OSPAR COMMISSION

Assessment of the impacts of shipping on the marine environment

2009

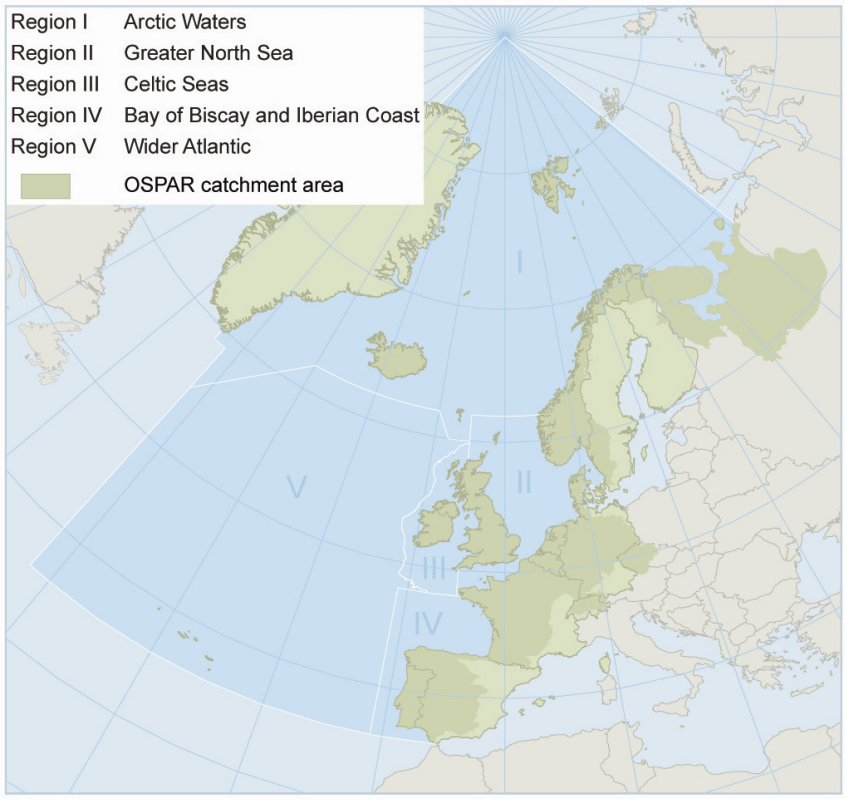
Monitoring and Assessment Series

OSPAR Convention

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.

Convention OSPAR

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.



The OSPAR maritime area and its five Regions

Acknowledgement

This report has been prepared by Ms Katy Ware, Shipping Policy, Department of Transport of the United Kingdom, task manger for the United Kingdom as lead country for this assessment.

Cover photo Busy port © Association of British ports.

Contents

Executive Summary

Substantial progress has been made at international and regional level in 1998 – 2009 on targeting maritime safety, pollution from ships, and the introduction of non-indigenous species with ships' ballast water in the OSPAR area. Special area regimes under IMO instruments have now established higher environmental protection standards in parts of Regions II, III and IV. Strict implementation of the measures in place will be essential to reduce impacts from shipping operations, illegal discharges and incidents. The "clean ship approach" still needs to be implemented in maritime and environmental policies. Further efforts are needed by OSPAR countries to mitigate adverse effects of shipping, including from ship noise and ship strikes on marine mammals, and to collect data to allow evaluating effectiveness of measures.

Growing maritime transport adds urgency to mitigate effects of shipping

90% of EU external trade, around 35% of trade between EU countries and a huge amount of through traffic is handled in the OSPAR area with busiest shipping lanes in the Greater North Sea (Region II) and the Bay of Biscay and Iberian Coast (Region IV). Maritime transport, especially tanker traffic, has been rapidly increasing and ship traffic is expected to continue to grow. Demand for maritime transport could especially increase in the Arctic (Region I) with ice retreating and new technologies providing opportunities for exploiting Arctic resources (e.g. hydrocarbons, minerals, fisheries). These developments add urgency to the strict implementation of existing measures such as the International Convention for the Prevention of Pollution from Ships (MARPOL) Annexes I – VI including requirements for port waste reception facilities, the global ballast water agreement and the worldwide ban of TBT antifouling paints, and to respond to risks from increasing ship traffic and shipping operations, especially in the Arctic Region.

Oil pollution at sea appears to be decreasing in the North Sea

For 80% of the oil slicks observed in the North Sea in 2007 it is not possible to identify the pollution source and the contribution of shipping is difficulty to quantify. Declining rates of stranded oiled seabirds in the North Sea Region provide some evidence of decreasing oil pollution. Reasons for the decline are thought to be better enforcement of shipping regulations, improved awareness and the introduction of port reception facilities for waste oil. These efforts must continue.

Incidental oil spills need to be prevented and adequate response systems must be put in place

The loss of the *Erika* in 1999 and of the Prestige in 2001 are examples of the severe effects ship incidents can have on marine ecosystems. Although there is indication that standards of ships operating in the OSPAR area are improving, the effective implementation of regulations to reduce risks of ship incidents and associated environmental impacts remains important. OSPAR countries should cooperate closer in the field of oil spill prevention, contingency planning and effective counter pollution response, especially in sea areas like the Arctic where relevant regimes have not yet been established.

Increasing air pollution from ships is of concern

Air pollution from shipping has been increasing over the last 10 years. Emissions of nitrogen oxides (NO_x) from international ship traffic on the North Sea and Atlantic for example increased by more than 20% in 1998 – 2007 reaching 1850 kt NO_x. Recently adopted strict IMO emission control standards are expected to help progressively reduce emissions in the OSPAR area. Improved practices and innovative technologies for ships in port and at sea need to be developed to further reduce atmospheric deposition of NO_x, sulphur oxides (SO_x), particulate matter and greenhouse gases on the OSPAR area.

Improved data collection is essential for a better future assessment

Many of the measures in place are too recent to allow evaluation of their effectiveness in this report. For other measures, lack of accurate data has hampered assessing progress, e.g. on oil spills from ships and discharges of wastes. OSPAR needs to consider means for data collection for future assessments of the impact of shipping on the marine environment.

Récapitulatif

D'importants progrès ont été réalisés au niveau international et régional entre 1998 et 2009 dans le domaine de la sécurité maritime, de la pollution provenant des navires et de l'introduction d'espèces non indigènes par les eaux de ballast dans la zone OSPAR. Des régimes de zones spéciales dans le cadre des instruments de l'OMI ont maintenant mis en place des normes de protection environnementale plus rigoureuses dans certaines parties des Régions II, III et IV. Il sera essentiel de mettre en œuvre de façon stricte les mesures actuelles afin de réduire l'impact des opérations de navigation maritime, des rejets illicites et des incidents. L'approche «navire propre» doit encore être mise en œuvre dans les politiques maritimes et environnementales. Les pays OSPAR devront faire des efforts supplémentaires afin de réduire les effets préjudiciables de la navigation maritime, et notamment l'impact du bruit et des collisions des navires sur les mammifères marins et de recueillir des données permettant d'évaluer l'efficacité des mesures.

La croissance du transport maritime rend urgente la mitigation des effets de la navigation

90% du commerce extérieur de l'UE, environ 35% du commerce entre les pays de l'UE et une part importante du trafic maritime se déroulent dans la zone OSPAR, les couloirs de navigation les plus fréquentés se trouvant dans la mer du Nord au sens large (Région II) et dans le golfe de Gascogne et les côtes ibériques (Région IV). Le transport maritime, en particulier le trafic de pétroliers, a augmenté rapidement et il est pressenti que la croissance du trafic de navires continuera. Les besoins en transport maritime pourraient augmenter en particulier dans l'Arctique (Région I), le retrait des glaciers et de nouvelles technologies fournissant l'opportunité d'exploiter les ressources de cette région (hydrocarbures, minéraux et pêche par exemple). Ces développements rendent plus urgente la mise en œuvre stricte des mesures existantes, telles que les annexes I à VI MARPOL – il s'agit notamment des exigences concernant les dépôts des déchets dans les ports, l'accord global sur les eaux de ballast et l'interdiction mondiale des peintures anti-salissure au TBT – et la réponse aux risques provenant de la navigation croissante et de son fonctionnement, en particulier dans la région arctique.

La pollution par les hydrocarbures semble être en déclin dans la région de la mer du Nord

Pour 80% des déversements d'hydrocarbures relevés dans la mer du Nord en 2007, il est impossible de déterminer la source de ces pollutions et de quantifier la contribution de la navigation maritime. Les moindres quantités d'oiseaux de mer mazoutés échoués dans la région de la mer du Nord suggèrent que la pollution par les hydrocarbures est en déclin. Ceci s'expliquerait par une meilleure mise en vigueur des règlementations sur la navigation, une meilleure sensibilisation et l'introduction de dépôts des déchets d'hydrocarbures dans les ports. Il faut poursuivre ces efforts.

Il faut empêcher les déversements accidentels d'hydrocarbures et mettre en place des systèmes de réponse adéquats

Les pertes de l'*Erika* en 1999 et du *Prestige* en 2001 illustrent les effets sérieux que les accidents de navigation peuvent avoir sur les écosystèmes marins. La mise en œuvre efficace de réglementations afin de réduire les risques d'accident de navigation et leur incidence sur l'environnement reste importante malgré l'amélioration apparente des standards des navires en exploitation dans la zone OSPAR. Les pays OSPAR devraient coopérer plus étroitement dans le domaine de la prévention des déversements d'hydrocarbures, de la planification de mesures d'urgence et de réponse effective de lutte contre la pollution, en particulier dans les zones marines telles que l'Arctique pour lesquelles des régimes idoines n'ont pas encore été créés.

La pollution atmosphérique croissante provenant des navires est préoccupante

La pollution atmosphérique provenant de la navigation a augmenté au cours des dix dernières années. Les émissions d'oxydes d'azote (NO_x) provenant de la navigation internationale dans la mer du Nord et l'Atlantique ont par exemple augmenté de plus de 20% entre 1998 et 2007 pour s'élever à 1850 kt. Les normes de contrôle des émissions qui ont été récemment adoptées par l'OMI devraient permettre de réduire progressivement les émissions dans la zone OSPAR. Il faut développer de meilleures pratiques et des technologies novatrices pour les navires dans les ports et en mer pour

pouvoir réduire plus encore les retombées atmosphériques de NO_x, d'oxydes de soufre (SO_x), de matière particulaire et les gaz à effet de serre dans la zone OSPAR.

