAR maritime area capable of making discharges to water or emissions to air has grown steadily (by a little over 68%) since the beginning of the baseline period (see section 2.9). The amount of produced water discharged annually has been increasing steadily in the period 1996 – 2004 and is expected to increase in future. In 2004, the total amount of produced water discharged to the OSPAR Convention area was 423 million m^3. This will also have affected the levels of discharges of radioactive substances, mainly radium (Ra-226, Ra-228) and lead (Pb-210), since (allowing for the spatial and temporal variations) the discharges of radioactive substances will be proportionate to the amount of produced water discharged. Assessment of discharges is based entirely on estimates and involves a number of uncertainties, for example concerning the radionuclide composition of the releases from produced water which vary over the lifetime of the oil platform and depend on the geographical location. For example, radium is present in produced water in relatively high concentrations, about 3 orders of magnitude higher than in normal seawater (e.g. Ra-226: 4.1 (0.7-10.4) Bq/l, Ra-228: 2.1 (0.3-10.0) Bq/l; mean and range for 11 production units in the Norwegian sector)[6]. OSPAR has so far not undertaken an estimation of the potential discharges of radioactive substances through produced water. In this context, displacement water is not significant since it consists mainly of seawater used in storage installations.

MEDICAL SECTOR

Current estimates suggest that there are about 10 000 000 scans a year in Europe that use Tc-99m. This number is thought to be growing at about 2 – 3% each year. The long-term growth prospects may, however, be limited, because other forms of body-imaging are being developed (particularly magnetic resonance imaging) which are considered to have less detrimental effects. The substantial use of Tc-99m for therapy would not be affected by these developments.

No data have yet been found on the scale of the use of iodine-131 in Europe, either for imaging or for treatment but some available country-related information suggests that the level of use of iodine-131 in nuclear medicine in the OSPAR countries is substantially less than that of technetium-99m.

6.3 Status of the marine environment

Baseline elements for concentrations should mirror the arrangements made for monitoring concentrations in the marine environment agreed by OSPAR in 2004 in the context of establishing a new system to regularly collect data on concentrations of radioactive substances in the marine environment (OSPAR agreement 2005-8). So far, OSPAR has established baseline-element values for concentration of radioactive substances in the marine environment. These are based on concentration data for the period 1995 – 2001. Calculated values were provided for median concentrations and brackets based on the calculated mean concentration. These will need to be reviewed in the light of additional data collected.

An assessment of the concentrations of radioactive substances in the environment including an assessment where information is available of the exposure of humans to radiation from pathways involving the marine environment will be carried out in 2007. The effects on marine biota will be assessed in 2008.

6 MARINA I 1999, based on *Strand T., Lysebo I., Kristensen D., Birovljev A.,* Radioaktive avleiringer i olje- og gassproductjion (Deposits of naturally occurring radioactivity in production of oil and natural gas), Osteras: Norwegian Radiation Protection Authority, 1997, Report No.: StralevernRapport 1997:1; *Lysebo I, Strand T.,* NORM in oil production in Norway, in: International Symposium on Radiological Problems with Natural Radioactivity in the Non-Nuclear Industry; 1997; Amsterdam; 1997.

7. Oil and gas industry

7.1 Aims of the Offshore Oil and Gas Industry Strategy

The OSPAR Offshore Oil and Gas Industry Strategy (the "Offshore Strategy") sets the objective of preventing and eliminating pollution and taking the necessary measures to protect the maritime area against the adverse effects of offshore activities so as to safeguard human health, and of conserving marine ecosystems and, when practicable, restoring marine areas which have been adversely affected.[7]

The Strategy provides that OSPAR will address the programmes and measures:

a. needed to prevent, control and eliminate pollution under Annex III to the OSPAR Convention on the Prevention and Elimination of Pollution from Offshore Sources;

b. to be adopted under Annex V to the OSPAR Convention on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area, following the identification of relevant human activities.

To fulfill this commitment, the Offshore Strategy requires the OSPAR Commission to collect information about threats to the marine environment from pollution or from adverse effects from offshore activities; establish priorities for taking action; and establish and periodically review environmental goals to achieve the Offshore Strategy's objectives. By its meeting in 2005, the Commission should have established environmental goals in respect of protection of the maritime area against adverse effects other than pollution, and, by its meeting in 2006, the Commission should establish further environmental goals related to pollution.

The implementation of the Offshore Strategy has so far concentrated on the use and discharge of hazardous substances, as defined by the OSPAR Hazardous Substances Strategy (see section 4.2), and of oil and other chemicals in produced water and from well operations. The category of chemicals of equivalent concern will include both substances which work synergistically with other substances to generate such concern, and also substances which do not themselves meet all PBT criteria but which degrade or transform into PBT substances or substances requiring a similar approach.

The Harmonised Mandatory Control System for the use and reduction of the discharge of offshore chemicals (HMCS) (Decision 2000/2 and the related OSPAR Recommendations 2000/4 and 2000/5) promotes the continued shift towards the use of less hazardous substances (or preferably non-hazardous substances). The HMCS and the recommendation not to issue new authorizations for the discharge of offshore chemicals that are, or which contain added substances, listed in the OSPAR 2004 List of Chemicals for Priority Action, or which are considered by national authorities to have an equivalent level of concern, and to phase out the discharges of such substances by 1 January 2010 (OSPAR Recommendation 2005-2) are the main measures agreed under the Offshore Strategy in order to achieve the cessation target for the priority chemicals identified under the Hazardous Substances Strategy.

In 2001, OSPAR adopted Recommendation 2001/1 on the management of produced water, which committed Contracting Parties to seek to achieve a minimum of 15% reduction in the total quantity of oil in produced water discharged into the sea between 2000 and 2006. By the end of the year 2006, no individual offshore installation should exceed a performance standard for dispersed oil of 30 mg/l (expressed as a monthly average) for produced water discharged into the sea.

According to the Strategy, OSPAR should, by its meeting in 2005, have established environmental goals in respect of protection of the maritime area against adverse effects other than pollution. Following a review of the situation, OSPAR 2005 concluded that there is no need at present to develop environmental goals for adverse effects of offshore activities other than pollution.

7 The OSPAR Strategy on Environmental Goals and Management Mechanisms for Offshore Activities was adopted by OSPAR in 1999 and revised in 2003 and is now called the Offshore Oil and Gas Industry Strategy.

7.2 Emissions, discharges, losses and structures

The pressures on the marine environment from offshore oil and gas activities are related to discharges of oil and chemicals, drill cuttings, emissions to air and disturbances of the seabed due to placement of structures and pipelines.

Data on the number of installations with emissions and discharges, the use and discharge of drilling fluids and cuttings, discharges of oil in produced water, chemicals used and discharged offshore, accidental spills of oil and chemicals and emissions to air are collected annually from Contracting Parties. The data are assessed every two years by an Expert Assessment Panel and the Offshore Industry Committee (OIC). The annual reports also present cumulative data on discharges back to 1984 and emissions back to 1992. The latest assessment report was published in 2005 and assessed the data from 2002 and 2003, as well as the trends in discharges, spills and emissions over the last 2 – 4 years (OSPAR 2005f). The next assessment is due for OIC 2007.

7.2.1 Discharges, spills and emissions from offshore oil and gas installations

The use of *oil-based drilling fluids* was the main source of oil discharges to the sea until the early 1990s. The adoption of PARCOM Decision 92/2 on the use of oil based muds effectively stopped the discharges of oil from cuttings. No discharges of cuttings contaminated with oil-based muds have been reported in the period 1996 – 2003, leading to a substantial decrease in the total discharges of oil (Figure 7.1). Produced water[8] and displacement water[9] are now the main contributors to the oil discharges from offshore oil and gas activities, representing around 95% of the total amount. An assessment of the data reported on oil spilled through flaring from well testing in the period 1994 – 2003 concluded that flaring is a minor source of oil discharges to the sea. In view of this, OSPAR has concluded that there is no need at this time to consider programmes and measures on flaring of oil and condensates from well testing (OSPAR 2005g).

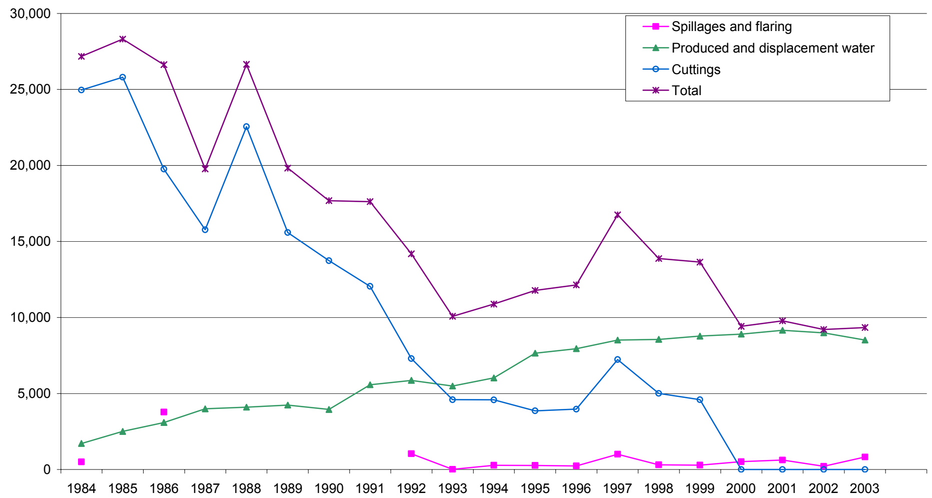


Figure 7.1 Contribution of different sources of inputs of oil and/or synthetic fluids to the OSPAR Convention's maritime area, 1984 – 2003 (tonnes). Source: OSPAR 2005f

The amount of produced water and displacement water discharged has been increasing steadily over the period 1996 – 2003. OSPAR has collected and published data on the estimated average daily quantities of these discharges. From 1996 to 2001, the statistics covered only production water and displacement water together. Since 2002, figures for the annual total of produced water discharges have also been collected

8 Produced water is the water that comes up from oil and gas wells along with the oil and gas. Some of it is water ("formation water") that has been in the hydrocarbon reservoir for geological time along with the oil or gas. Some of it is water produced by condensation during the production process ("condensation water").

9 This is sea-water which has been used as ballast in offshore storage tanks and similar installations.

separately (Table 7.1). The differences between countries are caused not only by different regulatory regimes, but also (and significantly) by the differences between oil and gas fields: gas fields result in very much less produced water than oil fields.

Table 7.1 Annual total discharges of produced water (millions of cubic metre)

Country	2002	2003	2004
Denmark	12,437	15,934	19,647
Germany	0,007	0,006	0,008
Ireland	0,003	NI	0,003
Netherlands	8,856	7,804	8,509
Norway	118,933	134,730	142,803
Spain	0,000	0,000	0,000
United Kingdom	266,745	260,761	251,956
TOTAL	**406,981**	**419,235**	**422,926**

NI: no information

The total quantity of dispersed oil (aliphatic oil) discharged to the sea (from produced water, displacement water and accidental spillage) is showing a decreasing trend (Figure 7.2). Contracting Parties are making efforts to reach the target of 15% reduction in the total quantity of oil in produced water discharged between 2000 and 2006, although some of them have indicated that it will be difficult to reach that target.

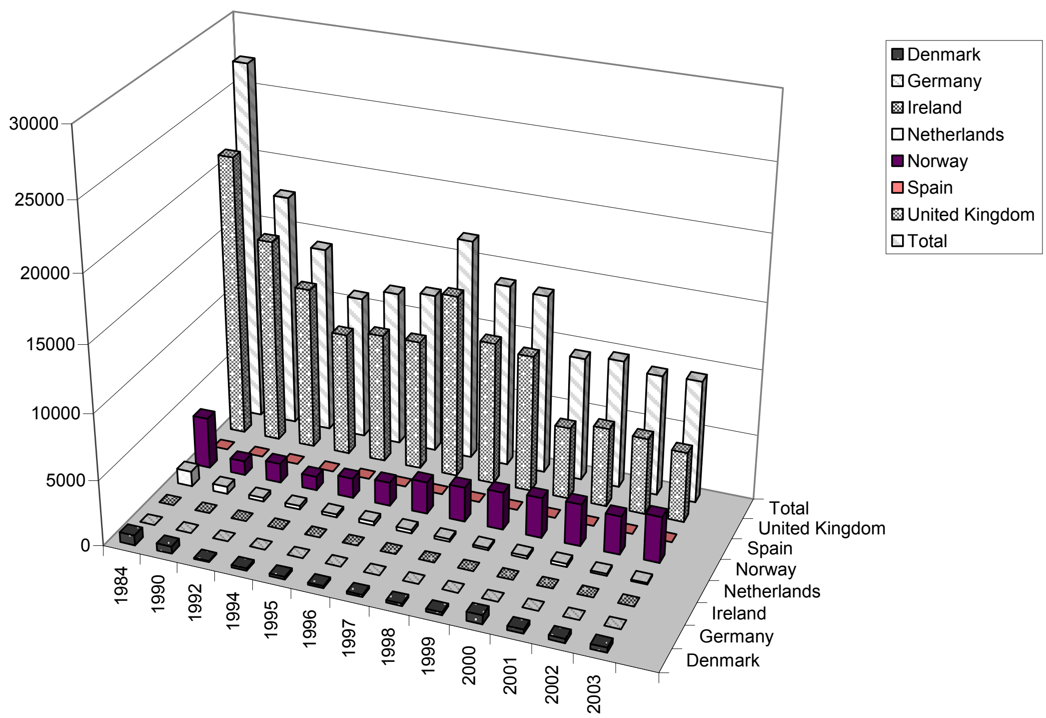


Figure 7.2 Total discharges and spillage of dispersed oil per country, in tonnes, in 1984 – 2003. Source: OSPAR 2005f

The quality of the produced water discharged (expressed as content of dispersed oil in the water discharged) has remained more or less stable over recent years. A number of installations continue to exceed the current performance standard for dispersed oil of 40 mg/l. Overall, however, the number of installations that do not meet the current performance standard has remained stable over the last few years (22 in 2003) (see Figure 7.3). In 2007, in line with OSPAR Recommendation 2001/1, Contracting Parties will implement the 30 mg/l performance standard.

