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OSPAR Review of the State of the North Sea – oil inputs and their impact on the marine environment of the North Sea

Angela Carpenter[1]

Abstract

The scope of the OSPAR Commission includes monitoring input of pollutants from sea, land and atmospheric sources entering the North Sea and wider North East Atlantic. The OSPAR Commission is responsible for implementing the requirements of the OSPAR Convention on the protection of the marine environment of the North-East Atlantic. As part of its activities, the Commission published the results of those monitoring activities in Quality Status Reports in 2000 and 2010. Those reports set out the state of the environment in the OSPAR Maritime Area as a whole, and for its Regional Areas such as the North Sea. Data on oil inputs from the offshore oil and gas industry and from shipping that enters the North Sea is generally available; but less so for the broader OSPAR maritime area. Data on the impact of oil inputs on the marine environment has much more limited availability. This chapter provides an overview of the development of the OSPAR Convention and Commission, and examines the findings of the Quality Status Reports, both for the wider OSPAR maritime area and for the North Sea more specifically.

Key words

OSPAR Convention 1992; oil spills; oil and gas installations; shipping; monitoring; Oslo Convention 1972; Paris Convention 1974, Quality Status Reports

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1. INTRODUCTION

The OSPAR Convention maritime area covers the internal waters and territorial seas of its Contracting Parties, the seas beyond and adjacent to the territorial sea of its coastal states, and the high seas, sea-bed and subsoil within limits specified in Article 1 of the Convention [1]. The Contracting Parties to the OSPAR Convention are Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom. Finland is a Contracting Party as some of its rivers flow into the Barents Sea while Luxembourg and Switzerland are Contracting Parties as they lie within the catchment of the Rhine which flows into the North Sea

The OSPAR Maritime Area is divided into five regions (see Fig. 1). Region I covers Arctic waters, Region II is the Greater North Sea, Region III is the Celtic Seas, Region IV is the Bay of Biscay and the Iberian Coast, and Region V is the Wider Atlantic.

Figure 1: OSPAR Maritime Area

Source: OSPAR Commission

This Chapter examines the OSPAR Maritime Area in general and Region II the Greater North Sea more specifically. That region, which has a surface area of around 750,000 km^2, a volume of approximately 94,000 km^3 and a maximum depth of 700m, lies on the continental shelf of north-west Europe. It is bounded by the coastlines of England, Scotland, Norway, Sweden, Denmark, Germany, the Netherlands, Belgium and France. Its south-western boundary lies at 48ºN latitude, 5ºW longitude and its most northerly boundary lies at 62ºN latitude, between 5ºW and 5ºE longitude. To the east of the North Sea, all of Norway, including the Skagerrak and Kattegat south to a point at 56ºN latitude on the coast of Sweden, and slightly further north on the coast of Denmark is part of Region II.

The North Sea contains a variety of marine landscapes including fjords, estuaries, sandbanks and bays. It is home to many species of fish and shellfish, together with sea birds, marine mammals and cetaceans, as well as many species of marine flora and plankton, for example. It has multiple uses including oil and gas production, fishing and mariculture, marine renewable energy from offshore wind farms, maritime transport and tourism, for example. It also has multiple inputs to the marine environment from land, sea and air. These include inputs from industry, agriculture and sediment deposition from rivers, from ships (operational, accidental and illegal discharges), and atmospheric inputs from incinerators, for example.

This chapter examines the development of measures put in place since the late 1960s to protect the marine environment of the North Sea from pollution from ships, airborne and land-based sources. It considers the development of the OSPAR Convention in particular, and the role played by the Convention and the OSPAR Commission in protecting both the North Sea and the wider North-East Atlantic area. It then sets out the findings of reports into the quality status of the North Sea specifically, together with the wider OSPAR Maritime Area, as they relate to inputs of oil into the marine environment. Finally, this chapter draws some conclusions on effectiveness of measures taken so far to reduce oil inputs, and on the continued need to assess the state of the marine environment in the future.

2. DEVELOPMENT OF THE OSPAR CONVENTION AND COMMISSION.

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the 1992 OSPAR Convention) [1] was opened for signature at a Ministerial Meeting of the Oslo and Paris Commissions in Paris in September 1992. It was signed and ratified by all Contracting Parties to the Oslo and Paris Conventions of 1972 and 1974 respectively. Signatory states are Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom. Luxembourg and Switzerland are also signatories to the OSPAR Convention. This Agreement therefore has a wider geographic scope than the Bonn Agreement, signatories to which are Belgium, Denmark, France, Germany, Ireland, the Netherlands, Norway, Sweden and the UK, while the EU is a contracting party to the agreement.