Il est essentiel d'améliorer le recueil des données pour permettre une meilleure évaluation future

De nombreuses mesures en place sont trop récentes pour permettre une évaluation de leur efficacité dans le présent rapport. Dans le cas des autres mesures, l'évaluation n'a pas pu progresser à cause du manque de données précises, il s'agit par exemple des données sur les déversements d'hydrocarbures provenant de navires et des rejets de déchets. OSPAR doit étudier les moyens de collecter des données pour les futures évaluations de l'impact de la navigation maritime sur l'environnement marin.

1. Introduction

This report is part of a suite of assessments prepared under the OSPAR Joint Assessment and Monitoring Programme to evaluate impacts of human activities on the marine environment and contributes to the Quality Status Report 2010.

Some of the busiest sea lanes in the world are in the OSPAR maritime area. Transport of goods and passengers is a constantly growing activity. Although maritime transportation is considered to be a comparatively environmentally friendly means of transport, shipping has clear impacts on the marine environment. The OSPAR Quality Status Report 2000 identified shipping as a clear pressure on the marine environment of the North-East Atlantic.

The purpose of this report is to evaluate the impacts of shipping on the marine environment of the OSPAR maritime area and the progress made since the Quality Status Report 2000 in addressing environmental concerns through international regulatory frameworks and their effectiveness. Progress on reducing impacts and their effects on the quality of the marine environment is reported specifically since 1998 (the closing date for information taken into account in the Quality Status Report 2000) and, as far as relevant, in relation to the five Regions of the OSPAR maritime area (Box 1).

The assessment focuses on maritime transport, including operation of fishing vessels (*i.e.* excluding the fisheries themselves and issues associated to fisheries activities, for example fish litter and discards etc.). While recognising the wide range of impacts shipping can have on the marine environment, the report focuses on key impacts specific to shipping. For impacts cutting across a number of activities such as noise and marine litter or impacts of activities ancillary to shipping (e.g. dredging for navigational purposes and dumping of dredged material, development of ports and harbour facilities), this report relies on more detailed assessments of those specific impacts and activities undertaken by OSPAR under the Joint Assessment and Monitoring Programme (Box 1).

The assessment is based on information collected from many different sources, including the OSPAR waterborne inputs, atmospheric and environmental monitoring programmes, information specifically reported by OSPAR countries in support of the assessment, and external sources (e.g. International Maritime Organisation (IMO), European Community, European Monitoring and Evaluation Programme (EMEP) under the Convention on Long-range Transboundary Air Pollution, and the International Council for the Exploration of the Sea (ICES)).

Box 1
Electronic navigator to complementary QSR assessments

- Leaching of hazardous substances from ships' coatings and anodes (OSPAR, 2009)
- Trends in atmospheric concentrations and deposition (OSPAR, 2009a)
- Trends and concentrations of hazardous substances in sediments and biota (OSPAR, 2009b)
- Dumping of dredged material (OSPAR, 2009c)
- Dredging for navigational purposes (OSPAR, 2008a)
- Introduction of non-indigenous species (ICES, 2009)
- Underwater noise (OSPAR, 2009f)
- Marine litter (OSPAR, 2009d)

2. What are the pressures from shipping?

Shipping impacts on the marine environment in a number of ways. The main pressures associated with shipping in the OSPAR area include:

- Pollution by oil and hazardous or toxic substances from incidental, operational and illegal discharges;
- Air pollution through emissions and particulate matter from engine exhaust gases and cargo tanks which may be carried over long distances;
- Discharge of operational wastes from ships, including discharge of raw sewage and garbage (litter);
- Release of toxic chemicals used in anti-fouling paints and leaching of heavy metals from anodes;
- The introduction of non-indigenous organisms through ships ballast water and associated sediments, and fouling on ships' hulls;
- Pollution and physical impact through loss of ships and cargo;
- Physical and other impacts including noise and collision with marine mammals.

The pressures are not evenly distributed across the North-East Atlantic. They concentrate in busy shipping lanes and harbours, impact in or close to ecologically sensitive areas or may be more significant in coastal areas. The pressures can result in damage to wildlife and combined with pressures from other activities may impact on other uses of the sea (e.g. mariculture; touristic uses).

The south east part of the OSPAR area from Gibraltar to and including the North Sea is particularly complicated in maritime terms. Its coastline is many thousands of kilometres in length, it borders several enclosed seas, it has numerous islands, is subjected to a wide variety of weather conditions and has over 600 significant ports distributed around it.

The North-East Atlantic contains part of the world's major shipping routes handling 90% of EU external trade and around 35% of trade between EU Countries (EMSA, 2006). The sea lanes in this region also handle a huge amount of through traffic. The busiest routes connect the central Baltic across Denmark to the German Bight, and from here via the English Channel around the Iberian Peninsular (Figure 2.1).

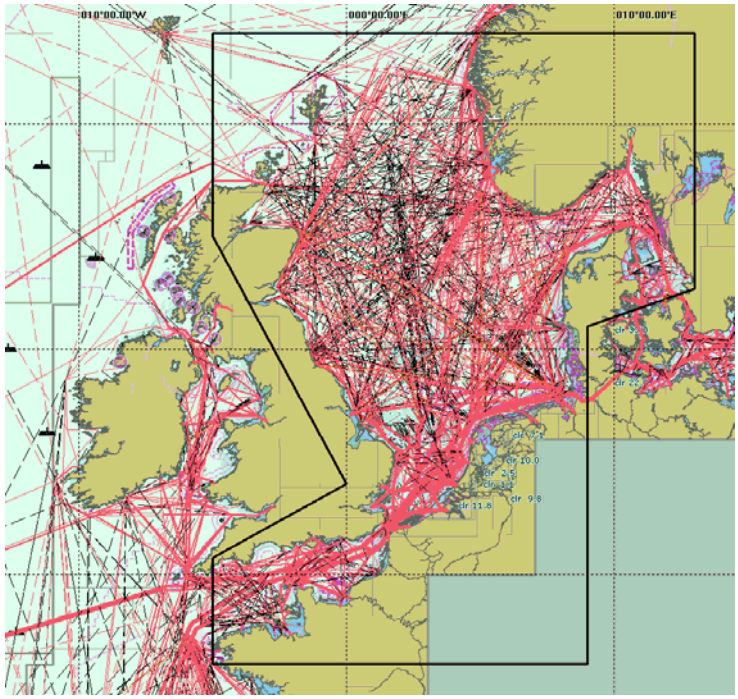


Figure 2.1 *Traffic links in the Greater North Sea and connections with the Baltic Sea. Source: OSPAR, 2009.*

Maritime transport has been a growing sector in the past 20 years worldwide (Figures 2.2 and 2.3) and is one of the economically most important maritime sectors in Europe (EC, 2008). Since 1998, ship traffic in the Greater North Sea and the Bay of Biscay/Iberian Coast has been increasing in line with market developments and policies to take transport of goods off the roads. This includes an increase in the number of ships, the cargo and the size of ships.

In particular oil tanker traffic has been growing rapidly as more and more oil is progressively being brought to the global market via EU waters. In tonnage terms, the amount of oil transported by sea worldwide increased from 1600 million tonnes in 1992 to over 2400 million tonnes in 2008 (Intertanko, 2009) (Figure 2.4).

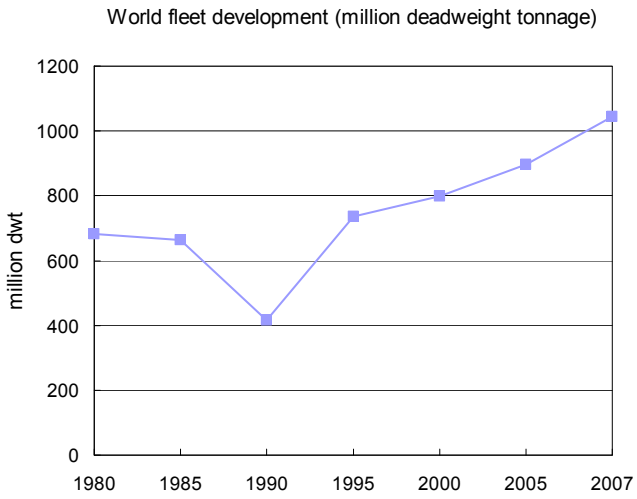


Figure 2.2 *The trend of the world fleet's deadweight tonnage in 1980 – 2007 shows a 60% capacity increase. Data source: Lloyd's Register/Fairplay World Fleet Statistic.*

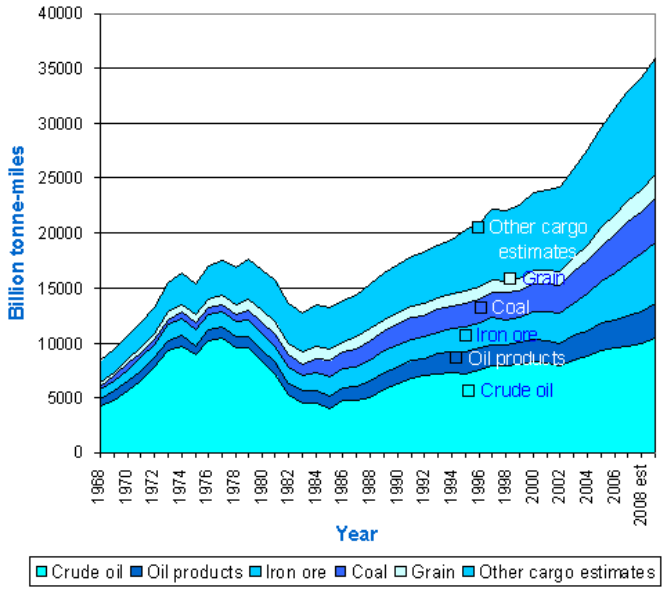


Figure 2.3 *Development of seaborne trade 1968 – 2008 expressed as a tonne of freight moved one mile. Source: Fearnley's Review.*

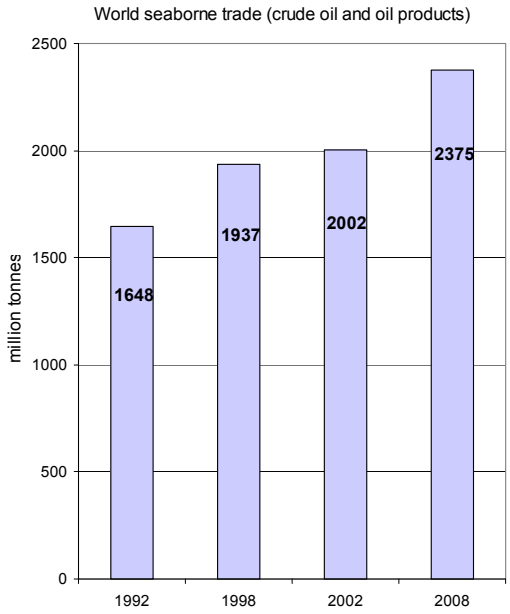


Figure 2.4 *World seaborne trade in crude oil and oil products in million tonnes. Data source: Fearnley's Review.*

Also passenger traffic has grown over recent years, reaching 350 million passenger journeys per year (EMSA, 2009). While still a comparatively small market, the European cruise sector is a growing industry which has increased in 1995 – 2005 by 230% to 3.3. million passengers (EC, 2008).