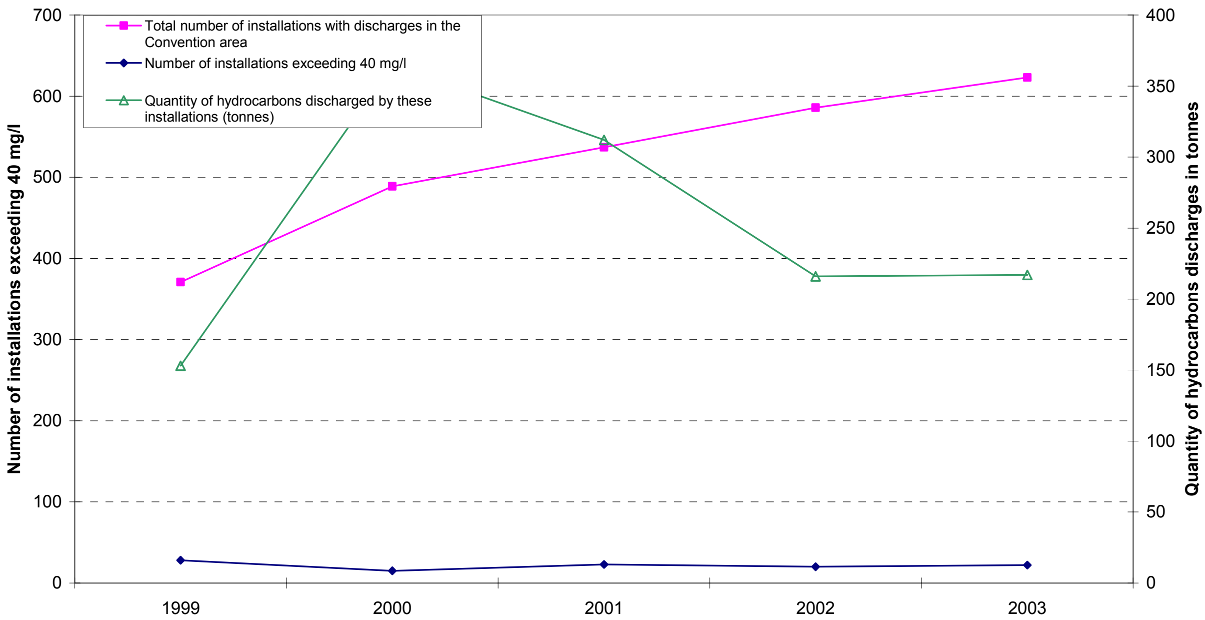


Figure 7.3 Installations which meet/do not meet the performance standard of 40 mg/l and the amount of dispersed oil discharged by those not meeting the standard. Source: OSPAR 2005f

Naturally occurring hazardous substances (heavy metals, PAHs, aromatic hydrocarbons or alkyl phenols) are also discharged with produced water. Injection of produced water is currently the only cost-effective method for reduction of these discharges. In order to assess the significance of inputs of heavy metals from produced water in comparison to land based sources, a survey was conducted in 2005 to collect available data on such inputs. The data did not allow for conclusions to be drawn, and a further one-off survey will be conducted in 2006.

OSPAR has long been concerned with the use and discharge of chemicals from offshore installations, regulated since 2001 by its Harmonized Mandatory Control System (HMCS). The total quantity of chemicals used offshore in 2003 was 765,789 tonnes out of which 274,373 tonnes were discharged into the sea. Of this amount 89% were chemicals on the OSPAR “list of substances/preparations used and discharged offshore which are considered to pose little or no risk to the environment”, the so-called PLONOR list. 0.74 tonne of chemicals identified by OSPAR for priority action under the Hazardous Substances Strategy was discharged. The rest are substances which meet two of the three pre-screening criteria related to persistent, toxic and bioaccumulative properties.

In the past, an increasing trend has been identified in atmospheric emissions. During the last five years the picture seems to have changed slightly:

- SO_2 has decreased;
- methane, NO_x and CO_2 have remained more or less stable;
- non-methane VOC (nmVOC) has decreased in 2002 and 2003 after a significant increase in the past. This change seems to be related to the quantities of oil loaded offshore.

Consistency in the data reported on atmospheric emissions has undoubtedly improved over the past few years, but for many reasons the intrinsic quality of the data (absolute figures) is still questionable. One must remain cautious with the conclusions which can be drawn up when variations are less than 10%, especially regarding nmVOC which is still very difficult to evaluate (Figure 7.4).

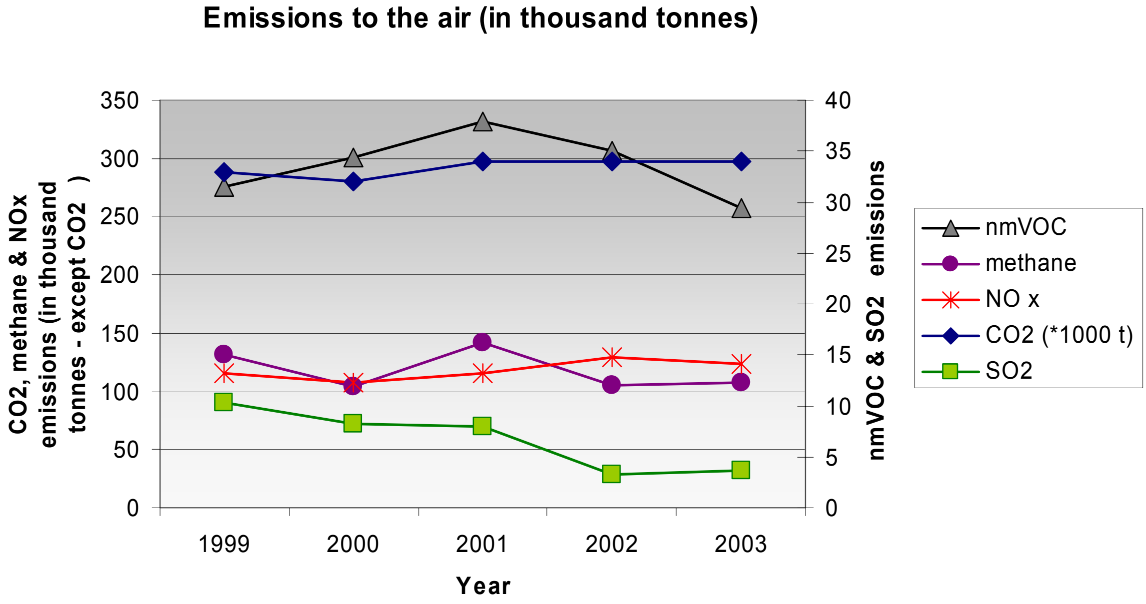


Figure 7.4 Trends in emissions 1999 – 2003. Source: OSPAR 2005f

7.2.2 Inventory of offshore installations in the OSPAR maritime area

The inventory of offshore installations in the OSPAR maritime area is prepared in accordance with OSPAR Decision 98/3 and gives an overview of installations in Denmark, Germany, Ireland, the Netherlands, Norway, Spain and the United Kingdom (OSPAR 2005h).

The total number of offshore installations in the OSPAR maritime area with discharges to the sea or emissions to the air was 648 in 2004 (see section 2.9). In the last years, 57 installations have been decommissioned. Most of these are steel installations which have been taken to land for recycling or disposal. Three gravity-based concrete installations have been decommissioned and all of them have been permitted to leave parts in place. There is so far too little experience to use this information for any substantive assessment of effects of the decommissioning.

7.3 Status and effects in the marine environment

There has been considerable research on the effects of discharges from offshore oil and gas installations. However, an assessment of this material by OSPAR is not yet available. Information, available from individual Contracting Parties on impacts in the marine environment, will be collated in an OSPAR wide assessment scheduled for 2007.

7.3.1 Cutting piles

Cutting piles may leak oil and chemicals and affect the biodiversity on the seabed. An assessment by OSPAR of the possible effects of releases of oil and chemicals from any disturbance of cutting piles is due in 2007. Information from research and surveys from the Netherlands, Norway and the United Kingdom on effects of cutting piles has been made available as basis for considerations by OIC 2006 of a possible management regime for cutting piles. The three-phase research drill cutting initiative of the UK Offshore Operators Association (UKOOA) has added substantially to the understanding of environmental impacts of cutting piles. The final project report (Phase III)[10] states that the pollution from the cutting piles are well below the level at which the potential environmental impact might be considered to be significant. The report also includes findings from a survey performed by the Norwegian Oil Industry Association (OLF) on 10 cutting piles in 1990 – 2002. These studies show that the area of contamination around piles has decreased by

10 UKOOA JIP 2004 Drill Cuttings Initiative – Phase III: Final report, 26 January 2005. For further information see http://www.ukooa.co.uk/issues/drillcuttings/.

50 - 90% following cessation of the use of oil-based muds. The current areas of contamination around these piles are 0.2 – 1.8 square kilometres. An example of results from investigations of leakages from cutting piles is shown in Figure 7.5.

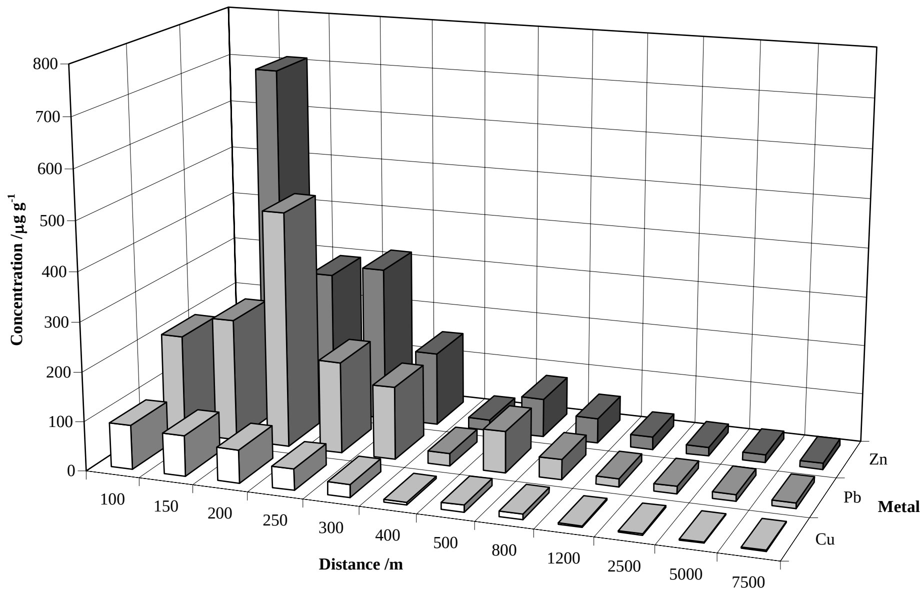


Figure 7.5 Leakages from cutting piles. Source: OSPAR 2001

7.3.2 Injection of cuttings and produced water

The disposal of drill cuttings and produced water has become a major concern for operators, not least because environmental controls have been tightened by regulatory authorities. One of the techniques the industry has developed to overcome the disposal problem is to grind up the drill cuttings and then inject them into a subsurface formation where they are likely to remain for the indefinite future. Injection has also been used to dispose of, or recycle, produced water.

The report by OSPAR on environmental aspects of on- and off-site injection of drill cuttings and produced water showed that there are few reported problems associated with the disposal of drill cuttings by re-injection into subterranean/sub-seabed formations (OSPAR 2001). Of most concern from the environmental point of view is the contamination of shallow fresh water aquifers or breakthrough to surface, i.e. ground level or seabed. There is little reported evidence of such breakthroughs happening.

Experience with drill cuttings re-injection operations in the northern North Sea has confirmed the findings of simulation experiments for similar geographical areas; these indicated that environmental contamination is unlikely.

One risk which is not generally considered is the generation of H_2S in the injected material after disposal. This may result in unexpected levels of H_2S if a disposal fracture is intersected by another well or if other contamination does occur. There are, however, well developed techniques both to avoid and to minimise such contamination. The report concluded that, although environmental contamination from drill cuttings or produced water (re-)injection is considered unlikely in much of the OSPAR area, this may not be the case everywhere. Specific situations should always be investigated before disposal operations commence.

7.3.3 Environmental effects of lead and other heavy metals in mineral weight-materials

The most commonly used weight-material in drilling fluids is barite. In the Norwegian sector ilmenite has also been used. Both barite and ilmenite are listed as PLONOR chemicals. Hematite is a mineral weight-material which has not yet been used to any extent. Iron oxide, which is the major component of hematite, is also listed as a PLONOR chemical. All the mineral weight-materials mentioned above do, in varying degrees, contain traces of heavy metals.

Work is ongoing in OSPAR to review the available evidence in relation to environmental effects of lead and other heavy metals in mineral weight-materials, such as the uptake of lead and other trace components in marine organisms. In 2004, Norwegian authorities, representatives from the operators on the Norwegian

Continental Shelf and the chemical suppliers initiated a project with the objective of reviewing available information on all weight-materials, both minerals and brines. The approach is to consider the data on leakage and bioavailability of heavy metals, differences in effect on the working environment and health, and also evaluate the technical range of use of the different weight-materials. Important objectives are to identify areas where knowledge is lacking, and to establish what is "best practice" regarding the use of weight-materials in drilling fluids. Conclusions are expected to be become available in 2007.

8. Other human activities

The OSPAR Biological Diversity and Ecosystems Strategy includes the commitment to assess a list of human activities in the marine environment and, if necessary to meet the objective of the Strategy, to draw up programmes and measures to control those human activities that have an adverse impact on species and habitats that need to be protected or conserved. In this context, consideration is relevant of those impacts which result from a variety of human activities such as litter, microbiological contamination and noise. OSPAR also includes fishing and maritime transportation in its assessment work in order to be in a position, where necessary, to draw questions related to these issues to the attention of the competent authority or international bodies.

8.1 Dumping

In the past, a wide range of material, including sewage sludge and industrial waste, has been disposed of at sea. Dumping of waste and other material is now prohibited by the OSPAR Convention except dredged material, waste from fish processing, inert material of natural origin, and vessels and aircraft (until 2004). Dumping may cause pollution due to losses of hazardous substances and nutrients from dumped material to the marine environment, and may have physical impacts, in particular on the seabed and bottom dwelling organisms at the dumping site and in its vicinity.

In the period 1980 to 2006, Contracting Parties reported in their annual dumping reports that several types of wastes are still dumped. Since 1998 more than 99% of the overall amount licensed for disposal at sea was for dredged material (OSPAR 2003b). Disposal of vessels, which has been phased out in 2004, decreased from 86 in 1990 to 4 in 2003 (OSPAR 2006e).

Disposal of fish waste, inert material and bulky wastes continues. Disposal of inert material, including for example rock, colliery, or mining wastes, decreased significantly from several million tonnes per year in the early nineties to a few 100 000 tonnes in the late nineties. In 2001, however, about 700 000 tonnes were dumped, quantities had halved by 2002 and a further increase was observed in 2003 (750 000 tonnes). The amounts of bulky wastes (for example steel wire and concrete) and fish waste disposed of at sea are comparatively small. Quantities of bulky wastes disposed of varied from less than 100 tonnes in most years to more than 1000 tonnes in 1991 and 1997; there were no disposals in the period 2001 – 2003. Disposal of fish waste amounted to less than 1000 tonnes/year except in 1992 and 1993. In 2003, no fish waste was dumped at sea.

The overall amount of dredged material disposed of at sea varies significantly (Table 8.1). No real trend can be observed as the amounts of material to be dredged are strongly influenced by natural conditions, dumping strategies, and episodic capital dredging activities which occasionally contribute huge amounts to the total amount of dredged material disposed of at sea. For this reason, trends in the amount of dredged material dumped at sea are not expected to be seen in future. The development of dredged material from harbours and navigation channels in 1986 – 2002 is shown in Figures 8.1 and 8.2.