2.1 North Sea Regional Legislation prior to the OSPAR Convention

The OSPAR Convention is one of a raft of legislative measures developed to protect the North Sea marine environment from pollution from various sources (Table 1). These included the Bonn Agreement of 1969 and its amendments of 1983, and also predecessors to the OSPAR Convention, the Oslo and Paris Conventions of 1972 and 1974. These measures are discussed at 2.1.1 to 2.1.3.

Table 1: Regional Marine Pollution Legislation on marine pollution with relevance to the North Sea Region

Year	Legislation
1969	Agreement for cooperation in dealing with pollution of the North Sea by Oil (Bonn Agreement)
1972	Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (Oslo Convention)
1974	Convention for the Prevention of Marine Pollution from Land-based Sources (Paris Convention)
1982	Memorandum of Understanding on Port State Control in Implementing Agreements on Maritime Safety and Protection of the Marine Environment (Paris MOU)
1983	Agreement for cooperation in dealing with pollution of the North Sea by Oil and other harmful substances (Bonn Agreement) – superceding 1969 Agreement
1992 (ratified 1998)	Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) which supercedes the Oslo and Paris Conventions

Source: Adapted from Carpenter (2005) Table 4.1, page 67 [2],

2.1.1 The Bonn Agreement, 1969

The earliest regional agreement to deal with marine pollution entering the North Sea was the 1969 Agreement for Cooperation in dealing with Pollution of the North Sea by Oil (Bonn Agreement) [3]. That Agreement came about as a result of action following a major oil spill of around 117,000 tonnes of oil from the grounding of the "Torrey Canyon" in 1967. The Bonn Agreement was subsequently amended in 1983 to cover "other harmful substances" in addition to oil. Signatories to the Bonn Agreement are Belgium, Denmark, France, Germany, Ireland, the Netherlands, Norway, Sweden and the UK, while the EU is a contracting party to the agreement.

In the intervening period (1969 to 1983), developments in protection of the marine environment in the North Sea region came from growing awareness of the

dangers posed by pollution of the seas and oceans through the intentional dumping of a range of substances including oil, sewage, garbage and industrial waste from ships and aircraft.

One example of potentially damaging pollution was the planned dumping of chlorinated waste in the North Sea by the "Stella Maris" which departed Rotterdam on 16 July 1971, that vessel being forced to return to port on 25 July having been unable to dump its waste as a result of both public pressure and government action [4]. Eight months after this event, in February 1972, the Oslo Convention was signed and it entered into force in April 1974 [5].

2.1.2 The Oslo Convention, 1972

The Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (Oslo Convention) [5] was developed in recognition of the need that international action was required to control pollution of the sea by the dumping of harmful substances from ships and aircraft. The original signatories to the Oslo Convention were Denmark, France, Ireland, Norway, Portugal; Spain and Sweden. Subsequently the UK, the Netherlands, Germany, Finland, Ireland and Belgium signed the convention, the last two around 10 years after the original agreement was adopted.

The geographic scope of the Convention was the high seas and territorial seas including parts of the Atlantic and Arctic Oceans and their dependent seas (Article 2), with specific exclusions for the Baltic Sea and its intersection with the North Sea, and for the Mediterranean sea and its intersection at the parallel of 36^{o} north latitude and 44^{o} west longitude. The Convention area covers the North East Atlantic and the North Sea. The Oslo Convention therefore had a much wider geographic scope than the Bonn Agreement [3], which covers the North Sea only.

The Contracting Parties to the Oslo Convention agreed to take all possible steps to prevent "pollution of the sea by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities, or to interfere with other legitimate users of the sea" (Article 1), and to "prevent the pollution of the sea by dumping [of harmful substances] by or from ships and aircraft" (Article 4). In recognition of the possibility that the dumping of harmful substances might be diverted to other marine areas, they also agreed to take action to prevent such diversion into seas outside the area to which the convention applied (Article 3). A list of prohibited substances was set out in Annex I to the convention and included various organic compounds, carcinogenic substances, heavy metals and persistent plastics, for example.