In the Arctic (Region I), shipping is mostly for transporting supplies, natural resources and marine tourism and less for through traffic. Cruise shipping in the Arctic has increased in the past ten years. Many of the cruise ships are not purpose built for Arctic waters (AMSA, 2009). This has increased risks of accidents and associated impacts on the ecosystem. With ice retreat and new technologies, new opportunities for exploiting Arctic resources (hydrocarbons, minerals, fisheries) are expected to increase demand for maritime transport. Growth predictions for the period to 2020 are difficult, however, due to confounding economic factors such as oil price and geopolitical issues. The most significant threats from Arctic shipping are incidental and illegal oil discharges (AMSA, 2009).

3. What has been done to reduce the impact of shipping in the OSPAR Maritime Area?

It is OSPAR's objective to protect and conserve the ecosystems and biological diversity of the North-East Atlantic. Shipping is one of the human activities in the OSPAR maritime area which may adversely affect the marine environment and its impacts are therefore assessed under the OSPAR Biodiversity and Ecosystems Strategy with a view to directing actions in the appropriate forum to safeguard against such harm. OSPAR is committed to the ecosystem approach and looks at human activities, including shipping, from an integrated ecosystem perspective.

The International Maritime Organization (IMO) is the competent international body for the regulation of international shipping. Measures to protect the marine environment from shipping are more efficiently regulated at global level. As a result, OSPAR has a preference to draw issues of environmental protection and the actions needed to the attention of the IMO. This is strengthened through an Agreement of co-operation between OSPAR and IMO. OSPAR Contracting Parties also co-operate on such issues within the IMO. However, there is scope for OSPAR actions to address impacts of shipping.

As early as at the end of the 1980s, OSPAR countries committed themselves to phase out the use of organotin compounds used in antifouling systems on ships in a concerted effort to combat pollution of the marine environment especially with tributyltin (TBT) while actions were pending in the IMO.

In anticipation of the coming into force of the IMO Ballast Water Management Convention, OSPAR together with the Helsinki Commission for the protection of the marine environment of the Baltic Sea (HELCOM) put in place in 2008 voluntary guidance (based on the IMO Guidelines) for the shipping industry to reduce risks associated with exchange of ballast water and the introduction of non-indigenous species (OSPAR agreement 2008-10).

OSPAR's co-operation with the IMO also encompasses the follow-up of the commitments of the North Sea Conference. Concern among North Sea states about the pollution and damage to the North Sea ecosystem has resulted in a series of six conferences. In the spirit of progress made, the last conference in Gothenburg in 2006 did not plan for another meeting but invited OSPAR, in cooperation with the EU, to facilitate periodic follow-up of commitments. The Gothenburg Declaration 2006 specifically focused on impacts of fisheries and shipping as important pressures on the marine environment of the North Sea. The Declaration reinforces the commitment of North Sea states to the "clean ship approach" as a concept of vessels designed, constructed and operated in an integrated manner with the objective to eliminate harmful discharges and emissions throughout their working life. As an integrated approach of sustainable shipping it addresses all vessel operations and possible impacts on the environment, and will provide an increased opportunity for transport managers to choose environmentally sound sea transport options. The clean ship approach has been followed up by some OSPAR countries (Box 2).

Box 2
German label system supports clean ship approach

Der Blaue Engel has been introduced more than 30 years ago to promote voluntary commitments to high environmental standards for a variety of services and products: www.blauer-engel.de.

In support of the clean ship approach, Germany has included in 2002 sea ships in their environmental label scheme called *Der Blaue Engel* ("the blue angel"). It promotes environmental standards for an innovative shipping sector and encourages environment-conscious ship operations, with a primary focus to reduce emissions to air and discharges of hazardous substances to the marine environment. The scope of application of *Der Blaue Engel* is the operation of sea ships under German and foreign flags. Excepted are tankers, fishing ships and ships used for sports and military actions. The label requires that particularly high standards are met of which 10 are obligatory and 20 are optional. These concern standards for quality management, environmental protection management, staff management, ship design and equipment, collision protection and leakage stability, redundant systems, hull stress monitoring, emergency towing systems, SOx emissions, particle emissions, emissions from cooling and refrigerating devices, waste disposal, incineration of waste, waste water ("black" and "grey" water), bilge water, antifouling, ballast water and firefighting foams. The award of the label depends on expert assessment of the requirements. In 2009, seven ships have been awarded the label.

OSPAR also works closely with the Bonn Agreement for cooperation in dealing with pollution of the North Sea by oil and other harmful substances on many cross-cutting issues. The North Sea States and the European Community work together under the Bonn Agreement to help each other in combating pollution in the North Sea area from maritime disasters and chronic pollution from ships and offshore installations as well as to carry out surveillance as an aid to detecting and combating illegal and incidental pollution at sea.

To improve enforcement in a transboundary North Sea context, the Fifth North Sea Conference 2002 took an initiative to set up the North Sea Network of Investigators and Prosecutors (NSN). The NSN works for the enforcement of international rules and standards to protect the marine environment from pollution by shipping. The NSN is associated to the OSPAR Secretariat. The NSN meets annually and members maintain a close contact intersessionally. States from outside the North Sea such as Spain also take active part in the work of the NSN. The NSN also cooperates closely with the Bonn Agreement. This includes joint workshops to identify and promulgate judicial lessons learned from surveillance operations and oil pollution cases.

The Quality Status Report 2000 identified a number of priorities that the Contracting Parties should consider taking action on, either individually and/or jointly with the view to reducing the further impact from shipping (OSPAR, 2000). This included actions directed at shipping safety, waste reception facilities in harbours, fuel quality, ballast water management, and the ban of the use of organotin compounds in antifouling systems.

A number of the priorities identified have now been addressed through the development of legislation at an international level through the International Maritime Organization (IMO). Apart from the recent Conventions on ballast water management and the ban of the use of TBT-based paints on ships, one of the key regulatory frameworks for preventing pollution from shipping is the MARPOL Convention and its thematic annexes I through VI (Annex I on oil, Annex II on noxious liquid substances carried in bulk, Annex III on packaged dangerous goods, Annex IV on sewage, Annex V on garbage and Annex VI on air pollution). In addition, the SOLAS Convention (on the Safety of Life at Sea) helps reducing risks of ship accidents and associated accidental pollution through setting technical minimum standards.

EC legislation addresses a number of the issues regulated by IMO at European level, for example waste reception facilities and air emissions (see Table 3.1 for overview). Since the loss of the Erika off the French Coast in 1999, the European Union has adopted several Directives aimed at preventing accidents at sea and marine pollution as well as establishing the European Maritime Safety Agency (EMSA). The aim of EMSA is to contribute to the maritime safety system in the European Community, by providing technical and scientific advice to the Commission in the field of maritime safety and pollution prevention, engage in the continuous process of updating and developing new legislation, monitoring the implementation of legislation, evaluating the effectiveness of the measures in place and working closely with Member States. The European Marine Strategy provides the framework for an integrated approach to managing marine activities, including shipping, and the environment.

In the Arctic region, the Arctic Council Working Group of the Emergency Preparation, Preparedness and Response (EPPR) was established to deal with the prevention, preparedness and response to environmental emergencies in the Arctic. Members of the Working Group exchange information on best practices and conducts projects (e.g. development of guidance and risk assessment methodologies, response exercises, training etc.). EPPR is not a response agency, the work focuses mainly on oil and gas transportation and extraction, and on radiological and other hazards. In 2004, EPPR was directed by the Arctic Ministers to expand its mandate to include natural disasters.

For Region IV and some adjacent areas in Region V, Lisbon Cooperation Agreement for the Protection of the Coasts and Waters of the North-East Atlantic against Pollution creates a mechanism to ensure the cooperation between its contracting parties (Portugal, Spain, France, Morocco and the European Community) in case of pollution accidents, and obliges them to establish and implement their own emergency structures and plans. While signed in 1990, the Agreement was not yet in force when the present assessment was finalised.

A detailed account of the measures taken to address the priorities for action identified by the Quality Status Report 2000 are summarised in Table 3.1 below.

An important contribution for the protection of sensitive ecosystems of the North-East Atlantic is the recognition by IMO of areas requiring stricter pollution regulations for shipping and allowing management of shipping routes (Figure 3.1). This includes designation of Special Areas under MARPOL, and the designation as Particularly Sensitive Sea Areas (PSSAs).

Special Areas are defined as certain sea areas in which, for technical reasons relating to their oceanographical and ecological condition and to their sea traffic, the adoption of special mandatory methods for the prevention of sea pollution is required.

A Particularly Sensitive Sea Area (PSSA) is an area that needs special protection through action by IMO because of its significance for recognised ecological or socio-economic or scientific reasons and which may be vulnerable to damage by international maritime activities. The criteria for the identification of particularly sensitive sea areas and the criteria for the designation of special areas are not mutually exclusive. In many cases a Particularly Sensitive Sea Area may be identified within a Special Area and vice versa.

In the OSPAR area the following special areas have been designated:

- North West European Water as a Special Area under MARPOL Annex I in 1999, leading to more stringent restrictions for the discharge of oil and oily waste.
- North Sea as Special Area under MARPOL Annex V in 1991. In this area more stringent restrictions for discharges of garbage apply.
- North Sea as SO_x Emission Control Area (SECA) under MARPOL Annex VI in 2007. Ships must comply with more stringent emission and fuel quality requirements if they want to pass through this area.
- Wadden Sea in 2002 and the Western European Waters in 2004 as Particularly Sensitive Sea Areas (PSSA).
- the Kattegat has been designated a Special Area under MARPOL Annex I, V and VI (SECA) and a PSSA as part of the Baltic Sea.