Table 8.1 Amounts of dredged material dumped in the OSPAR Convention area in 1990 – 2003 in million tonnes/year (dry weight). Source: National dumping reports

Year	1990	1999	2000	2001	2002	2003
Dumped dredged material In million tonnes (dry weight)	80 – 100	130	110	110	87	65

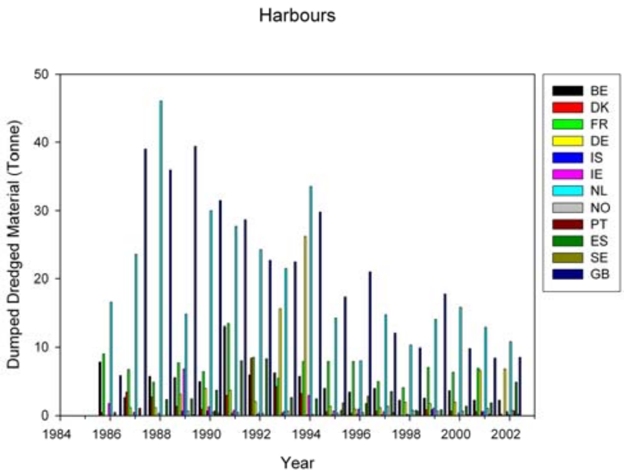


Figure 8.1 Dumped dredged material from harbours 1986 – 2002. Source: National dumping reports

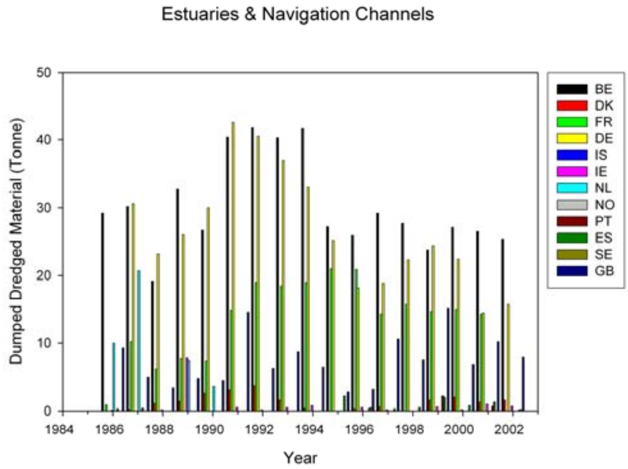


Figure 8.2 Dumped dredged material from estuaries and navigation channels 1986 – 2002. Source: National dumping reports

The total contaminant load of inputs reported by Contracting Parties is likely to be much higher than the actual inputs of contaminants resulting from the disposal of dredged material at sea because of the continuous return of sediments from disposal sites to dredging sites due to natural currents. For this and other reasons, assessments of trends in concentrations of contaminants in dredged material provide a better basis for the evaluation of the effectiveness of OSPAR measures than an assessment of trends in total loads. However, data sets of Contracting Parties on concentrations are neither sufficient nor consistent for a comprehensive evaluation. Still, trends in concentrations of contaminants in dredged material indicate that most of those contaminants are much closer to background levels than they were 10 – 15 years ago. There is a steady downward trend for some heavy metals and the few data on organic contaminants (mainly from the Netherlands) seem also to suggest a slow decrease of PCBs. This seems inevitable since concentrations of contaminants in dredged material approach background levels.

8.2 Dredging

Dredging is essential to maintain navigation in ports, harbours and navigation channels as well as for the development of such facilities or to remedy the contamination of the seabed. Dredging activities involve the removal of soil, depending on its purpose, from thin layers (remediation) to meters (capital and maintenance) and its vertical transport from the seabed to the barge or scow. A number of different mechanical, hydraulic and combined dredging techniques are available. Their selection with regard to the most favourable environmental performance depends on the purpose of dredging and on the local natural conditions including the density and contamination of sediments. In general, mechanical/hydraulic methods are inherently more environmentally effective than purely mechanical or hydraulic methods. They are used in dredgers which remove the soil mechanically by cutting or scooping it up and then transport the dredged material hydraulically using pumps and pipes. Mechanical digging generally leads to less disturbance than hydraulic methods and suspends less soil in the water. Hydraulic transport is carried out in enclosed systems thus the dredged material does not come into contact with the surrounding water.

Dredging causes, in general, some increase of turbidity that may be regarded as indicator for potential ecological impacts, as re-suspension of sediments may give rise to various adverse effects on the environment (OSPAR 2004a). These include transport of sediments and possibly adsorbed contaminants from the dredging site to other areas, release of nutrients, consumption of oxygen, remobilisation of contaminants, and decrease of primary production due to reduced transparency of the water column. The impact on pelagic and benthic organisms is considered less important at the dredging site than at the disposal site. Re-colonisation of the seabed is expected to take place fairly quickly depending on the local conditions and the intensity of the activity. Although information on impacts of many dredging techniques exists, there is still a need for information on impacts caused for example by agitation and water injection dredging, silt wing or hydro diggers. There is a need to improve or develop bioassays and their assessment.

No specific OSPAR measures exist to control impacts of dredging operations. However, the OSPAR Guidelines for the Management of Dredged Material (OSPAR agreement 1998-20) provide guidance to

Contracting Parties on how to minimise the effects of dredging operations on the marine environment. In the light of the complex processes depending on the local conditions, the OSPAR Guidelines are considered sufficient for guidance in local approaches to individual dredging operations. Dredging activities are regulated in most Contracting Parties through legislation and recommendations. However, only a few Contracting Parties require environmental impact assessments for each maintenance dredging project. Generally, impact assessments are carried out in special cases with a high risk of environmental impact, e.g. in sensitive or highly contaminated areas. Restrictions imposed by Contracting Parties on dredging activities where negative environmental impacts are observed or expected include the use of protective or mitigating measures to minimise effects, such as silt screens or sealed grabs, or temporal or seasonal restrictions. Regulations and guidance for the assessment of environmental impacts due to relocation of dredged material by agitation dredging or other related methods do not exist but might assist an effective control of impacts of dredging operations.

8.3 Dumped ammunition

Dumping of conventional and chemical munitions at sea within the OSPAR Convention area took place after the First and Second World Wars. Dumping of conventional weapons continued until the 1990s but is now prohibited under the OSPAR Convention. Dumping operations included dumping overboard from vessels and by sinking ships containing chemical weapons and munitions. Munitions dumped in these sites range from conventional explosives to phosphorous devices and chemical weapons containing agents such as mustard gas and phosgene. Almost 150 such dumpsites have been recorded within the Convention area of which 30 are known to contain chemical munitions (OSPAR 2005i). The full extent of this dumping will, however, never be known mainly due to inadequate and/or lost documentation relating to dumping events. For an overview of dumpsites based on best available information see Figure 8.3.

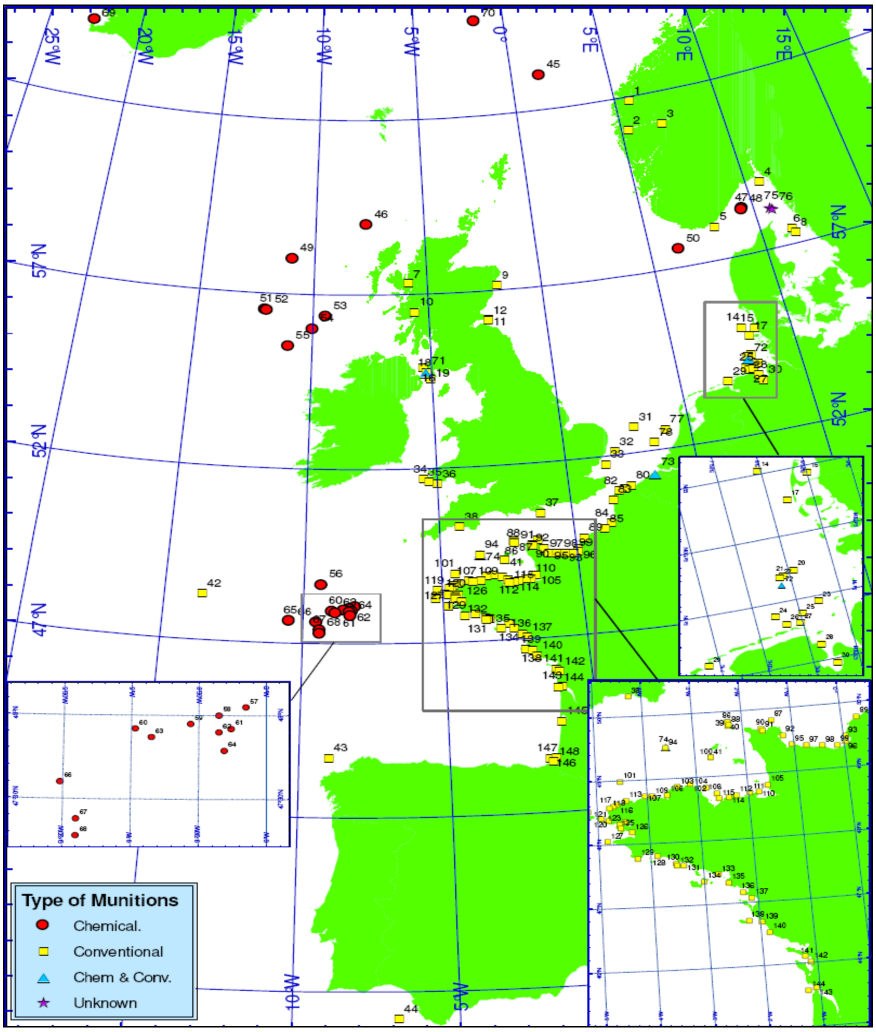


Figure 8.3 Location of munitions dumpsites. Source: OSPAR 2005i

This figure shows what is believed to be the best available information. The sites shown do not constitute an exhaustive description of the sites that may exist. No liability for the accuracy or completeness of this information is accepted either by the OSPAR Commission or by the Governments of Contracting Parties to the OSPAR Convention

To date the advice has been that if left undisturbed on the seabed, dumped conventional and chemical munitions pose no risk to humans. If disturbed, however, they represent a real risk to the fishermen/seafarers and to the general public, should they be washed ashore. It is a widely held view that recovery of dumped munitions is not technically feasible at present. Remediation of marine dumpsites for chemical weapons and munitions is technically challenging because of the nature of the material dumped and the uncertainty surrounding the quantities, type, locations and the present condition or stability of these materials.

Due to the inaccessibility (i.e. depth) of many munitions dumping sites, relatively little work has been carried out to investigate the condition of the munitions or possible effects on species, communities and habitats. Recent investigations at sites off the Norwegian[11] and Belgian[12] coasts and in the Irish Sea[13] have revealed little or no chemical warfare agents or contaminants associated with the dumped munitions in fish, shellfish and sediment samples collected in the vicinity of the dumpsites.

Very little is known about the migration of toxic agents associated with chemical munitions in the marine environment and their impacts thereon. Marine dumped chemical munitions react differently in water depending on the agent they contain. The munitions' shell may break open during the dumping operation or may corrode over time, allowing the agent to leak out. Nerve agents and many other agents hydrolyze, or break down and dissolve once they come into contact with water, and are therefore rendered harmless relatively quickly. However, the slow hydrolysis of Clark and Yperite (mustard gas) and their toxic breakdown products may pose a long-lasting threat to the environment, albeit only in the immediate vicinity of dumpsites. The main threat from Yperite is from direct contact with organisms, whereas Clark compounds easily adsorb onto sediments and may pose a threat to bottom-living organisms.

Where possible, ongoing monitoring of the condition (corrosion) of munitions in dumpsites and their potential impacts on the marine environment should be continued/implemented. Basic research on the behaviour of toxic agents and their long-term environmental effects is required.

8.4 Tourism and recreational activities

Tourism is a fast-growing industry and a major source of income for some European countries. The most popular destinations in the region are coastal zones, where tourism and recreation are one of the human activities most directly related to the environment, since it is precisely the natural characteristics of the coast that attract tourists. But the diversity and fragility of these coastal and marine ecosystems may suffer greatly from tourism-related impacts. Most environmental impacts arise from the construction of infrastructure for tourism (housing, marinas, transport, waste and water treatment facilities, etc.), from recreational activities (golf courses, water sports, and massive frequentation of coastal areas such as dunes, beaches and sea-cliffs) and from the excessive concentration of tourists (with a great demand for resources such as food, energy and construction material, and increasing waste and waste water generation).

OSPAR assessments (latest OSPAR 2006f) have shown that tourism-related impacts are diverse in origin and effects. Land is one of the natural resources most affected by coastal tourism, particularly through the occupation and destruction of natural ecosystems (dunes, wetlands) by tourist facilities and infrastructures. A particular form of land loss and coastal erosion is caused by building too close to the shoreline, or inadequate development of coastal infrastructures (marinas and harbours), resulting in the disturbance of coastal dynamics, the retreat of the shoreline and the subsequent loss of ecosystems and biodiversity. Coastal defence as well as beach nourishment procedures, designed to overcome this problem, may further affect coastal biological communities. Also, inadequate collection and disposal of the increasing amounts of waste generated by tourists may result in land pollution and habitat degradation. Freshwater resources are also greatly affected by tourism, since overexploitation caused by tourist demand of water (for human use, golf courses, swimming pools, etc.) can cause water shortages and degradation of groundwater reserves through saline intrusion. Also, both freshwater and coastal waters are subject to pollution due to discharges from treatment plants or direct disposal of waste water, resulting in some cases in eutrophication. Water

11 *Tørnes J.A., Voie Øyvind A, Ljønes, M., Opstad A.M, Bjerkeseth, L.H. and Hussain, F,* Investigation and risk assessment of ships loaded with chemical ammunition scuttled in Skagerrak. Forsvarets forskningsinstitutt, 2002.

12 *Federal Office for Scientific, Technical and Cultural Affairs (OSTC)*, Scientific Support Plan for a Sustainable Development Policy – Paardenmarkt Site Evaluation. OSTC Project Nr. MN/02/88, 2002.

13 *The Scottish Office Agriculture, Environment and Fisheries Department, Marine Laboratory, Victoria Road, Aberdeen, Scotland.* Survey of the Beaufort's Dyke Explosives Disposal Site, November 1995 – July 1996. Final Report – November 1996.

pollution may also arise from the use of pesticides and fertilizers in recreational areas, by improper collection and disposal of litter, and by oil spills from recreational vessels. The degradation of water quality may bring about the alteration of coastal and marine ecosystems, causing the death of organisms and the disruption of species composition in marine communities.

In the framework of the European Union, several initiatives on integrated coastal zone management and sustainable tourism are in place which can have a positive impact on the sustainable development of coastal tourism in the OSPAR region. OSPAR has not adopted specific measures on tourism but a number of OSPAR initiatives also address activities related to tourism such as, for example, the coordinated programme for the reduction of nutrients (PARCOM Recommendation 89/4), Guidelines for the management of dredged material, Guidelines on artificial reefs, best environmental practice for the use of pesticides on amenity areas (OSPAR Recommendation 2000/2) etc.