The Oslo Commission (OSCOM) was established under Article 16 of the Convention and was made up of representatives of all contracting parties. The role of the Commission was to regulate and control dumping of industrial wastes, sewage sludge and dredged material and incineration of liquid industrial wastes at sea with all but the dumping of dredged wastes being subsequently phased out [4].

OSCOM worked with the Paris Commission (PARCOM, see 2.1.3), through a common secretariat. While each Commission set up their own scientific groups with OSCOM establishing a Standing Advisory Committee for Scientific Advice (SACSA) and PARCOM establishing a Technical Working Group (TWG) [6], a

Joint Monitoring Group (JMG) and ad hoc working groups also provided common support to both Commissions, with mainly administrative activities under the Conventions being coordinated through the common secretariat.

The Oslo Convention was one of the earliest regional agreements relating to marine environmental protection and was seen as an international attempt to international regulation relating to marine pollution resulting from dumping of wastes at sea [7]. Particularly important was its requirement that no materials could be dumped unless all appropriate national bodies agreed to a permit for dumping, and that permit had to be obtained in advance of it taking place (Articles 6 and 7) [5]. Also important was the requirement that all contracting parties undertook to assist one another in dealing with pollution incidents and to exchange information on methods (Article 15, paragraph 4), and to work together to develop cooperative procedures to apply the Convention on the high seas (Article 15, paragraph 5), thus extending their activities beyond their normal territorial boundaries [5].

2.1.3 The Paris Convention, 1974

The Convention for the Prevention of Marine Pollution from Land Based Sources (Paris Convention) [8] was signed in June 1974. It was subsequently amended by a protocol of March 1986. Entry into force took place in May 1978 following ratification by seven Contracting Parties - Denmark, the European Economic Community, France, the Netherlands, Norway, Sweden and the UK. Subsequently, Portugal, Spain, Iceland, the Federal Republic of Germany, Belgium and Ireland also became signatories, the last two in 1984. The main executive body of the Paris Convention was the Paris Commission (PARCOM).

The objective of the Paris Convention was to take "all possible steps to prevent pollution of the sea ... of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as hazards to human health, harm to living resources and to marine ecosystems etc." (Article 1, paragraph 1). In order to do so, it required contracting parties to adopt "individually or jointly measures to combat marine pollution from land-based sources [by harmonizing] their policies in this regard" (Article 1, paragraph 2). The Convention required all contracting parties to eliminate land-based pollutants including various organic compounds, heavy metals, synthetic materials and persistent oils (Annex A, Part I) together with radioactive substances including wastes (Annex A, Part III).

The main difference between the Oslo and Paris Conventions was that the Paris Convention was one of the first international agreements aimed at the prevention of pollution from land-based sources [7], rather than from marine or air-borne sources. Those land-based sources included pollution entering the marine environment from watercourses, underwater or other pipelines, for example sewage outfall pipes, from man-made structures, and emissions into the atmosphere from land or man-made structures (Article 3) [8]. Man-made structures included offshore platforms.

The Paris Convention required joint cooperation between contracting parties in areas including working towards the elimination of pollution of the marine environment from land-based sources (Articles 4 and 5), joint programmes of scientific and technical research (Article 10), operation of permanent monitoring sys-

tems (individually or jointly) (Article 11) and offering assistance to one another to prevent incidents that might cause land-based pollution (Article 13). One area where PARCOM's work differed from that of OSCOM was its role in taking action to protect parts of the area where high levels of nutrients entering the environment led to algal blooms which are hazardous to the marine environment [4].

Although, OSCOM and PARCOM held joint meetings and shared a secretariat, "which also served as the secretariat to the Bonn Agreement" [9, page 333], as noted at 2.1.2 much of the co-operation took place at an administrative level and through the scientific Joint Monitoring Group, while each Commission held their own meetings and set their own work programmes, for example [2].

2.2 Potential Issues relating to the Oslo and Paris Conventions

A number of issues were identified with both Conventions. First was that their focus was on prevention or reduction of pollutants entering the marine environment, rather than on any reduction in the production of those pollutants. As a result of the pollutants might end up being disposed of elsewhere [2].

The second issue was that monitoring for pollutants examined their concentration in the environment but not their biological effects. The result of this was that it was not possible to identify whether the marine environment was improving or deteriorating, and whether it might therefore need further protection measures [9].