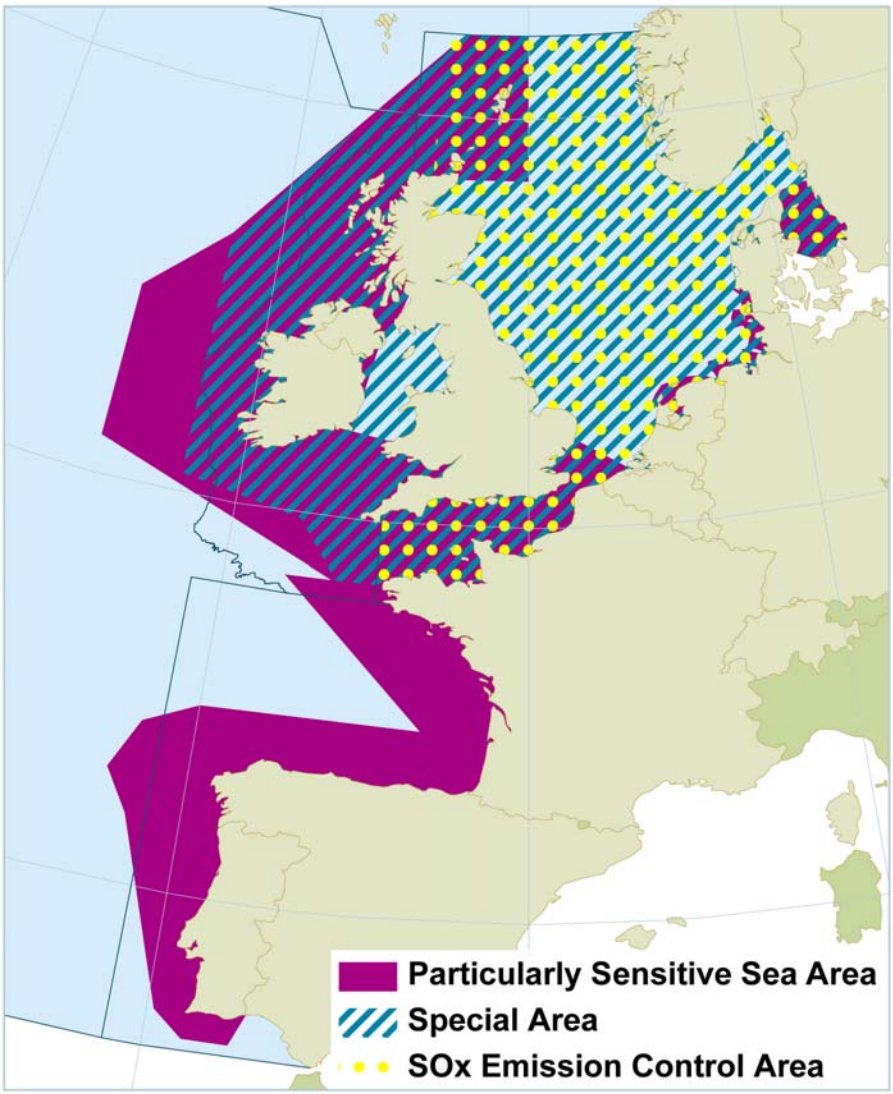


Figure 3.1 *Areas of the North-East Atlantic recognised as MARPOL Special Areas, MARPOL SO_x Emission Control Area (SECA) and as Particularly Sensitive Sea Areas (PSSAs).*

Table 3.1 *Overview of measures taken to address priorities for actions identified by the Quality Status Report 2000*

Impact	What issues QSR 2000 identified	Measure
Oil Pollution	Reducing the risk of accidental spills	**International** – As a consequence of the Erika incident, in 2001 the IMO revised MARPOL Annex I in order to reduce the risk of accidental oil pollution. A phasing out scheme for single hull tankers was introduced. **European** – EC Regulation 417/2002 (as amended by EC 1726/2003), introduced in 2002, accelerated the phasing out of single hull tankers in order to reduce the risk of accidental pollution in European waters. The Regulation prohibits single hull tankers carrying crude oil to operate under the flag of a EU Member State, and prohibits any oil tanker carrying crude oil, irrespective of its flag, to enter into ports or offshore terminals under the jurisdiction of a Member State.
Loss of ships and cargo and possible incidents	Improved traffic separation schemes	**International** – IMO SOLAS Convention Chapter V amended to allow States to establish Vessel Traffic Monitoring Systems. Entered into force 1999. **European** – Directive 2002/59/EC adopted in 2002 established a Community Vessel Traffic Monitoring & Information System to prevent accidents and pollution and minimise their impact on the environment. **Regional** – Several reporting systems have now been set up within the Region in accordance with the IMO rules.
	Ensure ships are operated to the highest standard	**International** – International Conventions provide a provision for Port State Control. **European** – Directive 95/21/EC as amended provides provisions for Port State Control. The Directive is currently being reviewed to include a new risk based inspection regime. **Regional** – In the OSPAR area the Paris Memorandum of Understanding is the predominant Port State Control Regime which is incorporated into EU law.
	Improved access to advanced information on the movement of shipping and cargo	**International** – IMO SOLAS Chapter V was amended to include automatic identification of ships (AIS) for enhanced ship monitoring and Voyage Data Recorders (VDRs) to facilitate investigations following accidents. The equipment was required to be fitted on a staged basis between 2002 – 2007. **European** – Directive 2002/59/EC requires EU Member States to exchange data. SafeSeaNet has been set up to allow electronic maritime data transfer between Member States.
Pollution from oil and noxious substances	Reduce the risk of related impact from accidental spills and loss of cargo through:	
	Regional Cooperation for emergency preparedness, prevention response	**International** – The IMO International Convention on Oil Pollution, Preparedness, Response & Co-operation (OPRC Convention) entered into force in 1995. The Convention places obligations on State Parties concerning their preparedness for, and response to, oil pollution incidents. It is a framework for international co-operation for combating major oil pollution incidents. A Protocol to the Convention has been developed to include pollution incidents involving hazardous substances other than oil, the Protocol has not yet entered into force. **European** – The European Maritime Safety Agency (EMSA) has been tasked with providing additional means to EU Member States to assist marine pollution response through EC Regulation 724/2004. Upon request by the affected Member State, these resources are available through the monitoring and information centre (MIC) of the community mechanism to facilitate reinforced co-operation in civil protection assistance interventions.

		Regional – The Bonn Agreement for co-operation in dealing with pollution of the North Sea by oil and other harmful substances is in operation. The members comprise of the States bordering the North Sea and the Channel, Ireland and the European Community. The parties notify each other of any marine pollution or threat of marine pollution likely to pose a threat to the coast or related interests of another party. They pledge to assist one another to the best of their ability, on request, and on a cost recovery basis. The Mancheplan – France and the United Kingdom have established the Anglo-French Joint Maritime Contingency Plan which covers counter pollution and search and rescue operations in the Channel. It sets out the division of responsibility between the two parties. For incidents likely to affect both parties, it outlines command and control procedures, channels of communication, and the resources available to each party. The Norbit Agreement – developed by Norway and the United Kingdom for joint counter pollution operations in the zone extending 50 miles either side of the line separating the United Kingdom and Norwegian continental shelf. The Norbit agreement sets out procedures for pollution incidents likely to affect both parties. However, it does not cover search and rescue activities.
Cargo loss	Promotion of measures to recover lost cargos by tags and transponders	**No known developments to date**
Litter	Establish reception facilities for litter or oily waste where such facilities are not available, providing incentives for the use of such facilities and improving enforcement of existing rules and regulations.	**International** – IMO MARPOL Convention regulates what waste can be discharged from ships. Annex V entered into force in 1988 and requires Party States to ensure adequate waste reception facilities in ports for ship generated waste. IMO developed a port reception facility database in 2006 to provide data on reception facilities. **European** – EC Directive 2000/59/EC which EU Member States were required to transpose before 28.12.2002 is to reduce the discharge of waste into the sea by ensuring the availability and use of port waste reception facilities. **Regional** – No measures taken.
Air pollution	Improve through the appropriate IMO regulations, the fuel quality in order to prevent both the risk of engine failure and problems arising from the environmentally hazardous combustion residues of bunker oil	**International** – IMO MARPOL Annex VI Regulations for the Prevention of Air Pollution from Ships entered into force 2005. Annex VI has been amended to further reduce harmful emissions from ships. **European** – Directive 2005/33/EC introduced parallel requirements to MARPOL Annex VI with respect to the sulphur content of fuels. The European Commission also introduced a strategy on air pollution with health and environmental objectives to be attained by 2020. **Regional** – Through the IMO the North Sea (2007) and the Baltic Sea (2005) have been designated as SO_x emission control areas.
Non-indigenous species	Develop through the IMO, global and regional measures for preventing the spreading of non-indigenous species via ballast water and promoting the development of inter-compared sampling techniques as well as monitoring programmes	**International** – IMO adopted the International Convention for the Control and Management of Ship Ballast Water and Sediments. The Convention is still pending entry into force as sufficient States representing the required merchant shipping tonnage have not ratified the Convention. **European** – None. The Commission supports the work of OSPAR and Helsinki Contracting Parties **Regional** – Contracting Parties of the OSPAR Convention and the Helsinki Convention have developed interim Guidelines on ballast water management effective from 2008 (OSPAR agreement 2008-10).
Tributyltin (TBT)	Establish within the IMO the legal basis for the intended global prohibition of the application of organotin compounds which act as a biocides in anti-fouling systems in ships by 1 January 2003, and the requirement to remove organotin compounds acting as biocides on ships by 1 January 2008	**International** – The IMO Convention on the Control of Harmful Anti-fouling Systems on Ships entered into force in 2008 and prohibits the use of harmful organotins in anti-fouling systems. **European** – EC Regulation 782/2003 banned the use of TBT anti-fouling on ships since 2003, and from 2008 TBT coatings on all ships visiting EU harbours are forbidden.

4. How does shipping affect the quality status of the OSPAR area?

4.1 Pollution by oil and other hazardous or noxious substances

Incidents involving ships carrying oil and other hazardous or noxious substances can have severe effects on the marine ecosystem. The effects may be short- or long-term depending on climatic and environmental conditions at the time of the spill and the sensitivity of the area. Pollution from oil and other hazardous or noxious substances arises from the incidental discharge of these substances that are carried by ships as cargo or fuel. Loss of fuel from the wrecks through leakage and the illegal discharge from ships into the sea of oily waste produced during ship operations may also contribute to pollution.

It is anticipated that oil tanker traffic will continue to grow as more oil is transported into the global market via the OSPAR area. The growth in environmental risk will be in the North Sea, waters off Norway, Sweden, Denmark, Germany, the Netherlands, Belgium, France and the United Kingdom.

What is the problem?

Oil spills from tanker accidents may have major economic and ecological impacts, including the effects on wildlife, mariculture and tourism.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In 1999 the laden oil tanker Erika encountered heavy weather in the Bay of Biscay. The vessel broke in two and sank resulting in the loss of several thousand tonnes of oil which killed marine life and polluted the shores around Brittany, France. The guillemot (*Uria aalge, see photo*) accounted for 82 % of the victims. At the end of June 2000, the League for the Protection of Birds reported over 63,000 oiled birds collected. By 4 September 2000, a total of 2150 birds had been freed, 61 403 had died and 53 were still convalescing.