8.5 Offshore installations

The impact of activities of offshore installations operating in the OSPAR Convention area for oil and gas activities is dealt with in Chapter 7 and in section 8.14. Offshore installations for the generation of electricity, in particular wind energy, relate to a relatively new activity. Only a few offshore wind farms have been erected in the OSPAR Convention area so far. With the exception of one (Horns Rev), they are all located close to shore (for example Tuno Knob in Denmark, Utgrunden in Sweden, Blyth in the UK) but the development of offshore wind-farms at a greater distance from the coast and in deeper waters is underway (Figure 8.4).

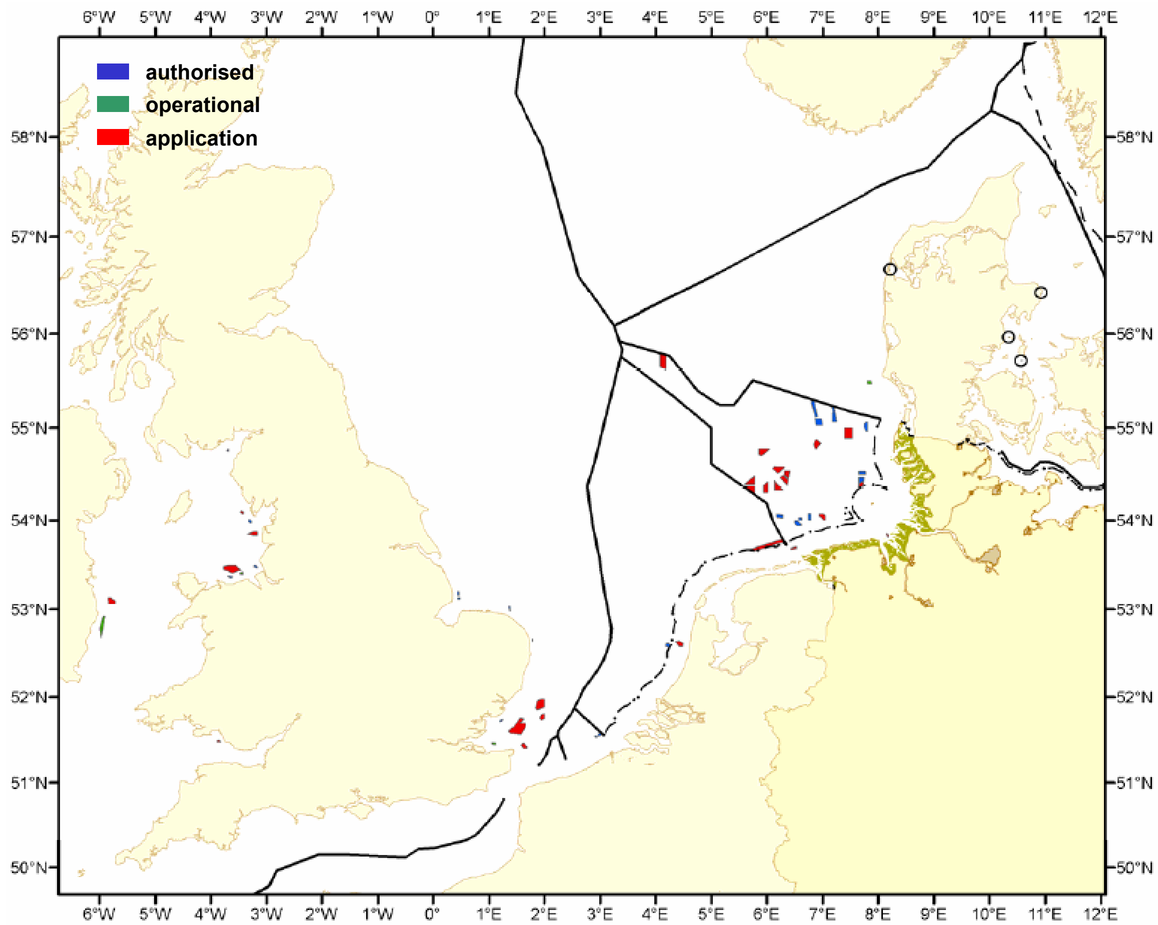


Figure 8.4 Map of offshore wind farms (applied for, authorised, in operation) in the OSPAR Area drawn from the OSPAR wind farm database (status by the time of the 2006 OSPAR Commission meeting)

Potential impacts from offshore wind farms are varied and encompass their construction, operation and removal phase. Due to their physical presence, offshore wind-farms may provide a hazard to shipping. Accidental collisions of vessels with the wind turbines may result in the release of oil and chemicals into the marine environment. Lighting of wind farms may also have impacts on the landscape. Offshore wind farms may affect the different parts of the marine ecosystem encompassing invertebrates, algae, fish, marine mammals, as well as resting birds. The introduction of additional hard ground causes the loss or physical change of habitats at local scale. Offshore wind farms may result in the displacement of fish and mammals due to noise and of resting birds due to moving propellers. Wind farms as well as single constructions may cause birds to collide with the installations during night, or act as barriers to migrating birds. Power cables may create electromagnetic fields irritating fish and warm sediments, thus encouraging settlement of non-indigenous benthic species. Offshore wind farms may also have protective effects on certain living communities (for example benthos or fish) when other human activities (fishing, dredging, shipping) are excluded from such an area.

First monitoring results related to existing offshore wind farms and research installations show that, in general, negative effects seem less severe than expected for a number of elements of the ecosystem (OSPAR 2006g). However, to date only few ecological studies have been carried out on the impacts of offshore wind farms, and the data situation is still too weak for a proper judgement. Important gaps in knowledge remain, mostly in the area of construction noise, bird displacement, seabed morphology, public perceptions/acceptance and cumulative impacts, as well as on interactions with other human activities and climate change. General gaps in knowledge of basic elements of the marine environment, namely species' distribution, abundance and their responses and behaviours, add to those specific to offshore wind farms.

Consultation processes with governmental and non-governmental stakeholders are underway in Contracting Parties to address questions of safety and environment impacts of offshore wind farms. Contracting Parties have made monitoring and assessment of the marine environment obligatory for all stages of offshore wind farms, from their planning, construction and operation to their decommissioning and aftercare. The results from the monitoring and the environmental impact assessments as well as from additional research activities will provide a basis for future assessments of the potential impacts of offshore wind farms on the marine environment, the scale of these impacts and their cumulative effects, and of measures to avoid or minimise negative environmental impacts of future projects. This will also provide a basis for OSPAR to progress work on the development of guidelines for the placement of offshore wind farms.

8.6 Fishing

The OSPAR Quality Status Report in 2000 identified fisheries as the highest priority in terms of environmental impact. Commercial fishing (see section 2.7) has a number of direct and indirect effects on the marine ecosystem including:

- removal of target species;
- mortality of non-target species (fish and invertebrates), birds and marine mammals, through their incidental catch in fishing gear;
- physical disturbance of the sea bottom through some demersal fishing gear and therefore an adverse impact on benthic habitats and communities;
- shifts in community structure; and
- indirect effects on the food web.

The sustainability of fisheries and fish stocks is evaluated by ICES on the basis of biological reference points for the stocks. The current system uses limit and precautionary reference points for spawning stock biomass (SSB) and fishing mortality (F). The limit on SSB (B_{lim}) is identified as a value of SSB, below which recruitment is impaired and there may be a danger of stock collapse. The limit on F (F_{lim}) is a value of fishing mortality which, if sustained, would cause the stock to decline to below B_{lim}. The precautionary values (B_{pa} and F_{pa}) are set with a safety margin so that there is low probability that the real values are beyond the limit values (below B_{lim} or above F_{lim}). More information is found in the OSPAR Background Document on the Ecological Quality Objective for Spawning Stock Biomass of Commercial Fish Species in the North Sea (OSPAR 2005j).

Based on advice from ICES, OSPAR 2000 found that fisheries for 40 out of 60 fish stocks in specific areas were believed to be unsustainable. Even for stocks that were evaluated to be within safe biological limits, the size compositions had been altered by fishing, and age compositions had become truncated. With fewer age groups in the exploited population, the spawning populations and fisheries become progressively more dependent on incoming recruitment and, consequently, more variable.

While OSPAR does not have the competence to adopt programmes and measures on fishing, OSPAR shall draw the attention of the competent authorities to such issues where the Commission considers that action is desirable. For the purpose of assessing the overall health of the marine environment and the impact of human activities, OSPAR has developed an ecological quality objective (EcoQO) for the spawning biomass of commercial fish stocks for the North Sea (see Chapter 9) based on precautionary reference points for SSB. The evaluation of the 2003 status of 26 stocks in the North Sea against this EcoQO showed that only 6 stocks were within safe biological limits whereas 11 were outside. For 9 of the stocks the situation was unknown or uncertain (Figure 8.5).

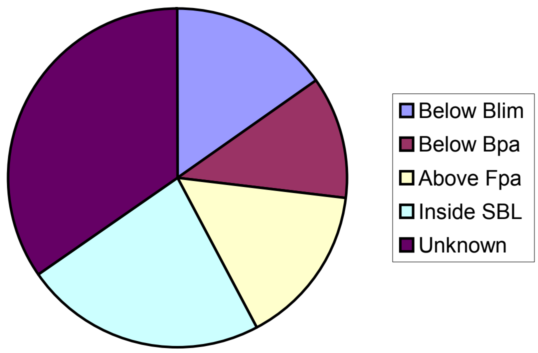


Figure 8.5 Proportions of North Sea fish stocks outside and inside safe biological limits. Three categories are used for stocks outside safe biological limits: stocks below B_{lim}, stocks below B_{pa} but above B_{lim}, and stocks harvested above F_{pa} but with SSB above B_{pa}. Source: OSPAR 2005j

8.7 Shipping

Commercial shipping has a variety of impacts on the marine environment: operational discharges, accidental, and occasionally illegal, releases of oil and hazardous substances, emissions of air pollutants such as sulphuric and nitrous oxides (see section 5.2), introduction of non-indigenous species through the vector of ballast water (see section 3.3), loss of a vessel and/or cargo. In addition, navigational requirements in coastal areas include dredging, disposal of sediments and large-scale development for port facilities.

The North Sea and the seas around Ireland and their approaches have received the status of Special Area under Annex I to the IMO MARPOL Convention as from 1999. This means that discharges of oil or oil mixtures from shipping are prohibited. With other international rules in place, the greatest potential for pollution by oil (or other hazardous substances) lies in shipping disasters, in particular if they occur close to ecologically sensitive areas. Spillages of oil and hazardous substances can be transported by the current to other areas and can cause death to the fauna concerned, including fish, birds and marine mammals, and can have long-term effects on the entire marine ecosystem concerned.

Operational losses of hazardous substances from shipping include losses by leaching of biocides, tributyltin (TBT) used in antifouling coatings, and of zinc, copper and aluminium applied as anodes to ships (ship hull, ballast tanks and cooling systems) as protection from corrosion. A first estimate by OSPAR in 2006 suggests that the magnitude of losses of most of the metals in 1997 – 2002 to the Greater North Sea equalled their direct discharges or atmospheric deposition; the magnitude of total losses of TBT from shipping in this OSPAR Region has been estimated to be around 134 tonnes in 2002 (OSPAR 2006h). TBT is known to cause shell deformation and to affect reproduction of molluscs. In accordance with OSPAR measures (see section 4.3.1), Contracting Parties have made progress in the last years towards the phasing-out of the use of TBT in antifouling paints. A world wide ban from 2008 has been agreed in the IMO framework (not yet in force).

OSPAR has not taken specific measures on shipping but some of its actions (concerning for example hazardous substances or dredging) address impacts associated with shipping. Recently, OSPAR started co-ordinated environmental monitoring of TBT in biota and of TBT-specific biological effects which will be periodically assessed (see section 4.4.2).

8.8 Mineral exploitation

Extraction of marine sediments started as an industry in the 1960s, and has been growing ever since in sophistication and volume of material withdrawn. Marine minerals are used as building material (mostly for making concrete), for land reclamation (infilling of docks, road base and other ground works), coastal protection (beach replenishment), or the improvement of agricultural soil structure. Some Contracting Parties, like Spain, have prohibited the extraction of marine aggregates for purposes of the construction industry and restricted permissions for the extraction of marine sediments to uses for beach replenishment/coastal defence. The majority of the minerals extracted by Contracting Parties are sand and gravel with limited amounts of maërl (calcareous algae) taken by France, mainly along the coast of Brittany, and Ireland (Bantry Bay), and shell by the Netherlands (ICES 2005a). By far the largest amount is taken from the North Sea where extraction has increased considerably over the past two decades but has decreased again over the last three years. In 2004, the extraction of aggregate sand and gravel in the OSPAR area was around 46 million m^3; the largest volume extracted is for sand. The Netherlands is the predominant user of sand for beach replenishment/coastal defence and the UK of sand and gravel for construction. The amounts of minerals extracted can vary considerably year by year if specific projects create particular demands at a time.

Dredging is almost entirely carried out by trailing suction dredgers, most of which can dredge in water depths of about 40 meters, although larger ships can work at twice this depth. Suction-trailer vessels dredge large areas of seabed, removing a thin (20-30 cm) layer of sediment. The aggregate material and the water are piped aboard into a hopper where the aggregate displaces the water which then overflows back to the sea, carrying with it suspended sediment that creates a turbidity plume.

The effects of the extraction of marine sediments on the marine ecosystem has been assessed by ICES in 2001 (ICES 2001). This shows that impacts of dredging on biota may result from the substrate removal and the resulting destruction of benthic biota, the alteration of the seabed topography, which in turn may affect local water circulation and coastal processes (by reducing sediment supply and transport to other areas), the creation of turbidity plumes in the water column, and plume deposition on the seabed. The chemical effects of aggregate dredging (release of reducing substances bound in sediments) are likely to be minor. The impact of dredging depends on the intensity of the activity and on the sensitivity of the local dredging site and its adjacent areas, in particular the natural stability of the sediment. The changes to seabed morphology, in the nature of the surface layer of the sediment, and effects on associated macrofauna are more profound and long-lived where extraction operations are more intensive, or where extraction sites occur in stable environments. In areas where wave exposure is low and tidal currents are reduced, increased diversity and abundance of marine life (with less resilient species) is encouraged which can contribute to highly productive fisheries for shellfish and provide important sources of food for commercially exploited fish species. In such areas the erosion of dredge tracks may take up to seven years whereas in highly dynamic areas mineral extraction may have only a short-lived impact with the rapid physical recovery (less than one year) and re-colonisation of the seabed (up to three years). There are local observations, that recolonising communities may exhibit a higher biomass in adjacent areas than pre-dredging levels and that depressions in the seabed topography may represent a more heterogeneous habitat and provide niches for certain fish species. Increased turbidity may, however, affect turbidity-sensitive species (for example *Posidonia* or other seagrass meadows and certain sessile invertebrates) and result in changes in the composition of benthic communities.