The third, and potentially most significant issue, was that both Conventions used a 'black' and 'grey' list approach in identifying how hazardous pollutants were and whether they could be disposed of in a way that they might enter the marine environment. 'Black list' substances could not be dumped at all and there was a requirement that any land based emissions should be eliminated. 'Grey list' substances could still be dumped with permission of competent authorities and based on strict limits. However, there was a question surrounding newly identified or developed substances from entering the environment, i.e. those substances not covered by the relevant Annexes to the Conventions. Those substances would require an amendment to the relevant Annexes and subsequent agreement by all contracting parties. This would also apply where improved scientific knowledge led to a better understanding of the environmental damage caused by various substances resulting in the transfer of a substance from the 'grey' to the 'black' list. There was, therefore, a level of inflexibility and potential for a delay in preventing those substances from being discharged into the marine environment [2].

3. THE OSPAR CONVENTION, 1992

The Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) [1] was adopted at a Ministerial level meeting of the Oslo and Paris Commissions entered into force in March 1998. Signatory states are Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom. Luxembourg and Switzerland are also signatories to the OSPAR Convention.

The decision, taken in 1990, to establish the OSPAR Convention to supercede the Oslo and Paris Conventions was "fuelled by developments in marine environmental policy and law which had taken place since the adoption of the two conventions" [9] including those issues discussed at 2.2. As a result, it was apparent that the work being undertaken by the separate Commissions no longer corresponded to the requirements of the conventions and action was required to make the conventions more relevant to the current time.

As noted at 2.1.2, the OSPAR Convention covers the same geographical area as the Oslo and Paris Conventions, and is divided into five Regions (see Fig. 1). This chapter considers, in particular, Region II Greater North Sea, described in the Introduction, which covers the area from where the North Sea opens into the Atlantic Ocean to the north, where it meets the Baltic Sea to the east, and where the English Channel meets the Bay of Biscay to the south west[2].

3.1 General Obligations of the OSPAR Convention

The OSPAR Convention [1] set out a number of general obligations for all Contracting Parties at Article 2. These include that they take "all possible steps to prevent and eliminate pollution and enact the measures necessary to protect the sea area against the adverse effects of human activities" in order to "safeguard human health and to conserve marine ecosystems and, when practicable, restore marine areas which have been adversely affected" (Article 2, Paragraph 1(a)). In addition, Contracting Parties were to "adopt programmes and measures [to] harmonise their policies and strategies (Article 2, Paragraph 1(b)).

The sources of pollution covered by the Convention are land-based sources (Article 3), dumping or incineration (Article 4), offshore sources (Article 5) and other sources "not already the subject of effective measures agreed by other international organisations or prescribed by other international conventions (Article 7).

3.2 Other Requirements of the OSPAR Convention

The most recent version of the OSPAR Convention [1], contains all amendments and updates up to 2007, and details 34 Articles, 5 Annexes and 3 Appendices.

Examples of these include: Article 8 which sets out requirements that Contracting Parties undertake complementary or joint programmes of scientific or technical research; Articles 10 and 12 which, respectively, set out the make-up of the OSPAR Commission and its permanent secretariat; Annexes I to III which relate specifically to pollution from land-based sources (Annex I), pollution from dumping and incineration (Annex II), and pollution from offshore sources (Annex III); Annexes IV and V which relate to the assessment of the quality of the marine environment (Annex IV) and to protection and conservation of ecosystems and bio-

[2] Further information on the geographic area, together with a description of Region II – Greater North Sea, is available from the OSPAR Commission website at: http://www.ospar.org/content/content.asp?menu=00470212000000_000000_000000

logical diversity (Annex V); and Appendix I which sets out criteria for best available techniques and best available practice.

3.3 Marine Monitoring under OSPAR

Contracting Parties to OSPAR are required to carry out an assessment of the quality of the marine environment, by undertaking and publishing regular joint assessments on the quality status of the marine environment (Article 6(a)). Included in those assessments is a requirement that they evaluate the "effectiveness of the measures taken and planned for the protection of the marine environment etc. (Article 6(b)).

Article 6 of OSPAR provided a solution to the issue identified at 2.2 in relation to the Oslo and Paris Conventions of not being able to identify whether the marine environment was improving or deteriorating due to a lack of biological monitoring. Article 6 put in place measures to do such monitoring on a regular basis, while publication of Quality Status Reports, initially by the Oslo and Paris Commissions in 1987 [10] and1993 [11] and by the OSPAR Commission in 2000 and 2010 [12, 13], provide policy makers and the public with a condensed overview of current knowledge and trends in both pressures and impacts of various activities on the quality of the North-East Atlantic [13].