In April 2000 the pollution from the Erika raised the question of whether the quality of water was acceptable to fill the fens in Guérande, France for the local production of salt, which was necessary for a proper harvest in the year 2000. Pre-spill concentration levels of 16 PAH, considered as priority pollutants, ranged between 5 and 20 ng/l in the water. After the spillage, water pollution in the fens area (fortunately protected by earth dams) ranged from 20 to over 300 ng/l. In order to respect the precaution principle as regards health and the environment, salt producers in Guérande, agreed against harvesting in 2000. (CEDRE, April 2005).

Another major pollution incident was the sinking of the tanker Prestige in 2002 on the Galicia bank, a large seamount off the Spanish Galician coast. After the sinking, the wreck continued leaking oil which polluted the sea bed and contaminated the coastline, especially along the territory of Galicia. Some estimated 64 000 tonnes of heavy fuel oil have been spilled (CEDRE[1]), polluting more than 1000 km of coastlines in Spain and France (ETC-LUSI[2]). Of the 20 000 oiled birds collected, 75% were dead and only few of those alive made a recovery (EEA, 2003). The Iberian population of the threatened guillemot (*Uria aalge*) was hit worst. Given the broad geographical extension of the pollution and the long time-span of the incident, overall mortality has been estimated to be much higher; estimates range between 100 000 – 200 000 birds (EEA, 2003) and 250 000 to 300 000 birds (WWF, 2003). The affected area is an important ecological region, supporting coral reefs and many species of sharks and birds. It also supports the fishing industry on which 60% of Galicia's population depends. The coastal

1 http://www.cedre.fr – status French site: May 2005; status English site: April 2006.
2 http://terrestrial.eionet.eu.int/en_Prestige. European Topic Centre on Land Use and Spatial Information

pollution forced the region's government to suspend offshore fishing for six months. The World Wildlife Fund (WWF) published a study on the spill's short term ecological consequences (WWF, 2003), noting a decrease in the population of inter-tidal animals. Additional studies showed high concentrations of heavy metals in the affected coastal salt marshes (Andrade *et al.* 2005). Biomarker measurements in fish showed that large areas of the northern Iberian shelf were affected by oil from the *Prestige* and that measurable effects decreased over the period 2002 – 2005 to levels indicating a recovery of the water quality (ICES/OSPAR, 2009; Martínez-Gómez *et al.*, 2009). A recent biological effects study of the spill on mussels on the affected Galician coast, suggests signs of recovery of mussel health but that pre-spill status has not yet been reached (Basque Research, 2009). Little is known about the effects of the oil pollution on the deep sea bed and its biological communities and the rate of recovery.

Oil pollution may also result from operational discharge. Various routine maintenance operations may result in liquid oily wastes. Controlled discharge of oily waste at sea is not illegal if it is done in accordance with MARPOL, hence bilge water can be legally discharged in the open sea if the hydrocarbon content is no higher than 15 parts per million (ppm) whatever the volume involved. Discharging oily sludge and waste oil is prohibited under all circumstances.

The North Sea has been assigned a Special Area under MARPOL Annex I which means the operational discharge of oily waste is more stringently controlled. However, surveillance undertaken under the Bonn Agreement suggests that possible illegal discharge of operational oily waste may occur (Figure 4.1).

What has been done?

New technical standards and routing measures have been introduced to help reduce the risks. As a result of the Erika incident legislative measures have been put in place to phase out the use of single hull tankers for transporting crude oil. These measures are now in force in the EU. A detailed account of measures taken is given in Table 3.1.

Important progress has been made in the design of oily water separating equipment for machinery space bilges and oil tanker discharges, and in the monitoring and control of the discharge of such mixtures. These technological advances have allowed international regulations to be adopted, reducing the permitted operational discharge of oil effluent from machinery space bilges from 100 parts per million (ppm) to 15ppm.

Discharges are not limited to oil; many tankers carrying different liquid products rinse their tanks at sea to

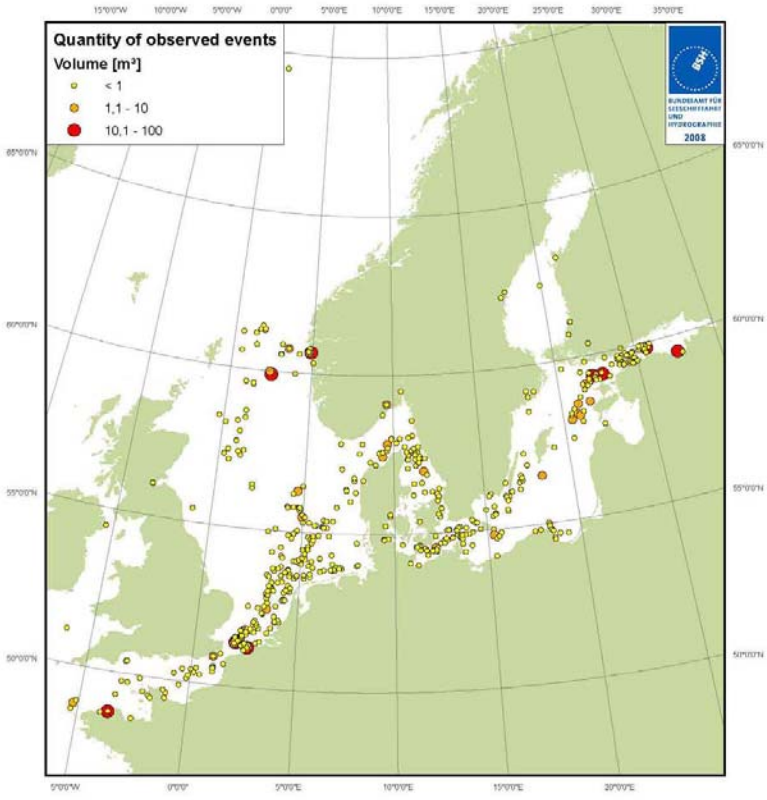


Figure 4.1 *Oil spillage in the North and Baltic Sea in 2007 located through aerial surveillance under the Bonn Agreement by Belgium, Denmark, Estonia, Finland, France, Germany, Latvia, Netherlands, Norway, Poland, Sweden and United Kingdom. Source: Bonn, 2008.*

clean them from cargo residue. MARPOL Annex II on noxious liquid substances carried in bulk was revised with effect from January 2007 to reduce the impact of cargo tank cleaning through linking discharge regulations to revised toxicity categories of noxious substances.

Did it work?

There is not sufficient information to conclude on trends and effectiveness of measures.

There are limited figures available to quantify how much oil has been spilt in the OSPAR area since 2000 as a result of incidental or illegal discharges from ships. However, there is evidence of pollution and this is highlighted through the Bonn Agreement annual reports on aerial surveillance of the North Sea (Figure 4.1).

The 2008 report clearly states that for about 80% of the oil slicks observed/confirmed the source of the polluter has not been identified (Bonn, 2008). As such it is not possible to quantify how many of these slicks are attributable to ships but it is recognised that shipping is a possible contributing source of pollution.

What lessons have we learnt since 1998?

The Paris Memorandum of Understanding for Port State Control[3] shows a steady decrease in the detention rate of substandard ships indicating that the standard of ships operating in the region is improving. Although serious accidents occasionally occur – the loss of the *Erika* and *Prestige* being recent high profile examples – the trend shows a continuing improvement, both in quantity and frequency of oil spills each year and the number of major oil spills shows a steady reduction.

4.2 Air Pollution

What is the problem?

Shipping is a growing contributor to air pollution. The vast majority of emissions of nitrogen oxide (NO_x), sulphur dioxide (SO_x) and particulate matter in EU sea areas are emitted from cargo ships over 500 GRT. EMSA studies estimate that about 45% of all emissions come from EU flagged ships and approximately 20% of emissions are emitted within the 12 mile limit of territorial seas (EMSA website).

In port cities, ship emissions are in many cases a dominant source of pollution. Moreover, emissions from ships may travel over hundreds of kilometres and can thus contribute to air quality problems on land even if they are emitted at sea. This is particularly relevant for the deposition of sulphur and nitrogen compounds, which cause acidification of natural ecosystems and threaten biodiversity through excessive nitrogen inputs (eutrophication).

Puente de Vizcaya

Ships also emit ozone-depleting gases (for example from incinerators, cooling installations, fire extinguishing systems and cargo vapour (volatile organic compounds and other) and greenhouse gases. Carbon dioxide (CO_2) is the most important greenhouse gas (GHG) emitted by ships primarily with exhaust gases. A recent IMO study estimates that shipping has emitted 1046 million tonnes of CO_2 in 2007, which corresponds to 3.3% of the global emissions during 2007, contributing to climate change and ocean acidification. Most of these emissions (870 million tonnes or 2.7% of the global emissions) of CO_2 in 2007 have been attributed to international shipping. Mid-range emission

[3] http://www.parismou.org/

scenarios show that, by 2050, in the absence of policies, ship emissions may grow by 150% to 250% (compared to the emissions of 2007) as a result of the growth in shipping. (IMO, 2009)

What has been done?

A Thematic Air Strategy was adopted by the European Commission in 2005 which also addresses shipping as emission source. Under MARPOL Annex VI, NO_x and SO_x Emission Control Areas can be designated leading to stricter emission standards. In 2007, the North Sea was established as a Sulphur Emission Control Area (SECA), which means that ships in the area are only permitted to burn lower sulphur content fuel. The allowed sulphur contents are however still 15000 times of that of fuel for road vehicles. In October 2008 the IMO adopted amendments to MARPOL Annex VI regulations to further reduce harmful emissions from ships. This addresses however only sulphur but not other (hazardous) substances, which is a gap that needs to be closed. A detailed list of measures is given in Table 3.1.

A number of policies to reduce GHG emissions from ships have been developed by the IMO. It has been found that market-based instruments are cost-effective policy instruments with high environmental effectiveness. These instruments capture the largest amount of emissions under the scope, allow both technical and operational measures in the shipping sector to be used, and can offset emissions in other sectors.

Did it work?

Nitrogen oxide emissions show a significant increase since 1998. EMEP emission data estimate that total contribution of nitrogen oxides (NO_x) from international ship traffic on the North Sea and the Atlantic was 1850 kt/year in 2007. This is an increase by 21% since in 1998 (Figure 4.3). Model calculations suggest that the total contribution of emissions from ship traffic on the North Sea and the Atlantic to atmospheric deposition of NO_x from the main emission sectors in the five OSPAR Regions ranged between 16% in Region I and 20 – 28 % in Regions II – V (OSPAR, 2009a). It is expected that emission levels will continue to increase with growing ship traffic.