To assist identification of priorities for future action, OSPAR will undertake an assessment in 2007 of the effects of extraction of marine sediments on the marine ecosystem. This assessment will be based on an update of the 2001 ICES assessment and is expected to be adopted by ICES in 2006. This report may assist an assessment of the progress made by Contracting Parties since 2000 in implementing effective measures to control extraction of marine sediments and in improving impact assessments, taking into account the ICES Guidelines for the Management of Marine Sediment Extraction.

8.9 Microbiological contamination

Microbiological contamination is a long-standing concern mainly with regard to the potential health threat of micro-organisms, such as bacteria and viruses, in costal waters used for bathing or for harvesting shellfish for human consumption. It is measured by means of the presence of faecal indicator organisms, such as faecal coliforms or faecal streptococci. The main sources of microbiological contamination are human pathogens in discharges of untreated or insufficiently treated waste water from coastal agglomerations, in particular from tourist sites such as camping areas, leaks in older sewerage networks, agricultural run-offs from pastures (faeces of livestock) and arable land (spread of manure from animal husbandry), or from certain types of industry, in particular the agro-food industry (for example slaughter houses or meat-, fish- and milk-processing factories).

The establishment of advanced waste water treatment and the progressive connection of agglomerations to sewerage, in particular with a view to implementing the Urban Waste Water Treatment Directive (91/271/EEC), have considerably reduced the introduction of microbial contaminants to coastal zones in the OSPAR maritime area (see section 2.4). A well functioning sewerage plant with biological secondary treatment can reduce the presence of faecal indicator germs by up to 99%. However, if the treated water was heavily polluted a large number of human pathogens may still be present in the sewage sludge which, if re-used as fertiliser, may re-introduce them into the ecological system.

Still more than 25 years after the adoption of the Bathing Water Directive (76/160/EEC), 100% compliance with the set water quality standards have not been reached anywhere in the European Union, although remarkable improvements have been achieved mainly in the 1990s, but gradual further improvements are still taking place (Figure 8.6). In 2005, the percentage of bathing areas in coastal zones in the EU-15 complying with the mandatory values of the Bathing Water Directive decreased slightly by 0.6% compared with the 2004 bathing season but remained still relatively high with 96.1% (EC 2006). The decrease was caused by a higher number of banned areas and areas which were insufficiently sampled in 2005. Reversing the slight decrease in the 2004 season, the percentage of bathing waters complying with the more stringent guide values rose from 88.5% in 2004 to 89.8% in 2005; this rate of compliance is high and can be compared with the value of the 2003 season. Where standards are not met, action has been initiated by the responsible authorities in each country to address the potential sources which often are of diffuse nature.

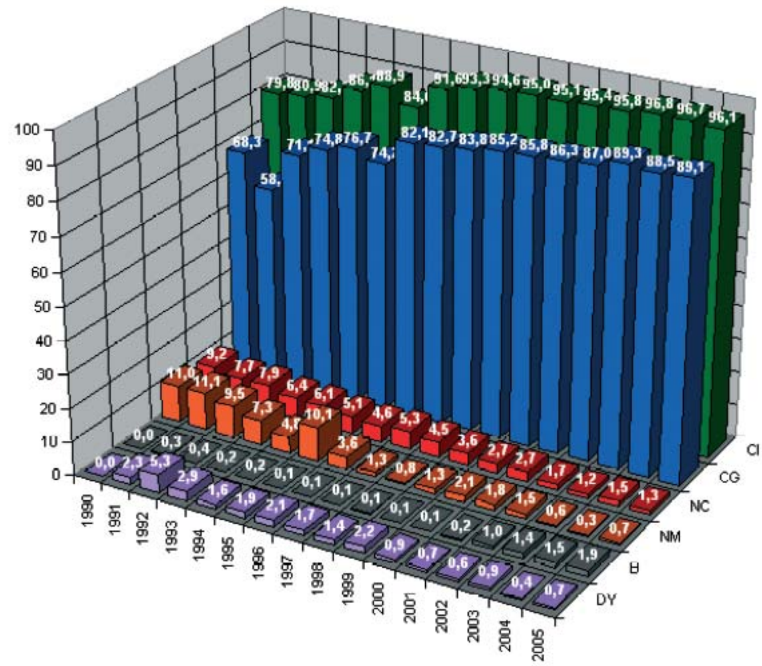


Figure 8.6 Compliance of bathing waters in coastal waters with Council Directive 76/160/EEC.Source: EC 2006

C(I)	percentage of bathing areas sufficiently sampled which comply with mandatory values
C(G)	percentage of bathing areas sufficiently sampled which comply with guide values and mandatory values
NF	percentage of bathing areas not sufficiently sampled
NB	percentage of bathing areas where bathing was prohibited throughout the bathing season
NC	percentage or number of bathing areas which do not comply with mandatory values
NS	percentage of bathing areas not sampled or for which no data are available

Bacteria and viruses in coastal waters can affect marine biota, including invertebrates, fish and seals. The binding of microbial contaminants to solid surfaces, however, may render them less available for exposure to biota, except when particles are taken up as part of the feeding activities of organisms or are re-suspended. To date it is difficult to make an assessment of ecological effects due to the lack in knowledge. Little is presently known about the risk to mammals and seabirds from human pathogens in the marine environment.

8.10 Litter

Litter that ends up in the marine environment is known to arise from a number of sources: shipping, offshore activities, sewage related debris discharged into the sea, land based sources such as landfill sites, inappropriate waste management practices and recreation and tourism. Shipping related garbage includes also fishing gear lost at sea. With the growth of plastic use in recent decades, the problem of marine litter has become more serious as it can remain in circulation for years, often travelling over long distances with the currents and winds and transferring the impact beyond the site of the initial dumping.

Despite a wide range of measures taken in recent years, litter in the marine environment still remains a significant source of pollution causing environmental, safety and economic problems to marine and coastal environments. The impacts from marine litter are well known. Effects to marine life include entanglement of animals which can cause loss of movement, starvation, suffocation or drowning, and ingestion, which can cause starvation or internal injury. Marine litter also impacts on humans, particularly economic loss to the tourism industry from litter-strewn beaches and to the fishing industry, where it can result in contaminated catches or cause the disablement of the vessel.

A wide range of work has been, and is being, undertaken in the OSPAR Convention area which targets the reduction of marine litter. The OSPAR project on marine litter monitoring comprises field surveys of reference beaches in a number of OSPAR Contracting Parties, the development of methods for statistical processing, analysis and presentation of the project data, the identification of trend indicators and source-specific indicators for tourism/recreation, and the inclusion of an operational objective for marine litter (OSPAR 2006i). The “Fishing for Litter” initiative under the Interreg IIIb project “Save the North Sea” (the transnational EC programme for the spatial development co-operation of European Regions) has demonstrated on a limited scale that the objectives and aims of the scheme can contribute to changing practices and culture within the fishing sector, provide a mechanism to remove marine litter from the seabed, and raise awareness among the fishing industry, other sectors and the general public. The final report of the project is expected to be published in 2007.

It could be argued that if similar “Fishing for Litter” schemes were to be implemented throughout the OSPAR region, significant amounts of marine litter could be removed from the sea thus reducing both environmental impacts and economic costs to the fishing industry and other sectors. Also, the review of EC Directive 2000/59/EC on port reception facilities for ship generated waste and cargo residues provides an opportunity for further actions to reduce litter in the marine environment.

The problems caused by marine litter have been a longstanding issue within OSPAR, and marine litter has been discussed at a high political level and included in declarations and statements from several ministerial meetings. To date efforts have tended to focus on cleanup activities but very little progress has been achieved in reducing the input of marine litter from its many sources.

8.11 Mariculture

For OSPAR purposes, mariculture is taken to be the part of the aquaculture industry (that is, the raising and harvesting of fish and shellfish under controlled conditions) that takes place in the OSPAR maritime area. Intensive fish farming (in particular of salmon) in marine waters is a relatively new and growing industry with impacts on the marine environment directly relevant under the OSPAR Hazardous Substances, Eutrophication and Biological Diversity and Ecosystems Strategies (OSPAR 2006j). The extent of the mariculture sector, the design and operating conditions vary considerably between Contracting Parties and the impacts are very site-specific. Impacts on the marine environment associated with mariculture include inputs of hazardous substances, inputs of nutrients through stock feed (see on this aspect section 5.2) and risks to biological diversity.

On pollution aspects, the preservation of the health of the fish and shellfish kept in unusually high concentrations in mariculture has lead to the use of a wide range of chemicals as veterinary medicines. In addition, there has been a need to keep the installations clear of the natural growths of algae and molluscs in the same way as ships’ hulls, which has lead to the use of a range of anti-fouling treatments and technical disinfectants. The use of these chemicals has been constrained, however, by the need to deliver the fish products in conditions which meet the requirements for human consumption.

OSPAR has taken specific action to reduce pollution from aquaculture (PARCOM Recommendation 94/6 on Best Environmental Practice (BEP) for the Reduction of Inputs of Potentially Toxic Chemicals). In 1994 - 2005, a decline of the use of veterinary medicines on salmon has been reported by Contracting Parties. In the same period salmon production has increased. Norway for example is the only Contracting Party to use to a greater extent cleaner fish (i.e. fish from wild stocks which are controlled for diseases before used) to minimise use of medicines. Active vaccination programmes, better hygienic routines and strategic delousing programmes have resulted in Norway in a decrease of the use of antibacterial in mariculture.

Not all Contracting Parties are using antifouling products and where this is done, the main active ingredient is copper. The use of TBT on cages, floats, nets and other appliances and equipment used for fish or shell fish farming has been banned in the EU (Directive 2002/62/EC).

Contracting Parties have not put in place specific best environmental practices for mariculture. This is probably due to the fact that the main issues are covered by existing EC legislation (for example the EC Biocides Directive (98/8/EC), the Water Framework Directive (2000/60/EC), or EC chemicals legislation) and corresponding national implementing laws and regulations. In the current review of EC Directive 96/61/EC on Integrated Pollution Prevention and Control the inclusion of aquaculture in Annex 1 to the Directive is considered so that authorisation would be required. However, in the light of the combination of considerable national diversity, and action within OSPAR and the EC/European Economic Area, OSPAR has concluded that, for the time being, no further action within OSPAR is needed specifically for the control of hazardous substances used in mariculture.

On non-pollution aspects of mariculture, impacts are site-specific. Therefore the choice of site is important to minimise impacts and avoid damage to particularly sensitive ecosystems. Impacts on the wider coastal environment, in particular on wild stock through escape of farmed fish and shellfish (including spat and fry), is difficult to predict. This concerns the genetic biodiversity of wild stocks as much as the issue of introducing non-indigeneous species (e.g. rainbow trout, Pacific oyster). Free-trade agreements allow cross-boundary transfers of disease-free living organisms. OSPAR programmes and measures could not cut across these obligations.

A wide range of international regulations and environmental standards address issues of mariculture including EC legislation on aquaculture, the Habitats Directive or the Birds Directive. Currently discussion on the extension of the IPPC Directive to aquaculture activities is ongoing in the European Community. In the light of the initiatives in place, the regional differences in fish farming technology, species farmed and the nature and quantity of wastes discharges, and the local susceptibility of the area concerned to impacts of mariculture, OSPAR concluded that a harmonisation of the standards throughout the OSPAR maritime area would therefore be a difficult and an unnecessary task. The existing approaches responded to locally, regionally or nationally specific pressures and needs. As a substantial amount of general guidance is available to give the background to case-by-case decisions, OSPAR has therefore concluded that, in the present circumstances, there is no need for the development of additional programmes and measures at the OSPAR level.

8.12 Underwater noise

A number of human activities such as, for example, seismic exploration, shipping or naval exercises generate underwater noise. A significant increase of underwater noise levels during the past five decades in some areas are attributed to increases in commercial shipping, particularly in the northern hemisphere. However, an understanding of the impact of such increase on marine life in general, and a detailed analysis of ambient noise levels in the OSPAR maritime area in particular, is still lacking.

Possible direct impacts of sonar on biota include the risk of auditory or bodily injury by emissions from high intensity sound sources, while possible indirect impacts include the degradation of habitats or the exclusion of species from habitats. Both effects have the potential to affect entire local populations. So far, scientific studies have documented both the presence and absence of physiological effects and significant behavioural response of marine life to various sound signals. However, to this date, no universal conclusions on the effect of sound could be drawn and are unlikely to emerge in the future.

The full effects of sonar on fish are poorly known, mostly due to the lack of study. In the studies that have been conducted, effects of sonar have been noted at the individual level. However, these studies have focussed on a few species and it is not known whether their responses are representative of the wide diversity of other marine fish species. Based on the limited information currently available, wide-ranging species of fish of commercial importance are unlikely to be affected at the population level with current rates of usage (and areas of usage) of military sonar. Other sonars (and noise sources) are more widespread, but their effects are not known.

Equally, the full effects of sonar on cetaceans are not well known, mostly due to the difficulty of studying the interaction. There is no evidence of harm for sound sources other than high-intensity (>215dB) mid-frequency (1 – 10 kHz) sonar. The use of this sonar has led to the deaths of a number of cetaceans in some places. All incidents that have been investigated have occurred in the North Atlantic or Mediterranean and have related to the use of military sonar. Other stranding incidents have occurred in these and other seas, but their cause is not clear. From relatively limited knowledge, it appears that beaked whales are the most affected species, in particular Cuvier's beaked whale *Ziphius cavirostris*. It is not known whether this species is particularly sensitive or just the most often exposed to the sound. The most consistent deduction from the evidence is that behavioural alteration is more important than the direct effect of the sound on hearing mechanisms. It is unknown how many animals that are affected further out to sea can survive and do not strand. Little is known of the sub-lethal effects of sonar on beaked whales or on other cetacean species. The possibilities and consequences of these effects are summarised in Table 8.2.

Table 8.2 Summary of likely effects of sonar on beaked whales. Source: ICES 2005b

Type of effect	Extent of effect	Severity of effect	Individuals affected	State of knowledge
Direct death and lethal injury	Very local	Severe	Few/none	Adequate for current purposes
Gas embolism	Medium scale	Severe	Small numbers?	Moderate
Sublethal injury	Medium scale	Unknown	Small numbers?	Poor
Behavioural (avoidance)	Widescale	Mild/long term	Large numbers	Poor

There have been globally about 40 scientifically-verifiable sonar-related deaths among cetaceans (mostly, if not all, beaked whales) over the last 9 years. A recent IWC report indicates that worldwide, fisheries kill several hundred thousand cetaceans as bycatch each year. The scale of beaked whale bycatches in the North-East Atlantic is not known.

Considerable gaps in knowledge remain which are difficult to be filled. Potential acoustically induced direct and indirect effects are difficult to be observed in the marine environment. On potential direct effects, injured whales dying offshore are likely to escape detection while strandings can occur only in near-shore areas. Some impacts, such as temporary or permanent hearing threshold shifts, are virtually undetectable. Moreover, necropsies of stranded specimen rarely include diagnostic investigations for acoustic traumata but mostly concentrate on pathologic examinations for mechanical injuries, contaminants, or infections.