3.4 The use of the Precautionary Principle and Polluter Pays Principle under OSPAR

Article 7 of OSPAR [1] provided a solution to the third issue identified at 2.2., i.e. on categorising newly identified or developed substances or responding to new scientific knowledge of the impact of a substance on the marine environment, and also the inflexibility of the 'black' and 'grey' list approach. Article 7, which deals with pollution from other sources, is much more responsive in taking action to prohibit or limit discharges of many more substances once they are identified as hazardous to the marine environment. Also relevant here are the requirements under Article 2 which, unlike the Oslo and Paris Conventions' use of 'black' and 'grey' lists, requires Contracting Parties to apply the precautionary principle (Article 2, Paragraph 2(a)) and the polluter pays principle (Article 2, paragraph 2(b)) [2].

3.4.1 The Precautionary Principle

The precautionary principle, as defined by Principle 15 of the 1992 Rio Declaration [14], states that: *"*In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation*."*

3.4.2 The Polluter Pays Principle

The polluter pays principle, as defined by Principle 16 of the 1992 Rio Declaration [14], states that "National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment".

4. ROLE OF THE OSPAR COMMISSION

The work of the OSPAR Commission is formally governed by a set of Rules and Procedures [15], with each Contracting Party being represented on the Commission (Rule 2) and providing a Head of Delegation to the Commission (Rule 3). The Commission meets at least once a year (Rule 4) with extraordinary meetings being held at the request of at least three Contracting Parties (Rule 5). A Chairman and Vice Chairman are elected (Rule 10) every two years (Rule 11) and those posts are rotated between all Contracting Parties to ensure equitable geographical representation (Rule 12). The OSPAR Commission has a Secretariat, based in London, and an Executive Secretary, appointed by the Commission (Rule 15).

The Commission works to implement all requirements of the OSPAR Convention through the adoption of decisions which are legally binding on all Contracting Parties, and also through recommendations and other agreements on, for example, agreed programmes of monitoring and information collection, on actions that the Commission takes on behalf of the Contracting Parties [16].

4.1 Structure of the OSPAR Commission

The Commission has a number of Committees on Hazardous Substances and Eutrophication, Offshore Industry, Radioactive Substances, Biodiversity, and on the Environmental Impact of Human Activities. It also has a number of groups such as the Coordination Group, various working groups and the Group of Jurists and Linguists [17]. Each main committee has an annual work programme with specific products to be delivered at the next meeting of that Committee or subsequent meetings, and each product has a specific task manager from a lead country.

In addition to the OSPAR Committees, the North Sea Network of Investigators and Prosecutors (NSN) was established in 2002 to help enforce international regulations preventing ship-source pollution and that body has direct links with the Bonn Agreement to carry out those activities [18].

4.2 Observers to the OSPAR Commission

There are a number of Observers to the OSPAR Commission [19] including inter-governmental (IGOs) and non-governmental organisations (NGOs). Examples of IGOs include: the Baltic Marine Environmental Protection Commission (Helsinki Commission), the Common Wadden Sea Secretariat (CWSS), the European Environment Agency (EEA), the International Maritime Organization (IMO) and the United Nations Environment Programme (UNEP). Examples of NGOs include the Advisory Committee on the Protection of the Sea (ACOPS), the International

Association of Oil and Gas Producers (IOGP), the Oil Companies' European Organisation for Environmental and Health Protection (CONCAWE), and the World Wide Fund for Nature (WWF).

4.3 Publications from the OSPAR Commission

The OSPAR Commission makes available, via its website [20], a wide range of publications that are freely available to the general public. These include an online version of the 2000 Quality Status Reports, Annual Reports (in both English and French), together with reports from the Oslo and Paris Commissions for 1989-1992 and 1992-1995. Also available are reports on discharges, spills and emission to air from offshore installations between 2010-2012 [21] and on discharges, spills and emissions from offshore oil and gas installations in 2012 [22], for example.

5. MONITORING THE QUALITY STATUS OF THE NORTH SEA

There have been a number of publications relating to the quality status of the North Sea. These were published in 1987, 1993, 2000 and 2010. The North Sea region covered by the reports is delineated in Fig. 2, taken from the 1993 report [11] which covered the North Sea only. Fig. 2 shows defined geographical boundaries for subregions within the North Sea and lead countries responsible for reporting on the individual subregions.