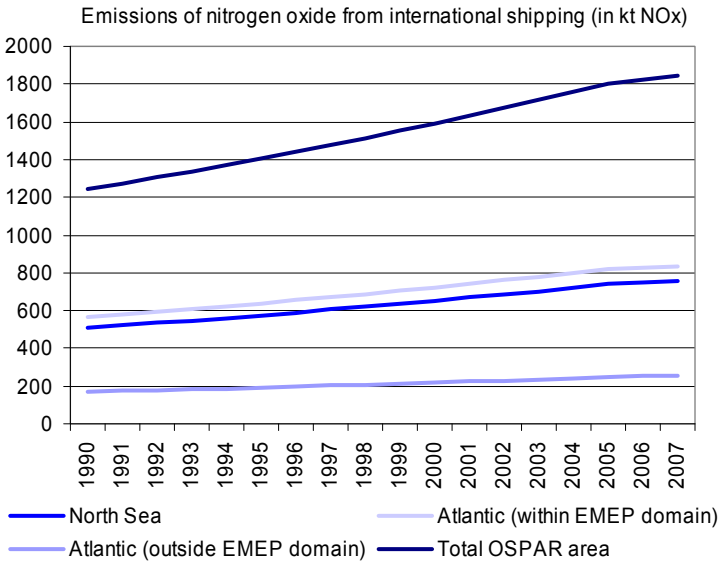


Figure 4.3 *Emissions of nitrogen oxides from international shipping in kt NO_x per year in 1990 – 2007. Source: OSPAR, 2009a based on EMEP emission data.*

Sulphur dioxide emission levels are expected to have increased since 1998.

Gaps in knowledge

There are gaps in knowledge to accurately quantify the contribution of international shipping to greenhouse gas emissions. This difficulty has been highlighted at a national level when collating inventories for submission to the UN Framework Convention on Climate Change and the EU European Monitoring and Evaluation Programme. For example, in the case of the United Kingdom, the inventories submitted only cover emissions from United Kingdom coastal and fishing vessels in United Kingdom territorial waters. Emissions from international shipping using United Kingdom fuels are not

included in the national totals. This means foreign vessels passing through United Kingdom waters which have purchased fuel outside the United Kingdom are not included in the inventory, even though these could be contributing to regional air pollution problems in the United Kingdom.

What lessons have we learnt since 1998?

Studies performed for the European Commission show that, without the stringent standards of the review of MARPOL Annex VI adopted in 2008, by 2020, emissions of sulphur dioxide, nitrogen oxides and primary particulate matter (PM2.5) from international shipping in EU seas would be expected to increase from their 2000 levels by 40%, 45% and 55% to 3186, 4828 and 396 kt/yr respectively (Figure 4.4).

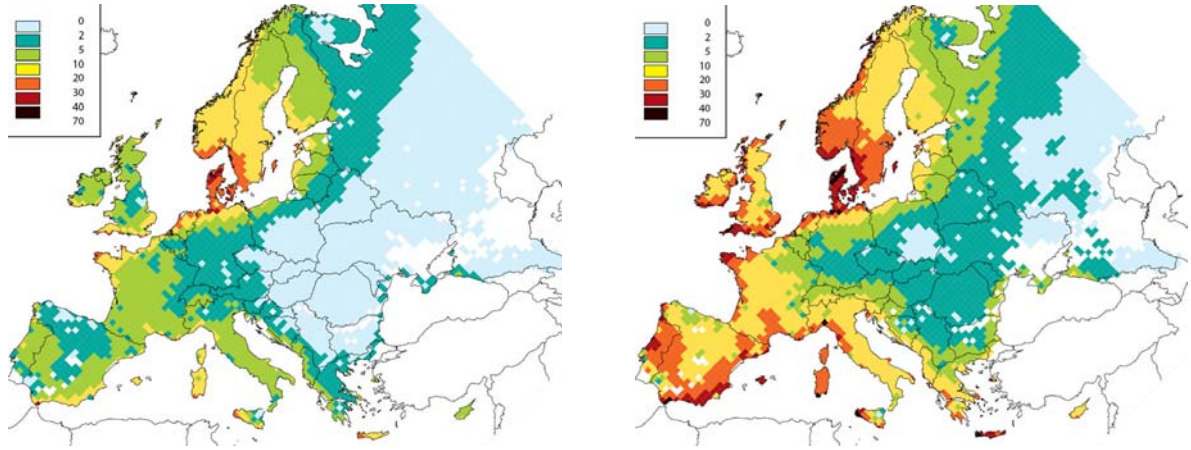


Figure 4.4 *Percent of sulphur deposition originating from international shipping in 2000 (left panel) and projected for 2020 if no action was taken (right panel). Emission controls as result of the revisions to MARPOL Annex VI adopted in 2008 are expected to progressively reduce deposition. Source: IIASA, 2007.*

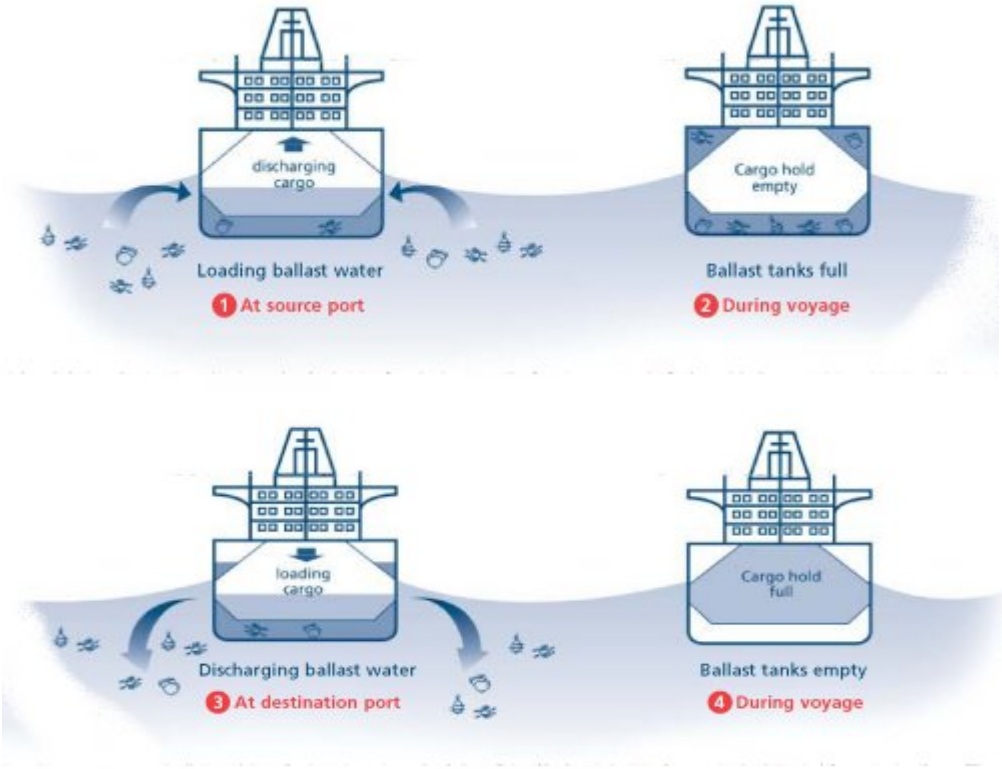
4.3 Introduction of non-indigenous species

Ballast water is essential to the safe and efficient operation of shipping, providing balance and stability to ships. Exchange of ballast water does however pose a risk to marine ecosystems as it includes marine species which can be introduced when releasing ballast water in other parts of the world. Non-indigenous species also travel through other vectors such as fouling on ships hulls and sea chests.

What is the problem?

Over 160 non-indigenous species have been identified in the OSPAR regions. However, introductions of non-indigenous species are by nature very difficult to pinpoint in time. It is difficult to get reliable and timely information of spatial distribution of any such species since this implies a host of infrastructure. Furthermore impacts of invasions are in general very difficult to assess. As a result of these difficulties the number of species in the OSPAR maritime area is certainly under represented.

Some of the main routes of such unintentional introductions are ship's ballast water and associated sediments as well as fouling on ships' hulls (ICES, 2009). Species invasions are related to the volume of ballast water discharged, the frequency of ship visits and the environmental match of the donor and recipient region of the ballast water (Figure 4.5).



Representative Ballast Capacities

VESSEL TYPE	DWT	BALLAST CONDITION			
		NORMAL (tonnes)	% of DWT	HEAVY (tonnes)	% of DWT
Bulk carrier	250 000	75 000	30	113 000	45
Bulk carrier	150 000	45 000	30	67 000	45
Bulk carrier	70 000	25 000	36	40 000	57
Bulk carrier	35 000	10 000	30	17 000	49
Tanker	100 000	40 000	40	45 000	45
Tanker	40 000	12 000	30	15 000	38
Container	40,000	12 000	30	15 000	38
Container	15 000	5000	30	n/a	
General cargo	17 000	6000	35	n/a	
General cargo	8000	3000	38	n/a	
Passenger/RORO	3000	1000	33	n/a	

Figure 4.5 *Cross section of ships showing ballast tanks and ballast water cycle. Ballast water capacity is given in dead weight tonnes. Source: AGPS, 1993.*

Non-indigenous species can severely affect the structure of the ecosystem. Ballast water has been named as the main vector for a number of species (ICES, 2009). For example, the zooplankton and fish-egg feeding comb jellyfish which has been introduced with ballast water to the Black Sea in the 1980s and has been associated with dramatic changes in the pelagic system of the Black Sea with effects throughout the food chain and with collapse of commercial anchovy fisheries (DAISIE, 2006 with further references). The species (see photo) was first recorded in the Netherlands, Norway and Sweden (Region II) in 2006. Its effects on the North Sea trophic structure and fish stocks such as cod are still unknown. Milder winters due to sea temperature rise are expected to favour its spreading in the Region.

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Shipping traffic is increasing, therefore the probability of the introduction of new species is also increasing. Additionally, faster ships and shorter voyage times means that organisms have a greater chance of survival during the voyage. Temperature rise due to climate change might favour living conditions and distribution of certain invasive species.

What has been done?

International legislation has been adopted through the IMO to control the management of ballast water and reduce the transfer of non indigenous species. The Contracting Parties of OSPAR and HELCOM have developed guidelines for the management of ballast water based on those of the IMO which can be used on a voluntary basis during the interim period. For details on measures see Table 3.1.