Potential indirect effects such as perceptual, behavioural, chronic, cumulative, and habitat related effects probably occur at sound levels lower than those causing physical effects, their lack or presence and their eventual impact on populations and habitat quality of different species is still largely unknown and will remain difficult to demonstrate in many cases.

Sound pressure threshold values (in dB) have traditionally been used to specify a general safety limit for specific sound sources in some national contexts. However, research results indicate that this single parameter is not suited to reflect the complex relationships of physical, environmental, and biological parameters. Current knowledge rather suggests considering peak pressure and energy levels as received by the respective species to assess a source's potential risk. The prediction of such exposure levels is rather demanding, due to the complex nature of sound propagation in water and along its boundaries, the frequently highly directional emission patterns, and the species' specific sensitivity.

The effectiveness of various mitigation measures – as requested by some national and international bodies with regard to the use of naval sonar and air-guns – is discussed controversially. Probably the most effective approach involves both temporal and geographic management of relevant noise-producing activities to avoid sensitive habitats, such as breeding grounds and Marine Protected Areas during sensitive periods.

8.13 Artificial reefs

Artificial reefs are, in the terms of the OSPAR Convention, "placements" on the seabed. They are man-made, submerged structures to mimic some characteristics of a natural reef. They are built for a range of coastal management applications. This includes purposes of coastal defense (reduction of flooding and coastal erosion) and the promoting of marine benthic habitat to enhance marine life for nature conservation or fisheries purposes. Hard surfaces can provide suitable substrate for algae and invertebrates to attach and thus create habitat structures and food for fish communities. Thus, artificial reefs can be used for example for developing habitat for crustaceans fisheries, particularly in conjunction with juvenile restocking or restricted fishing areas for fish stock protection, mitigating for habitat losses elsewhere, for instance as consequence of land reclamation, or replacing habitats in areas where substrate is under threat. They can also be used for the production of marine resources and the cultivation of algae or mollusc, for sheltered anchorage for shipping and small boats, or for leisure purposes such as diving or surfing. They are built from a variety of material and structures, including for example the re-use of ship wrecks, cars, aircrafts etc.

The development of artificial reefs in the OSPAR maritime area is still in its infancy. In recent years, a small number of artificial reefs have been placed, almost all in UK waters, using concrete blocks and tires (Poole Bay, Dorset), waste rocks from a quarry (Loch Linnhe, Scotland) and, in one case, a decommissioned naval frigate (Whitsand Bay, Cornwall). They primarily serve research purposes. Monitoring of the growth of organisms on the reef and chemical analyses have been undertaken to see whether the materials used are suitable for use in the marine environment. First research results for two of the UK reefs established in 1989 and 1998 have already become available.[14]

The placement of artificial reefs on the seabed may have potential to cause adverse effects in the marine environment through pollution from leaching, physical or chemical weathering and/or biological activity and through physical impacts on the seabed area where they are placed. Their impacts and the evaluation of suitable materials for their construction are still under investigation. An assessment by OSPAR of their environmental impacts is planned in 2006/2007. So far, OSPAR has adopted guidelines to assist Contracting Parties in considering the consequences for the marine environment of the placement of artificial reefs on the seabed by recommending authorisation procedures for the construction of artificial reefs, including environmental impact assessments. The guidelines make recommendations for the use of inert material for, and the design of, their construction, and their placement on the seabed as well as the setting up of monitoring programmes to verify whether the management objectives are fulfilled and to assess the environmental impacts and/or conflicts of the artificial reef with other legitimate uses of the maritime area.

8.14 Exploration and placement of structures for the exploitation of oil and gas

Exploration activities are essential in the search for oil and gas before development and production. This includes geological and geophysical surveys and physical impacts from drilling to locate an oil or gas reservoir, and from the drilling of additional wells after a discovery to determine the boundaries of an underground reservoir. Other adverse impacts result from the placement of structures, cables and pipelines. The exploitation of oil and gas offshore and the related pollution of the marine environment are dealt with under Chapter 7. An assessment by OSPAR of the environmental impacts of these exploration and exploitation activities is planned for 2006/2007.

A first assessment in 2004 of the environmental impacts of oil and gas activities other than pollution showed that research on impacts of construction or placement of structures alone is rather uncommon (OSPAR 2004b). Information collected in 2004 on the assessment of the effects on ecosystems and biological diversity of the existing and potential types of offshore installations, offshore pipelines and other pipelines that may be placed in the maritime area, and on cables that are related to oil and gas exploration and exploitation showed that potential for impacts is sufficiently covered by both international and national regulations' requirements applying to territorial waters and the Exclusive Economic Zones. This includes requirements for the assessment of environmental impacts prior to the placement of structures and for specific environmental monitoring related to the placement of structures, pipelines or cables during and/or after their construction or placement in the marine area. Based on the available monitoring information, impacts of the placement of structures, cables and pipelines for oil and gas on the marine environment have not been ascertained. This might be taken as an indication that the system of environmental impact assessments is working adequately. However, it might also be argued that increased monitoring focusing particularly on these issues is needed in order to verify that this actually is the case.

OSPAR concluded that until new information became available, no further action needed to be taken at OSPAR level on the development of programmes and measures on environmental impacts of oil and gas activities other than pollution.

[14] For further details on the Poole Bay artificial reef using concrete blocks with fly ash incorporated (studied by the Department of Oceanography of the Southampton University) see http://www.soc.soton.ac.uk/PR/NEWS/content/030402_reef_talk.htm; on the artificial reef at Loch Linnhe (built and studied by the Scottish Association of Marine Sciences Laboratory) see http://www.sams.ac.uk/schools/artreef.pdf

8.15 Coastal defence and land reclamation

Under the JAMP, OSPAR has scheduled assessments of the impact of coastal defence and land reclamation for 2007.

9. Means of integration

In 2002, the Fifth North Sea Conference agreed on the adoption of a system of Ecological Quality Objectives (EcoQOs) as a means of applying the ecosystem approach to the management of human activities in the North Sea. The development and application of the EcoQO system is taking place in the framework of OSPAR through a pilot project for the North Sea. EcoQOs offer OSPAR a means of showing how the six OSPAR Strategies can be integrated and work together to deliver the agreed general goal of a healthy and sustainable marine ecosystem throughout the OSPAR maritime area. The system defines the "envelope" within which that objective can reasonably be expected to lie, by providing precise bench-marks to show whether the different components are within that envelope, and thus showing whether the OSPAR Convention is achieving its aim.

9.1 System of Ecological Quality Objectives

Ecological Quality can be best defined as "an overall expression of the structure and function of the marine ecosystem taking into account the biological community and natural physiographic, geographic and climatic factors as well as physical and chemical conditions including those resulting from human activities".

Within this overall concept, Ecological Quality Issues are the fields in which it is appropriate to attempt to measure aspects of the general ecological quality of the marine ecosystem under consideration. It is recognised that the overall marine ecosystem of the OSPAR maritime area can be seen as comprising a number of separate ecosystems which may need to be considered separately. For the development of an EcoQO system for the North Sea, nine issues have been selected under which Ecological Quality Elements have been identified, i.e. those individual aspects of ecological quality warranting specific focus. The number of elements selected under each issue varies.

For each of the Ecological Quality Elements, an Ecological Quality Objective is set which defines the desired level of an ecological quality. The EcoQO is set in relation to a reference level which is the level where the anthropogenic influence on the ecological system is minimal. EcoQOs need to be set on a clear scientific basis, to enable data to be collected effectively and economically, to have a clear reference level or target, and to be generally accepted by all stakeholders.

So far a suite of 12 advanced EcoQOs has been developed under the North Sea pilot project with EcoQOs for 10 less advanced EcoQ elements requiring further work before EcoQOs can be implemented (Table 9.1) (OSPAR 2005k). Hence, the set of EcoQOs for the North Sea is not yet a complete set.

Table 9.1 The North Sea EcoQO system in relation to the OSPAR Strategies and related main human activities. *Text in italics presents those Ecological Quality Elements which are less advanced and related preliminary EcoQOs which need further development prior to their final adoption and application*

Ecological Quality Issue	Ecological Quality Element	Ecological Quality Objective	Relevant OSPAR Strategy and related human activities[15]
Commercial fish species	Spawning stock biomass	Above precautionary reference points for commercial fish stocks where these have been agreed by the competent authority for fisheries management	Biodiversity – fisheries
Marine mammals	Seal population trends in the North Sea	(a) Harbour seal population size Taking into account natural population dynamics and trends, there should be no decline in harbour seal population size (as measured by numbers hauled out) of ≥10% as represented in a five-year running mean or point estimates (separated by up to five years) within any of eleven sub-units of the North Sea. These sub-units are: Shetland; Orkney; North and East Scotland; South-East Scotland; the Greater Wash/Scroby Sands; the Netherlands Delta area; the Wadden Sea; Heligoland; Limfjord; the Kattegat, the Skagerrak and the Oslofjord; the west coast of Norway south of 62°N. (b) Grey seal pup production Taking into account natural population dynamics and trends, there should be no decline in pup production of grey seals of ≥10% as represented in a five-year running mean or point estimates (separated by up to five years), and in breeding sites, within any of nine sub-units of the North Sea. These sub-units are: Orkney; Fast Castle/Isle of May; the Farne Islands; Donna Nook; the French North Sea and Channel coasts; the Netherlands coast; the Schleswig-Holstein Wadden Sea; Heligoland; Kjørholmane (Rogaland).	Biodiversity – cross-cutting, i.e. multi activity
	By-catch of harbour porpoises	Annual by-catch levels should be reduced to below 1.7% of the best population estimate	Biodiversity – fisheries
Seabirds	Proportion of oiled common guillemots	The proportion of such birds should be 10% or less of the total found dead or dying in all areas of the North Sea	Oil and gas – illegal or accidental releases of oil
	Mercury concentrations in seabird eggs	*The average concentrations of mercury in the fresh mass of ten eggs from separate clutches of common tern (Sterna hirundo) and Eurasian oystercatcher (Haematopus ostralegus) breeding adjacent to the estuaries of the Rivers Elbe, Weser, Ems, Rhine/Scheldt, Thames, Humber, Tees, and Forth, should not significantly exceed concentrations in the fresh mass of ten eggs from separate clutches of the same species breeding in similar (but not industrial) habitats in south-western Norway and the Moray Firth*	Hazardous Substances, Oil and Gas – activities resulting in discharges, emissions and losses of mercury
	Organohalogen concentrations in seabird eggs	*For each site, the average concentrations in fresh mass of the eggs of common tern (Sterna hirundo) and Eurasian oystercatcher (Haematopus ostralegus) should not exceed: 20 ng g−1 of PCBs; 10 ng g−1 of DDT and metabolites; and 2 ng g−1 of HCB and of HCH. Sampling should be of ten eggs of each species from separate clutches of birds breeding adjacent to the estuaries of the Rivers Elbe, Weser, Ems, Rhine/Scheldt, Thames, Humber, Tees, and Forth, and in similar (but not industrial) habitats in south-western Norway and in the Moray Firth.*	Hazardous substances – activities resulting in discharges, emissions and losses of organohalogens
	Plastic particles in stomachs of sea birds	*There should be less than 2% of northern fulmars (Fulmarus glacialis) having ten or more plastic particles in the stomach in samples of 50–100 beach-washed fulmars found in winter (November to April) from each of fifteen areas of the North Sea over a period of at least five years*	Biodiversity – marine litter
	Local sand eel availability to black-legged kittiwakes	*Breeding success of the black-legged kittiwake (Rissa tridactyla) should exceed (as a three-year running mean) 0.6 chicks per nest per year in each of the following coastal segments: Shetlands, north Scotland, east Scotland, and east England*	Biodiversity – fisheries

[15] This covers human activities addressed under all thematic Strategies. For the Biological Diversity and Ecosystem Strategy the following activities have been identified for assessment in Appendix 3 to the Joint Assessment and Monitoring Programme (JAMP) (reference number: 2003-22, update 2005): fisheries; marine litter; mineral extraction; dredging; dumping of waste; dumped ammunition; exploration for oil and gas; underwater noise; placement of pipelines and cables; artificial reefs; offshore windmill farms; placement of structures; land reclamation; coastal defence; tourism; mariculture; marine transport.

	Seabird population trends as an index of seabird community health	*Under development*	Biodiversity – cross-cutting, i.e. multi activity
Fish communities	*Changes in the proportion of large fish and hence the average weight and average maximum length of the fish community*	*Under development*	Biodiversity – fisheries
Benthic communities	Imposex in dog whelks (Nucella lapillus) or other selected gastropods	The average level of imposex in a sample of not less than 10 female dog whelks (Nucella lapillus) should be consistent with exposure to TBT concentrations below the environmental assessment criterion (EAC) for TBT – that is, < 2.0, as measured by the Vas deferens Sequence Index, Where Nucella does not occur naturally, or where it has become extinct, the red whelk (Neptunea antiqua), the whelk (Buccinum undatum) or the netted dog whelk (Nassarius reticulatus) should be used, with exposure criteria on the same index of <2.0, <0.3 and <0.3, respectively.	Hazardous substances – anti-fouling treatment of ship hulls
	Density of sensitive (e.g. fragile) species	*Under development*	Biodiversity – cross-cutting, i.e. multi activity
	Kills in zoobenthos in relation to eutrophication	This EcoQO is part of the integrated subset of EcoQOs for eutrophication	Eutrophication
	Changes in zoobenthos in relation to eutrophication	*This EcoQO is part of the integrated subset of EcoQOs for eutrophication*	Eutrophication
Plankton community	Phytoplankton chlorophyll a	This EcoQO is part of the integrated subset of EcoQOs for eutrophication	Eutrophication
	Phytoplankton indicator species for eutrophication	This EcoQO is part of the integrated subset of EcoQOs for eutrophication	Eutrophication
Threatened and/or declining species	*Presence and extent of threatened and/or declining species in the North Sea*	*Under development*	Biodiversity – cross-cutting, i.e. multi activity
Threatened and/or declining habitats	*Restore and/or maintain the quality and extent of threatened and/or declining habitats in the North Sea*	*Under development*	Biodiversity – cross-cutting, i.e. multi activity
Eutrophication	Overarching Ecological Quality Element/Objective for eutrophication:		
	Eutrophication status of the North Sea	All parts of the North Sea should have by 2010 the status of non-problem areas with regard to eutrophication, as assessed under the OSPAR Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area	Eutrophication – Activities resulting in discharges, emissions and losses of nutrients
	Six supporting Ecological Quality Elements/Objectives for eutrophication:		
	Winter nutrient (DIN and DIP) concentrations	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%	Eutrophication – Activities resulting in discharges, emissions and losses of nutrients
	Phytoplankton chlorophyll a	Maximum and mean chlorophyll a concentrations during the growing season should remain below a justified area-specific deviation from background not exceeding 50%	
	Phytoplankton indicator species for eutrophication	Area-specific phytoplankton eutrophication indicator species should remain below respective nuisance and/or toxic elevated levels and there should be no increase in the average duration of blooms	
	Oxygen	Oxygen concentration, decreased as an indirect effect of nutrient enrichment, should remain above area-specific oxygen assessment levels, ranging from 4 - 6 mg oxygen per litre	
	Kills in zoobenthos	There should be no kills in benthic animal species as a result of oxygen deficiency and/or toxic phytoplankton species	
	Changes in zoobenthos	*Under development*	

The suite of EcoQOs identified so far is heterogene in that the EcoQOs:

a. take different functions: Some are formulated as targets (showing what conditions are desirable; even though a failure to achieve them may be consistent with a healthy and sustainable marine environment), some as limits (values where there is a commitment to avoid breaching them) and others as indicators (values which show what is happening and give a threshold for investigations whether, and if so what, management actions are needed);

b. are at varying levels in relation to the marine environment: For example the EcoQO on by-catch of harbour porpoises relates specifically to one aspect of one species, whereas the EcoQO on fish stocks covers twenty-six separate stocks, raising the question of an appropriate level of aggregation;

c. address different aspects of the Driver-Pressure-State-Impact-Response analysis, with an emphasis on “state” and “impact”;

d. do not distinguish clearly between those which have a clear cause/effect linkage to specific human activities (e.g. the EcoQO on by-catch of harbour porpoises which has a direct link to fisheries) and those which are a more generalised index of a range of aspects of the marine environment (e.g. EcoQO on seal population trends).