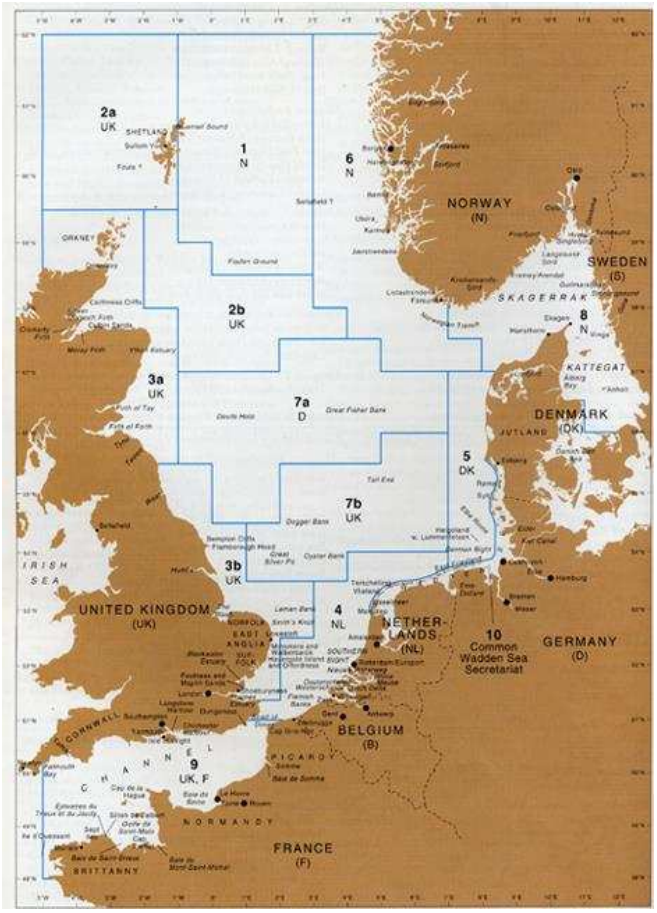
The OSPAR reports of 2000 and 2010 set out the quality status of the entire OSPAR maritime area, together with regional reports for each of the five OSPAR Regions, of which the Greater North Sea is OSPAR Region II.

5.1 The North Sea Quality Status Report 1993

In 1987 an early North Sea Quality Status Report was prepared for the Second International Conference on the Protection of the North Sea held in London in November 1987 [10]. The Ministerial Declaration arising from that Conference identified that there were many shortcomings in scientific knowledge of the North Sea environment and that, without such knowledge, it was difficult to make strategic decisions on environmental protection or to assess the effectiveness of measures that had already taken place [23].

In order to tackle knowledge-gap, it was decided to create a task force, the North Sea Task Force (NSTF), which would be the joint responsibility of the Oslo and Paris Commissions and the International Council for the Exploration of the Sea (ICES).

Figure 2: Boundaries of the North Sea defined by the North Sea Task Force



Source: North Sea Task Force (1993), page 8 [11]

5.1.1 The role of the North Sea Task Force

The role of the NSTF was to "carry out work leading ... to a dependable and comprehensive statement ..." on the state of the North Sea, which included inputs and dispersion of contaminants and also the effects of human activities [11]. In addition, the task force was involved in the development of a monitoring master plan (MMP) for monitoring the whole North Sea environment [24].

The NSTF was made up of representatives from Belgium, Denmark, France, Germany, the Netherlands, Norway and the UK, together with representatives of the Commission of the European Communities. The NSTF commenced its work in 1988 and the Secretariat of the NSTF worked with the Secretariats of the Oslo and Paris Commissions and ICES.

At the Third International Conference on the Protection of the North Sea in 1990, the NSTF was asked to carry out work to address a number of specific topics. These including the impact of fishing activities on the ecosystem, surveillance of chemicals not routinely monitored for under existing programmes, the environmental impact of persistent chemicals, and the role of atmospheric inputs as a source of contamination and environmental damage [11].