Did it work?

Whilst the introduction of non-indigenous species is evident it is very difficult to identify and assess the impact of the introduction of non-indigenous species particularly in linking a species invasion to a single voyage or shipping operation. Qualitative data on the status of introductions of Non-indigenous Marine Species to the North Atlantic and Adjacent Waters for the period 1992 to 2002 was elaborated by the International Council for the Exploration of the Sea Working Group on Introductions and Transfers of Marine Organism and was presented in the 2006 annual report of ICES. There is a need for better inventories and more strategically targeted studies and specific methodologies to identify rare species and unique habitats in order to determine which species are indigenous/non-indigenous to each Contracting Party.

What lessons have we learnt since 1998?

It is not possible to provide information relating to species abundance as data is limited. In addition it has been recognised that the number of non-indigenous species in the Region is under-represented as long-term monitoring and recoding of data is not available. As identification techniques become more sophisticated, it is likely that the list of non-indigenous species will increase.

4.4 Releases of antifouling chemicals

The accumulation of organisms on ships' hulls (so called fouling, see photo below) can reduce the performance of vessels and increase fuel consumption. To prevent this, paints used on ships' hulls include chemicals which discourage settlement of marine organisms on ships' hulls.

What is the problem?

Anti-fouling paints have been relying on toxic chemicals. Particular concerns have been raised about tributyltin (TBT), which has been used as in antifouling paints on ships, and which has an endocrine disrupting effect, particularly on shellfish. TBT is found to be present in the world's oceans in a wide range of animals and plants with adverse effects on sensitive species. The impacts from TBT can be seen even in protected areas.

What has been done?

Because of its intrinsic properties, TBT has been prioritised by OSPAR for action under its Hazardous Substances Strategy. This requires OSPAR countries to make every effort to move towards cessation of release of TBT by 2020.

Following OSPAR and EC measures, OSPAR countries have made progress in the last years towards the phasing-out of the use of TBT in antifouling paints, supported by a partial ban of TBT containing paints in European waters. The main substitutes for TBT in anti-fouling systems are copper and Irgarol. Their use started on smaller vessels and has now continued for over a decade. Although they are less hazardous than TBT, these substitutes still rely on their toxicity to prevent the settlement of organisms on hulls. A new generation of anti-fouling systems, so called non-sticky paints, is under development which abstains from any use of biocides.

A global ban of the use of organotin compounds in anti-fouling paints entered into force under the IMO International Convention on the Control of Harmful Anti-fouling Substances in September 2008.

Did it work?

Releases of TBT are expected to cease in future while releases of copper are expected to increase.

Based on ship movement data for the Dutch Continental Shelf in 2007 (Figure 4.6), a rough estimate is that some 8 tonnes of TBT in the North Sea will be released into the sea from ship coatings (OSPAR, 2009). It is expected that with the global ban of TBT, releases from ships' hulls will progressively cease. The substitution of TBT antifouling agents with copper-based paints is expected to result in increased losses of copper and Irgarol. A rough estimate, based on shipping data for the Netherlands' continental shelf in 2007, suggests that copper losses at sea from coatings of moving ships are in the order of 10 tonnes in the North Sea (OSPAR, 2009).

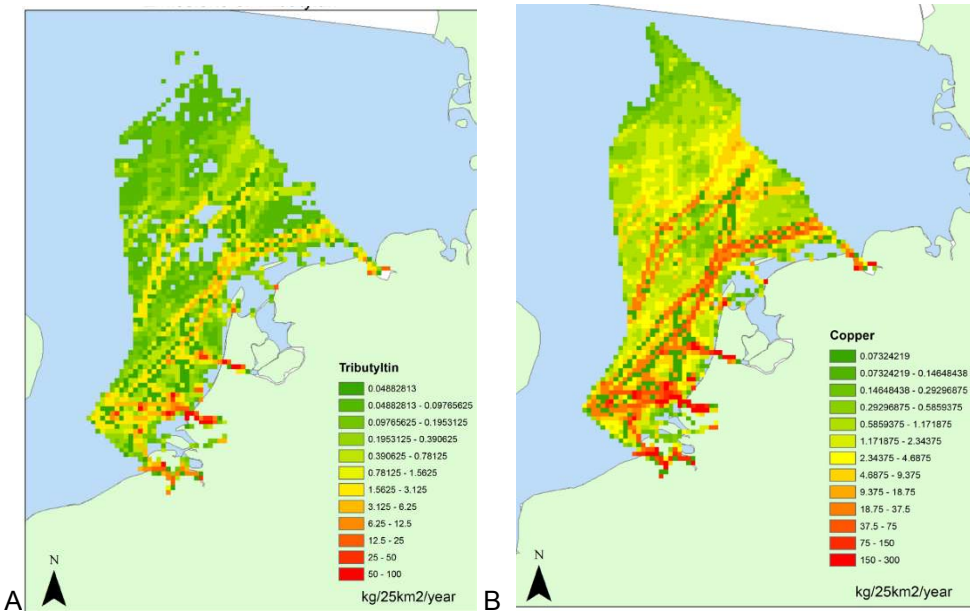

Figure 4.6 *Estimates of losses (kg/25 km^2/year) of TBT (A) and copper (B) from ship coatings at sea (excluding fishing vessels) on the Netherlands' Continental Shelf have been calculated as the product of the wet surface area times the emission factor for the substances. This is based on Automatic Identification System (AIS) data for the Netherlands' Continental Shelf in 2007, which allow reconstructing ships' movements and provide information on their type and size. Source: OSPAR, 2009.*

How does this affect the quality status of the OSPAR maritime area?

Contamination with TBT and pollution effects are decreasing.

Progressive phase out in Europe of TBT in anti-fouling paints is reflected in decreasing concentrations of TBT in water and sediments around some recreational harbours. An associated decline in adverse effects on populations of dogwhelks and snails (gastropods) which are sensitive to TBT and respond with non-functional male characteristics (measured as imposex) has been observed (OSPAR, 2009b). There has been encouraging evidence of recovery in gastropod populations, which have recolonised sites where they were formerly extinct due to TBT, amongst other locations this has even been found in the heavily polluted United Kingdom south coast region (Thomas *et al.,* 2000 and 2001).

Although the overall status is improving, populations of gastropods still show pollution effects from TBT over large parts of the OSPAR area, especially in Regions II, III and IV (OSPAR, 2009b). There appears to be a clear relationship with shipping. In or near busy shipping lanes, imposex levels are high as is particularly clear in the vicinity of some large harbours (e.g. Rotterdam, Clydeport, Vigo). The situation is markedly better where there is less large vessel traffic e.g. the west coast of Scotland and in the northern part of Norway. However, even in these areas, the presence of a harbour can be linked to a more impacted site.

There remain concerns about continued "hot-spots" of TBT contamination. This applies particularly to TBT-contaminated sediments often associated with commercial ports, which require constant maintenance dredging and spoil disposal operations. Contamination levels of dredged sediments has been highly variable in 1998 – 2007 but there is some evidence that TBT concentrations in disposed harbour dredged material may have decreased in recent years (OSPAR, 2009c). The issues associated with the disposal of dredged sediments have been articulated frequently (Svavarsson *et al.*, 2001; Santos *et al.*, 2004). An example of this is Southampton Water (United Kingdom), where, despite legislation restricting the use of TBT on the large number of recreational vessels in the area, trial reintroductions of *Nucella lapillus* populations showed that severe imposex effects developed within six months, thus implicating TBT from commercial shipping.

Recent monitoring of sediment suggest that copper concentrations were at levels giving rise to concern for the marine environment at some coastal stations and were increasing at a third of trend measurement stations (OSPAR, 2008). As TBT is substituted with copper antifouling paints it is expected that concentrations of such metals will increase in coastal sea waters.

There are no international agreements on the use of anodes on ships. However, cadmium released by zinc anodes is a substance on the OSPAR List of Chemicals for Priority Action. Estimates of cadmium release from anodes are given in OSPAR (2009).

What lesson have we learnt since 1998?

The partial ban of TBT in the OPSAR maritime areas appears to be having a positive effect and the global ban is expected to result in progressive cessation of releases of TBT from ships. However, contaminated (harbour) sediments remain a problem and whilst losses of copper are less hazardous than TBT they are of concern and as such needs attention.

4.5 Discharges of wastes

Wastes generated on ships include sewage, domestic and operational wastes (garbage) and cargo residues generated during the service of a ship. When ship generated waste is not disposed or delivered legally it contributes to pollution of the marine environment and may have adverse effects on ecosystems.

4.5.1 Discharge of Sewage

What is the problem?

Sewage introduces pathogens and nutrients to the water and may contribute to poor water quality and associated effects on human health and marine ecosystems. This includes, especially in coastal areas, microbiological contamination of waters and the passing on of diseases to humans in contact with the water or through consumption of contaminated shellfish. Nutrients can enhance eutrophication, *i.e.* excessive growth of algae and associated adverse effects like oxygen depletion. Sewage may also lead to obvious visual pollution.

What has been done?

MARPOL Annex IV prohibits ships from discharging sewage within a specified distance of the nearest land, unless they have in operation an approved treatment plant.

Governments are required to ensure the provision of adequate reception facilities at ports and terminals for the reception of sewage.

The IMO Marine Environment Protection Committee (MEPC) at its 55th session in October 2006 adopted revised Guidelines on implementation of effluent standards and performance tests for sewage treatment plants which will apply to sewage treatment plants installed onboard after 2010. The MEPC also adopted a standard for the maximum rate of discharge of untreated sewage from holding tanks when at a distance equal or greater than 12 nautical miles from the nearest land.

Did it work?

There is no data available to assess the effect of the measures. It is generally considered that on the high seas, the oceans are capable of assimilating and dealing with raw sewage through natural bacterial action; therefore the effect of sewage from shipping is thought to be minimal. Illegal sewage discharges in coastal areas can however be a significant problem locally and add to pressures from the main sources of excess nutrients coming from land, such as municipal sewers or treatment plants.

4.5.2 Discharge of garbage

What is the problem?

With respect to ships, garbage is all kinds of victual, domestic and operational waste (excluding fresh fish but including oily ballast, tank washing and bilge water) generated during the normal operation of a ship. When garbage is not disposed of legally, it becomes litter.

Litter from ships can be as deadly to marine life as oil or chemicals. The greatest danger comes from plastic, which can float for years. Fish and marine mammals may mistake plastic for food, they can also become trapped in plastic ropes, net bags and other items.

What has been done?