9.2 Integrating OSPAR Strategies

9.2.1 General relationship between EcoQOs and OSPAR Strategies

The overall objectives of each of the five OSPAR thematic Strategies are a description for the theme concerned of what is needed to ensure an overall healthy and sustainable marine environment in the OSPAR maritime area. Between them, the Strategies should be sufficient to address the human activities that they cover. As progress is made towards the overall objectives of the thematic Strategies, conditions should be created which will ensure progressively the achievement of the EcoQOs which translate the more or less abstract description of the Strategies’ objectives into operational terms. There should be no need for separate actions to deliver the EcoQOs in those fields.

However, the observation of achievements against EcoQOs will not, of itself, demonstrate the achievement of all OSPAR strategic objectives, since some of these strategic objectives are in the form of specific changes to be attained in inputs to, or pressures on, the maritime area, rather than the resulting ecological quality of the marine environment. Such changes must be monitored directly. Other adverse impacts resulting from catastrophic, rather than chronic, causes (such as ship disasters) will also need to be looked at separately.

The sixth OSPAR Strategy is implemented through the JAMP, designed to assess the impacts by the separate human activities covered by the thematic Strategies, as well as their combined effects on the overall quality of the marine environment. The thematic and general assessments to be conducted under the JAMP are periodic “health” checks on the status of the marine ecosystems. They are based on assessment criteria translating the objectives of the thematic Strategies into concrete parameters against which progress towards the OSPAR Strategies is measured. Similarly, the EcoQO system also focuses on the overall health and sustainability of the ecosystems and should therefore be used in close association with the JAMP and related assessment criteria and monitoring, namely for biological effects. This is particularly so because of the lack of a simple one-to-one relationship between human activities and the EcoQOs. While some of the EcoQOs relate directly to a manageable human activity and can be used operationally to regulate such activities, others contribute to defining the envelope of what constitutes a healthy and sustainable marine ecosystem. The whole set of EcoQOs should therefore periodically be used as part of the thematic and general assessments of the JAMP.

The goals of the North Sea Conference have effectively been assimilated to the strategic goals and objectives of OSPAR (except in relation to the management of fisheries and shipping). Separate programmes of work for delivering these goals (again except fisheries and shipping) will therefore not be needed. Therefore, the North Sea pilot project EcoQOs will also be useful to measure progress towards the overall objectives of the OSPAR Strategies and to do so in an integrated manner. In this way, the EcoQO system complements the work under the six OSPAR Strategies. With regard to fisheries, where OSPAR does not have the competence to adopt programmes and measures, and shipping, where action is mainly taken at global level but where action through OSPAR at regional seas level may sometimes be appropriate, OSPAR assessments under the EcoQO system as well as under its Strategies may indicate that there is a need for OSPAR to take the issue forward in accordance with the provisions of Annex V to the OSPAR Convention.

9.2.2 Human activities reflected by EcoQOs

The North Sea EcoQO system covers a number of human activities addressed by the OSPAR Strategies (Table 9.1) but leaves scope for further development:

a. Hazardous Substances Strategy: the EcoQO approach so far taken is to look at the impact of discharges, emissions and losses of hazardous substances in top predators as the substances tend to bioaccumulate. There may be scope for extending the current selection of sea birds (mercury and organochlorine in sea bird eggs) to cover fish (such as shark and cod) and marine mammals. The development of EcoQOs under the ecological quality issue “habitat” may also offer possibilities for looking a the levels of hazardous substances in the marine environment;

b. Radioactive Substances Strategy: so far the development of EcoQOs has not addressed radioactive substances. The planned collection under the JAMP of data on concentrations in the marine environment (water and biota) may provide a basis for developing an EcoQO on the presence of radioactive substances from anthropogenic sources;

c. Offshore Oil and Gas Industry Strategy: human activities relevant to this Strategy will, in general, be adequately covered by the EcoQOs related to the discharges, emissions and losses of hazardous substances. To the extent that the eventual system of EcoQOs covers radioactive discharges, that aspect of the offshore oil and gas industry will also be adequately covered. No further EcoQOs specifically reflecting human activities under this Strategy are needed with one exception. There are possible concerns from noise pollution from such activities relating to the exploration of offshore mineral resources as for example seismic testing. This is linked to other questions of noise pollution e.g. from shipping;

d. Eutrophication Strategy: the current integrated set of EcoQOs covers the main factors in the eutrophication process from nutrient enrichment to its direct and indirect effects. The development of a complementary EcoQO for changes in zoobenthons in relation to long-term eutrophication is currently under way;

e. Other human activities under the Biological Diversity and Ecosystems Strategy: The current EcoQOs for fisheries address most relevant aspects as the level of capture of fish expressed as the spawning biomass needed for successful recruitment of commercial fish species, the effect of fisheries on the age structure of the fish population, the effects of bottom-trawling on marine benthos, and the level of by-catch, but might need to consider also the composition of by-catch and the levels of discards. With regard to shipping, the EcoQOs on oiled guillemots (illegal discharges of oil or from disasters), plastic particles in stomachs of seabirds (marine litter) and imposex in dog-whelks (anti-fouling treatments of ships’ hulls) need to be complemented by a broader EcoQO for marine litter, and possibly one for the impact of noise from propellers, engine noise and hull noise of large vessels especially to cetaceans and fish. Successful management of marine sand and gravel extraction and dredging for navigational purposes will be reflected in some of the EcoQOs relating to fisheries as well as by the EcoQOs on threatened and/or declining species and habitats which are suitable to measure the impact of a variety of human activities, including land reclamation or tourism, or the protection of marine biodiversity, a human activity in its own right.

With regard to the protection of marine biodiversity under the Biological Diversity and Ecosystems Strategy, there will be a need to look at the success in protecting threatened and/or declining species and habitats and in achieving an ecologically coherent network of well-managed marine protected areas. There is a question of how to measure this success. Since much further work is needed on the ecological quality issues relating to threatened and/or declining species and habitats, a means will be desirable to link the reporting on marine protected areas into the EcoQO system.

Human activities are also having an important influence on the seas and their ecosystems through the way in which the climate is being changed. All these impacts share the feature that the causes are global in their nature and would therefore need to be addressed at global level. This has implications for the suite of EcoQOs, since the global community is developing measurement systems to look at impacts of this kind, as a basis for the necessary global measures. While some of the North Sea EcoQ elements may reflect the impacts of global climate change, any future consideration of whether North Sea/OSPAR objectives or monitoring strategies for the impacts of global change should be developed, needs to take account of what the North Sea/OSPAR States are doing in the global partnership, and risk giving only a partial picture, since they focus only on the North Sea. While the impacts of the human activities that are bringing about global climate change need to be taken into account in any assessment of the health and sustainability of the North Sea, it does not seem appropriate at present to set out to develop the North Sea EcoQO system so as to cover the impacts. The ecological objectives, the measures to deliver them and the monitoring of progress in achieving them need to be developed and implemented at global level.

9.2.3 Implementation of EcoQOs

For the advanced EcoQOs, background documents have been published, containing a first inventory of results from existing monitoring programmes and an evaluation of the suitability of the indicator and associated target. Arrangements have been made *inter alia* to improve the inventories with monitoring results from more Contracting Parties, to investigate the needs and possibilities for improving and harmonising monitoring methods and to get a better understanding of the resources needed to properly monitor and assess the EcoQOs.

Examples of advanced EcoQOs are seal population trends, by-catch of harbour porpoises and oiled guillemots. The first inventories of grey and harbour seal populations show that these are increasing in most parts of the North Sea. Decreases have been observed linked to culling of grey seal pups on the Farne Islands and two epizootics that affected harbour seal populations in the southern and eastern North Sea. However, trend assessment, which is required to judge whether the EcoQO is being met, is not possible on many data sets owing to short time series and/or infrequent monitoring.

Monitoring of by-catches of harbour porpoises is compulsory under the Habitats Directive, but consistent programmes are not yet in place in all North Sea States. In addition, estimates of harbour porpoise populations, which are needed to evaluate the proportion of by-caught porpoises to the total population, are rare. Another problem is that no sufficient information is present on the structure of the harbour porpoise population (or populations) in the North Sea. Based on the available information the EcoQO is probably not met in the East-Central North Sea and the Western Channel. More reliable information will be made available in the near future.

Monitoring of beached oiled guillemots is carried out in most relevant areas of the North Sea, with some time series going back to the 1960s. In order to harmonise monitoring methods, much attention has been given to develop observation protocols for the purpose of EcoQO assessment. According to the present knowledge, oil rates are declining, but only three out of the 15 North Sea sub-regions, i.e. Shetland, Orkney and Northeast England, meet the objective (Figure 9.1).

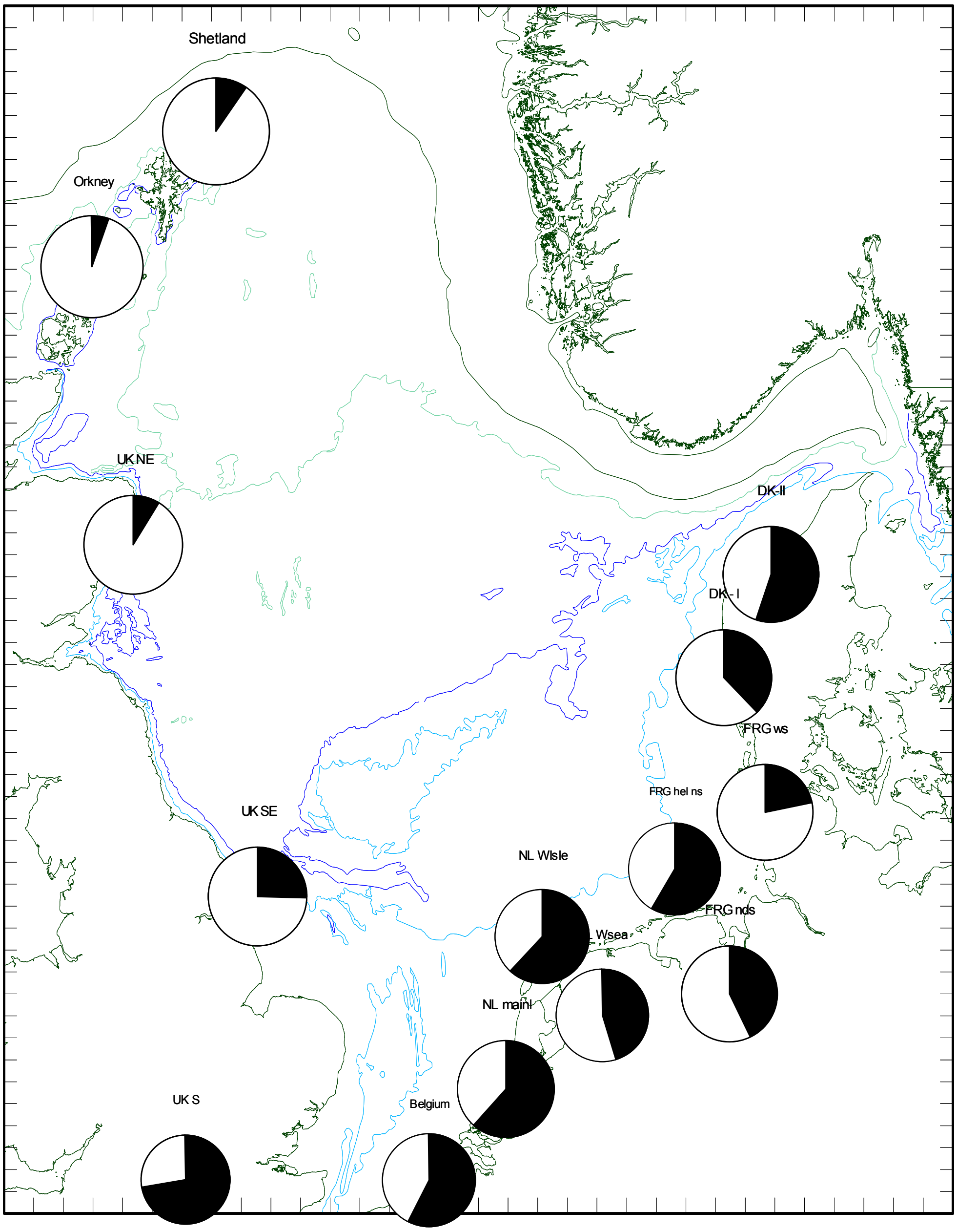


Figure 9.1 Mean oiled rate (% oiled) in Common Guillemots in the North Sea over 1997/98-2001/02 (i.e. excluding the Tricolor incident). Source: OSPAR 2005l

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Glossary and abbreviations *

aerosol	System of solid or liquid particles suspended in a gaseous medium, having a negligible falling velocity
ASMO	OSPAR Environmental Assessment and Monitoring Committee
agreement on monitoring strategies	OSPAR Agreement on Monitoring Strategies for Substances on the OSPAR List of Chemicals for Priority Action, OSPAR agreement 2004-14, as amended
B_{lim} / B_{pa}	Limit (lim) / precautionary (pa) reference point for spawning stock biomass of fish stocks
BAT	Best Available Technique is defined in Appendix 1 to the OSPAR Convention as the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste.
Bathing Water Directive	Council Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water (OJ L 31, 5.2.1976, p. 1), as amended (for consolidated version click here)
BC/BAC	OSPAR Background Concentrations (BCs) and Background Assessment Criteria (BACs) representing the concentrations of selected hazardous substances at “remote” sites, or in “pristine” conditions and used to assess if concentrations of hazardous substances in the marine environment are at, or approaching, background levels for naturally occurring substances and close to zero for man made substances (OSPAR agreement 2005-6).
BEP	Best Environmental Practice is defined in Appendix 1 to the OSPAR Convention as the application of the most appropriate combination of environmental control measures and strategies.
bioassay	A test used to determine the concentration or biological activity of a substance by comparing its effects with the effects of a standard preparation on a culture of living cells or a test organism.
Biocides Directive	Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the market (OJ L 123, 24.4.1998, p. 1), as amended (for consolidated version click here)
Birds Directive	Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds (OJ L 103, 25.4.1979, p. 1), as amended (for consolidated version click here)
B/RC	OSPAR Background/Reference Concentrations (BRCs) agreed for assessment in 1997 (OSPAR agreement 1997-14). In the course of their updating in 2005, the term Background/Reference Concentration was replaced by Background Concentrations (see BC/BAC).
BREF	EC Reference Documents on Best Available Techniques (BREF) prepared under, and for the purposes of, the IPPC Directive through the European Integrated Pollution Prevention and Control Bureau (see http://eippcb.jrc.es).
Bremen Statement	Statement of the Ministerial Meeting of the OSPAR Commission in Bremen on 25 June 2003
CAMP	OSPAR Comprehensive Atmospheric Monitoring Programme, set out in the CAMP Principles, OSPAR agreement 2001-7, as amended (for consolidated version click here)

* OSPAR agreements are available, and searchable with their reference number, under the “Measure” section of the OSPAR website (http://www.ospar.org). At the time of the publication of this document, the 2006 OSPAR agreements and the updated agreements following their amendment by OSPAR 2006 were not yet available on the web for a hyperlink.

CB / PCB	Chlorinated biphenyls (CBs) / polychlorinated biphenyls (PCBs), persistent organic pollutants identified by OSPAR for priority action. CB 153 is one representative PCB congener selected for use in OSPAR assessments
CEMP	OSPAR Coordinated Environmental Monitoring Programme, set out in the CEMP Principles, OSPAR agreement 2006-1 (latest update).
CIRES	Cooperative Institute for Research in Environmental Sciences is a joint project of NOAA (see there) and the University of Colorado at Boulder (USA).
CO_2	Carbon dioxide, acts as greenhouse gas
Common Procedure	Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area, OSPAR agreement 2005-3
cutting piles	An accumulation of drill cuttings on the sea bed. Drill cuttings refer to any solids removed from a wellbore while drilling. More specifically, the term refers to solid material removed from drilled rock when drilling petroleum wells together with any solids and liquid from any adherent drilling fluids.
DG Environment	Directorate General Environment of the European Commission (see http://europa.eu.int/comm/environment/index_en.htm)
DG Fish	Directorate General Fisheries and Maritime Affairs of the European Commission (see http://ec.europa.eu/comm/fisheries/policy_en.htm)
DIN/DIP	Winter concentrations of dissolved inorganic nitrogen compounds (DIN) and ortho-phosphate (DIP), used under the Common Procedure as parameters for nutrient enrichment of a marine area
DSP/PSP	Diarrheal Shellfish Poisoning (DSP) / Paralytic Shellfish Poisoning (PSP) are two of four recognized syndromes of shellfish poisoning induced by toxins which are produced by dinoflagellates and diatoms and accumulated in shellfish. DSP/PSP incidence can indicate increased eutrophication of the water in which in the shellfish is harvested.
DYNAMEC	OSPAR Dynamic Selection and Prioritisation Mechanism (DYNAMEC) for identifying chemicals for priority action based on the properties of persistence, liability to bioaccumulate and toxicity (OSPAR publication 2006/256)
EAC	OSPAR Ecotoxicological Assessment Criteria (EACs) agreed for assessment in 1997 (reference number 1997-15). In the course of their review, which is still ongoing, they were renamed Environmental Assessment Criteria (EACs) in 2004.
EC	European Community
EcoQO(s)	OSPAR Ecological Quality Objective(s) which define the desired level of ecological quality for an individual aspect of the overall ecological quality.
EC legislation	Binding Community acts of secondary legislation (regulations, directives, and decisions; see Article 249 of the Treaty Establishing the European Community). Texts, including consolidated versions, of EC legislation and preparatory documents are available at http://europa.eu.int/eur-lex/lex/en/index.htm.
European Economic Area	European Economic Area came into being on 1 January 1994 following the entry into force of the Agreement on the European Economic Area between the EFTA States Iceland, Liechtenstein and Norway on the one side and the 25 EU Member States and the European Community on the other. Through this Agreement, Iceland, Liechtenstein and Norway are associated with the EU and participate in the EU internal market, including the relevant EC legislation.
EMEP	Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe set up under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP) and held by UNECE (see http://www.emep.int)
EPER	European Pollutant Emissions Register, established by Commission Decision 2000/479/EC on the implementation of a European Pollutant Emission Register (EPER) (http://www.eper.cec.eu.int)
EU	European Union; here used interchangeably with EC.

EU-15/EU-25	EU-15 refers to the EU and its Member States (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the UK) at the time of the accession of the 10 new Member States (Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovakia and Slovenia) in 2004. EU-25 refers to the EU and all its Member States after its latest enlargement in 2004.
European Marine Strategy	Thematic Strategy on the Protection and Conservation of the Marine Environment, Communication from the Commission to the Council and the European Parliament of 24 October 2005, COM(2005) 504 final
Exclusive Economic Zone	In accordance with public international law as codified by the United Nations Convention on the Law of the Sea (UNCLOS) (Part V), the Exclusive Economic Zone is an area beyond and adjacent to the territorial sea, not extending beyond 200nm from the baselines from which the breadth of the territorial sea is measured, in which the coastal State has specific rights and jurisdiction.
F_{lim} / F_{pa}	Limit (lim) / precautionary (pa) reference point for the mortality of fish stocks
fishing-for-litter	The landing and disposal of litter gathered in fishing nets. An initiative to encourage this has been co-ordinated by KIMO International and co-funded by the European Commission, calling on fishermen to help reduce North Sea marine litter through fishing for litter (see http://www.kimointernational.org)
Habitats Directive	Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.7.1992, p. 7), as amended (for consolidated version click here)
High Seas	In accordance with public international law as codified by the United Nations Convention on the Law of the Sea (UNCLOS) (Part VII), the high seas are all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State. Freedom of the high seas means that the high seas are open to all States and that States should exercise their freedom under the conditions laid down by UNCLOS.
HMCS	Harmonised Mandatory Control System, established by OSPAR under the Offshore Industries Strategy by OSPAR Decision 2000/2 on the Harmonised Mandatory Control System for the Use and Reduction of the Discharges of Offshore Chemicals, as amended
H_2S	Hydrogen sulphide, occurs in crude petroleum (in small amounts only) and natural gas
ICES	International Council for the Exploration of the Sea which coordinates and promotes marine research in the North Atlantic (see http://www.ices.dk)
IMO	International Maritime Organisation, responsible for improving maritime safety and preventing pollution from ships (see http://www.imo.org)
Initial OSPAR List	Initial OSPAR List of threatened and/or declining species and habitats, OSPAR agreement 2004-6, as amended
Interreg IIIb	Interreg IIIb is the EC transnational cooperation programme under the EC regional policy concerning spatial development. It involves national, regional and local authorities with a view to promoting better integration within the EU through the formation of large groups of European regions. (see http://www.ec.europa.eu/regional_policy/interreg3)
IPCC	Intergovernmental Panel on Climate Change, responsible for assessing scientific, technical and soicio-economic information relevant for the understanding of climate change, its potential impacts and options for adaptation and mitigation (see http://www.ipcc.ch)
IPPC Directive	Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (OJ L 257, 10.10.1996, p. 26), as amended (for consolidated version click here)

IUCN	International Union for the Conservation of Nature and Natural Resources (the World Conservation Union), a conservation network bringing together states, government agencies and non-governmental organisations (see http://www.iucn.org)
JAMP	OSPAR Strategy for a Joint Assessment and Monitoring Programme, OSPAR reference number: 2003-22, as amended
MARPOL	International Convention for the Prevention of Pollution from Ships (MARPOL) was adopted on 2 November 1973 at IMO. As the Convention had not yet entered into force the Protocol of 1978 relating to the 1973 Convention (the 1978 MARPOL Protocol) absorbed the parent Convention. The combined instrument (MARPOL 73/78) is referred as the "International Convention for the Prevention of Marine Pollution from Ships, 1973 as amended by the Protocol of 1978 relating thereto", and entered into force on 2 October 1983 (Annexes I and II).
MPA	Marine Protected Area. For the purposes of OSPAR "marine protected area" means an area within the OSPAR maritime area for which protective, conservation, restorative or precautionary measures, consistent with international law have been instituted for the purpose of protecting and conserving species, habitats, ecosystems or ecological processes of the marine environment.
NAO index	Measures the anomalies in sea level pressure between the Icelandic low pressure system and the Azores high pressure system which determines climate and weather (temperatures, rain fall, wind and currents) in the OSPAR Convention area
NATURA 2000	A coherent European ecological network of special areas of conservation being established under the Habitats Directive (92/43/EEC). It comprises Sites of Community Importance (SCI) or Special Area of Conservation (SAC) under the Habitats Directive and Special Protection Areas (SPA) under the Birds Directive (79/409/EEC)
NEAFC	North-East Atlantic Fisheries Commission, the regional fisheries' commission for the management of the fisheries resources in the North-East Atlantic (see http://www.neafc.org)
Nitrates Directive	Council Directive 91/676/EEC 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), as amended (for consolidated version click here)
nm	Nautical mile
nmVOC	Non-methane volatile organic compounds
NO_2 / NO_x	Nitrogen dioxide (NO_2), one of several nitrogen oxides (NO_x) which are major air pollutants and toxic by inhalation
NOAA	US National Oceanic and Atmospheric Administration (http://www.noaa.gov)
NORM	Naturally occurring radioactive material
OECD	Organisation for Economic Co-operation and Development, covers in its work economic, social and environmental issues (see http://www.oecd.org)
OIC	OSPAR Offshore Industry Committee
OLF	Norwegian Oil Industry Association (see http://www.olf.no)
OSPAR agreement	OSPAR agreements other than recommendations and decisions which can be found in the "Decisions, Recommendations and other Agreements" section on the relevant thematic Strategy page of the OSPAR website (http://www.ospar.org).
OSPAR Commission	Forum set up by the OSPAR Convention through which OSPAR Contracting Parties co-operate. It normally meets once a year and is supported by six main committees (for each OSPAR Strategy) and their working groups (see http://www.ospar.org).
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 (published at http://www.ospar.org)
OSPAR Convention area	This covers the land territories of the OSPAR Contracting Parties and the OSPAR maritime area (see there)
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.
OSPAR List of Chemicals for Priority Action	List of substances prioritised for immediate action by OSPAR, OSPAR agreement 2004-12, as amended
OSPAR List of Substances of Possible Concern	List of substances selected through a worst case screening procedure (step 1 of the DYNAMEC mechanism) on the basis of their intrinsic hazardous properties of persistence, liability to bioaccumulate and toxicity. The list is a dynamic working list and substances may be added or excluded if new information emerges. OSPAR agreement 2002-17, as amended
OSPAR Network of MPAs	The network of marine protected areas being established by OSPAR Contracting Parties in fulfilment of their commitments under the Bremen Statement with the aim of being an ecologically coherent and well managed network by 2010.
OSPAR publication	Reference to OSPAR publications other than agreements, decisions or recommendations which can be found in the "publications" section of the OSPAR website (http://www.ospar.org).
OSPAR thematic Strategies	The 2003 Strategies of the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic (reference number: 2003-21) comprise five Strategies which direct the further work of the OSPAR Commission towards the objectives of the OSPAR Convention in the fields of biodiversity, eutrophication, hazardous substances, offshore gas and oil industry and radioactive substances
PAH	Polycyclic aromatic hydrocarbons, identified by OSPAR for priority action
PARCOM	Paris Commission established under the 1974 Paris Convention on land-based sources of marine pollution, now superseded in 1992 by the OSPAR Commission
PBT	Persistent, bioaccumulative and toxic (PBT) properties of a substance; the PBT cut-off values for OSPAR purposes are defined in OSPAR agreement 2005-9
PHS	Priority hazardous substance (PHS) under the Water Framework Directive, determined in accordance with Article 16(3) and (6) of the Directive
PLONOR chemical	A chemcial listed on the OSPAR List of Substances/Preparations Used and Discharged Offshore Which are Considered to Pose Little Or No Risk to the Environment (PLONOR list), OSPAR agreement 2004-10, as amended
population equivalent	For the purpose of, and in accordance with, the Urban Waste Water Treatment Directive, 1 population equivalent (p.e.) means the organic biodegrable load having a five-day biochemical oxygen demand (BOD5) of 60g of oxygen per day.
proposed Marine Strategy Directive	Proposal for a Directive of the European Parliament and of the Council establishing a Framework for Community Action in the Field of Marine Environmental Policy, of 24 October 2005, COM(2005) 505 final

PS	Priority Substance under the Water Framework Directive, defined in Article 2(30) of the Directive as substances identified in accordance with its Article 16(2) and listed in its Annex X. Among these substances are "priority hazardous substances" which means substances identified in accordance with Article 16(3) and (6) for which measures have to be taken in accordance with Article 16(1) and (8).
QSR	Quality status report, produced by OSPAR in fulfilment of the obligation of Contracting Parties under Article 6 of the OSPAR Convention to undertake and publish at regular intervals joint assessments of the quality status of the marine environment and its development
REACH	Commission Communication COM(2003) 644 final of 23 October 2003 on a Proposal for a Regulation of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency and amending Directive 1999/45/EC and Regulation (EC) {on Persistent Organic Pollutants} and a Proposal for a Directive of the European Parliament and of the Council amending Council Directive 67/548/EEC in order to adapt it to Regulation (EC) of the European Parliament and of the Council concerning the registration, evaluation, authorisation and restriction of chemicals
RID	OSPAR Comprehensive Study of Riverine Inputs and Direct Discharges, OSPAR agreement 1998-5, as amended (for consolidated version click here)
SO_2	Sulphur dioxide, an air pollutant which, when it reacts with water and atmospheric oxygen to from sulphuric acid, is known as "acid rain"
SSB	Spawning stock biomass of a fish stock
TBT	Tributyltin, an organotin compound and persistent organic pollutant, identified by OSPAR for priority action
territorial waters	In accordance with public international law as codified by the United Nations Convention on the Law of the Sea (UNCLOS) (Part II), the territorial sea are sea waters of a coastal State, not extending further than 12 nautical miles from baselines determined in accordance with UNCLOS, to which the sovereignty of the coastal State extends.
Texel-Faial criteria	OSPAR criteria for the identification of species and habitats in need of protection, OSPAR agreement 2003-13
UKOOA	UK Offshore Operators Association (see http://www.ukooa.co.uk)
UNECE	United Nations Economic Commission for Europe, strives to foster sustainable economic growth among its 56 member countries. Its work includes legal instruments addressing trade and transport and the environment, statistical services and economic and environmental analysis (see http://www.unece.org)
Urban Waste Water Treatment Directive	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 click here)
Water Framework Directive	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 click here)

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

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