The discharge of garbage by ships is regulated by MARPOL Annex V which prohibits the disposal of plastics anywhere into the sea, and severely restricts discharges of other garbage from ships into coastal waters and "Special Areas". The North Sea was established as a Special Area for the control of discharge of garbage in 1997. This designation was pre-implemented voluntarily through the IMO prior to the actual implementation of MARPOL Annex V.

The OSPAR pilot project on monitoring beach litter (2000 – 2006) and the designation of the North Sea as a Special Area for the purpose of MARPOL Annex V, are examples at the practical level of action taken to deal with marine litter in the OSPAR region.

In addition, EU Member States are obliged to provide port waste reception facilities for all sizes of vessels (Directive 2000/59/EC).

Did it work?

A recent assessment suggests that very little progress has been achieved to develop and implement programmes and measure to reduce the illegal input of wastes from its marine sources, or to introduce mechanism for the remediation of existing litter in the coastal and marine environments (OSPAR, 2007). A study of the German Federal Environment Agency suggests that around 60% of the wastes from shipping washed up on the beach of the German North Sea coast in 1991 – 2002 were plastic and styrofoam, with timber providing the second largest waste quantities. Since 1998, OSPAR has monitored levels of beach litter, initially through a pilot project followed by a voluntary monitoring programme which suggests no statistically significant trend in volumes of beach litter between 2001 and 2006 (OSPAR, 2009d). It is however difficult to confirm how much litter actually is attributable to shipping and efforts should be made to improve our knowledge. Marine litter remains an outstanding pollution issue throughout the North-East Atlantic.

A recent study on the effectiveness of EC Directive 2000/59/EC, conducted by the European Marine Safety Agency (EMSA), involved port reception facilities in 50 major European ports (EMSA, 2005). It concluded that

- each port had defined and implemented its own individual system especially relating to cost recovery systems and incentives for ships to deliver waste in ports;
- the Directive had raised awareness amongst ship operators, shipping agents, waste operators and environmental authorities of the environmental impact of illegal discharges into the sea;
- the Directive has led to an improvement of ship waste handling;
- there was a need for detailed and clear guidelines at EU level to ensure uniform implementation of the Directive.

What lessons have we learnt since 1998?

Despite the study by EMSA it is difficult to identify an improvement in the situation with respect to port waste reception facilities as prior to implementation date of measures there was no reporting system in place and most waste operations in ports are contracted out to private operators. These operators often do not report to port authorities and therefore only limited statistics are available.

With respect to reception facilities for operational and oily waste the overall situation is changing, with increased ship traffic, particularly oil tankers, travelling through the Region's waters without calling at ports to discharge their waste. As such it will be necessary to continually adjust legislation to take changing transport patterns into account.

4.6 Pollution due to the loss of ships or their cargo

Pollution may occur due to the loss of a ship itself or the loss of a ship's cargo.

The *Levoli Sun* was a chartered chemical tanker which sank in October 2000 approximately 9 miles off Casquets, France. The tanker had a cargo of 6000 tonnes, including 4000 tonnes of styrene, 1000 tonnes of trichlorosilane and 1000 tonnes of isopropyl alcohol. The wreckage was caused by bad weather and a styrene slick was identified by the United Kingdom surveillance six weeks after the sinking.

The general cargo vessel *Ice Prince* sank off the south coast of the United Kingdomin January 2008 after it experienced heavy weather. The vessel was carrying almost 5300 tonnes of sawn timber of which 2000 tonnes washed up along the south coast of the United Kingdom.

In January 2006 the P&O *Nedlloyd Genoa* lost 27 containers over board when it encountered heavy weather after departing from France. This was the first of five high profile accidents involving the loss of containers since 2006. The United Kingdom Marine Accident Investigation Branch investigated the incident and whilst the exact cause of the accident could not be determined with certainty a number of recommendations were made.

Whilst such incidents highlight that cargo losses occur, there are no figures to assess the impact on the environment. However, a number of legislative measures have been put in place to reduce the risk of incidents, such as Port State control to ensure that ships are operated and maintained to the correct standard; vessel traffic monitoring to reduce the risk of collisions, and increased emergency preparedness and cooperation to ensure the environmental impact of incidents is minimised. Better control of securing of cargo is one action that could help minimise incidence of cargo loss.

4.7 Physical and other impacts

4.7.1 Underwater Noise

Green (June 2004) states that the main source of noise from shipping is the ship's propeller. It produces a loud hiss which dominates the low frequencies below 600Hz in busy shipping lanes. Some whales rely on low-frequency for communication over large distances; these frequencies are the same as those occupied by shipping. It is documented that icebreakers cause avoidance reactions in narwhales, belugas and walruses. Some scientists are concerned that shipping may have population impacts on these species. Long-term chronic noise has the potential for permanent damage to the the hearing system of marine mammals. Green (June 2004) cites one scientist who found a third of all stranded cetaceans he studied to have some form of auditory damage.

It is estimated that there has been an approximate doubling (3 dB increase) of background noise per decade since 1950s in some ocean areas where sufficient measurements support such analysis. Commercial shipping is the most probable source of that increase (OSPAR, 2009e). Details on underwater noise pollution and on the introduction of noise by shipping are documented in the OSPAR Background Document on noise (OSPAR, 2009e) and the OSPAR noise impact assessment (OSPAR, 2009f).

The 58th Session of the IMO Marine Environmental Protection Committee in 2008 agreed to the development of a new work programme agenda on minimising the introduction of incidental noise from commercial shipping operations in the marine environment to reduce the potential adverse impacts on marine life.

4.7.2 Strikes of Cetaceans

Concerns about the risk of ships strikes with cetaceans have been raised through the international forums. Collisions with ships are known to kill whales, especially larger species and those inhabiting waters with high shipping volumes. Collisions between whales and vessels have been recognised as a threat to some vulnerable cetacean populations and as such raise concerns about conservation and animal welfare as well as the possibility of an environmental incident resulting from a damaged vessel.

The development of faster and larger ships, and increased traffic, has led to increasing concern about the risk associated with ship strikes.

At the 58th Session of the IMO Marine Environmental Protection Committee in 2008, the Committee agreed to the development of a guidance document for minimising the risk of ship strikes with cetaceans.

Apart from certain species and areas there has been concern expressed about the inadequacy of information and statistics on ship strikes and it has been identified that there is a need for further data to be gathered so the extent of the problem can be assessed properly.

5. What lessons have we learnt since 1998 and what do we do next?

Much progress has been made to develop measures to address the various threats from shipping to the marine environment, primarily within the framework of the International Maritime Organization. Many of these measures have recently entered into force or are pending entry into force. As a result there is very limited data to allow assessing the effectiveness of such measures at this point in time.

However, there is still a need to reduce the impact on the environment caused by ships and to protect the OSPAR area against the main impacts of shipping.

To combat pollution from shipping, implementation of existing regulations is essential.

OSPAR should promote actions by OSPAR countries within the IMO framework:

- to implement MARPOL Annexes I-VI;
- to implement the ‘clean ship’ approach in maritime and environmental policies agreed under the Gothenburg Declaration;
- to develop improved practices and innovative technologies for ships in port and at sea to help reduce current and future emissions of greenhouse gases, nitrogen oxides (NO_x), sulphur oxides (SO_x) and particulate matter (PM), taking into account the relevant IMO regulations;

- to provide effective reception facilities for garbage and oily waste and apply best practice as recommended by IMO;
- to implement the Convention on the Control of Harmful Anti-fouling Systems on Ships and its global prohibition on the application of organotin compounds which act as biocides in antifouling systems in ships.

Oil spills need to be prevented and adequate response capacities must be in place

OSPAR countries should implement the regulations adopted by the IMO to reduce the risk of collisions and grounding and the related impacts from accidental spills and losses of cargo at the soonest possible opportunity.

OSPAR countries should cooperate closely in the field of oil spill prevention, contingency planning and effective counter pollution response. This should be accomplished through actions by OSPAR countries within the Agreement for cooperation in dealing with pollution of the North Sea by oil and other harmful substances (Bonn Agreement); the development of adequate response capacities and international cooperation agreement(s) in the Arctic; and entering into force of the Cooperation Agreement for the Protection of the Coasts and Waters of the North-East Atlantic against Pollution (Lisbon Agreement).

The seas need to be protected from invasive species arising from ballast water

OSPAR countries should apply the global and regional measures agreed for the prevention of the spreading of non-indigenous species via ballast water, particularly through application of the D1 Ballast Water Exchange Standard in the North-East Atlantic as actively promoted by OSPAR and HELCOM, and associated IMO guidelines

OSPAR countries should ensure the rapid ratification of the International Ballast Water Convention and work within the forum of the IMO to ensure its timely entry into force. OSPAR countries should also assess the risk of introducing invasive species so that adequate regional and prevention measures can be implemented.

The possible impacts on marine mammals need to be further assessed

OSPAR should engage with relevant international organizations to further assess the effects on marine mammals due to ship noise and ship strikes and work with the IMO in developing and implementing mitigation strategies.

The predicted growth of Arctic marine shipping needs attention

Given the predicted growth of Arctic marine shipping OSPAR countries should cooperate closely with respect to shipping in the Arctic and promote related work of other international fora, in particular the IMO and the Arctic Council. Priority issues include updating mandatory application of the IMO Guidelines for ships operating in Arctic ice-covered waters; where necessary the designation of “Special Areas” or “Particularly Sensitive Sea Areas”; and the strengthening of passenger ship safety.

The need for accurate data for future assessments must be addressed

OSPAR countries should consider the development of the means to collect and collate accurate and uniform data that can be used in future assessments of the impact of shipping on the marine environment.

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7. Abbreviations

AIS	Automatic Identification System
Bonn Agreement	Agreement for cooperation in dealing with pollution of the North Sea by oil and other harmful substances, 1983
CO_2	Carbon dioxide
DWT	Deadweight tonnage
EC	European Community; used in this report interchangeably with EU
EMEP	European Monitoring and Evaluation Programme under the UN-ECE Convention on Long-range Transboundary Air Pollution
EMSA	European Maritime Safety Agency
EPPR	Emergency preparation, preparedness and response
EU	European Union; used in this report interchangeably with EC
GHG	Greenhouse gas
GRT	Gross Register Tonne
HELCOM	Helsinki Commission, cf. Helsinki Convention
Helsinki Convention	Convention on the Protection of the marine environment of the Baltic Sea area, 1974
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organisation
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto
MEPC	IMO Marine Environment Protection Committee
NO_x	Nitrogen oxides
NSN	North Sea Network
ppm	Parts per million
PSSA	Particularly Sensitive Sea Area
SECA	SO_x Emission Control Area
SOLAS	International Convention for the Safety of Life at Sea, 1974
SO_x	Sulphur oxides
TBT	Tributyltin

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

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