5.1.2 General content of the 1993 QSR

The 1993 QSR [11] examined both the geography of the North Sea and its physical oceanography – its depth, salinity, circulation, tides and climate – together with a wide range of inputs to the marine environment and their impacts. Those inputs included riverine and direct inputs, atmospheric inputs, incineration and dumping, and radioactive substances. The report also considered the anthropogenic impacts of human activities including coastline modification for sea defences, the development of offshore drilling rigs, platforms, and pipelines, and the impact of trawling on benthic species, for example.

In addition to considering inputs, and their sources, the report made an overall scientific assessment of the North Sea in respect of habitat changes and physical disturbances, fish, bird and mammal mortality, the sources and patterns of contaminant inputs, and the overall health of the North Sea.

5.1.3 Oil contamination in the North Sea

In considering sources of oil entering the North Sea, the 1993 QSR identified sources of contamination from the offshore oil and gas industry [11]. Those sources included drilling muds and cuttings from water-based muds, cuttings containing oil from the use of oil-based muds, produced water (water that comes from the reservoir along with oil) and spills and flaring. Those sources contained not just oil but other substances including heavy metals, corrosion inhibitors, defoamers, detergents and thinners, for example [11].

The report identified an area of relatively dense drilling activities in the central North Sea, generally the area lying between the north-east UK and south west Norway and extending into the southern North Sea between the UK and Dutch sectors. They were located mainly in subregions 1, 2b, 7a, 7b, 3b and 4 as set out in Fig. 2.

Figures for the number of oil and gas platforms in production between 1990 and 1992 identified that there were 30 platforms in Danish waters in 1990, 68 in Netherlands waters in 1992, 50 in Norwegian waters in 1991 and 150 in UK waters also in 1991, and the 1987 QSR had identified offshore oil and gas installations as significant sources of hydrocarbons discharged into the North Sea [11].

No information was provided in the 1993 QSR on the amount of oil entering the marine environment from riverine or direct inputs or from atmospheric or from sources other than the oil and gas industry.

5.1.4 The impact of oil on ecosystems

A number of impacts of man-made inputs of oil into the North Sea were identified in the 1993 QSR [11]. Estimates of the area of the sea-bed contaminated by oil in sediments ranged from 1,900 to 4,500 km^2 in 1986 to 8,000 km^2 by the time the 1993 QSR was written.

The accumulation of oil in sediments is identified mainly as coming from deposition of oil-contaminated drill cuttings. Two adverse effects from those cuttings are physical smothering of seabed organisms where large volumes of cuttings are deposited, and chronic pollution which can result in the decline of some sensitive species in the area, increased abundance of other opportunistic species, and a reduction in biodiversity, for example.

Oil concentrations in sea water were identified as being generally low, with elevated levels being found in the inner German Bight and around some oil platforms. This was as a result of discharges in produced water, cuttings and flaring. Experiments with certain species such as mussels, cod and herring showed a range of problems including higher mortality.

Oil slicks, both from ships and from offshore installations, were identified as causing the deaths of tens of thousands of seabirds each year, with some marine mammals also being fouled by oil slicks. Oiling rates for beached birds were identified as being stable over a 20 year period, with declining levels identified in only a few areas such as the Shetland and Orkney Isles and along the German coast.

5.1.5 Concerns and agreed measures from the 1993 QSR

The issue of concern, highlighted in the 1993 was that there were concerns about the volumes, duration and long-term effects of discharges of oil into the North Sea, and also the area affected by discharges as a result of oil cuttings from offshore activities [11]. The report highlighted that there were cases of contaminated fish caught in the vicinity of platforms.

While improvements in cutting cleaning technology, and the types of oils used in the process, had resulted in reduction in inputs from cuttings, with a 30% decrease in total discharges of hydrocarbons through the reduction in discharges of oil-contaminated cuttings [11], there was an expectation that produced water would make an increasingly greater contribution to total inputs of oil, and from incomplete gas flaring from oil platforms.

A second issue of concern related to the qualities of oil being discharged illegally from ships and from incomplete gas flaring from oil platforms. The abun-

dance of oiled bird carcasses being found on North Sea coastlines was seen as an indicator of pollution levels.

A number of specific actions had been agreed at the Third International Conference on the Protection of the North Sea at The Hague in 1990 in order to reduce oil pollution, including: that North Sea states should work with the International Maritime Organization to apply more stringent standards for ships discharging oily waste and residues in all sea areas; that contaminated cuttings should no longer be discharged into the sea; and that the feasibility of reducing the oil content in produced and displacement water from existing and new offshore installations was to be investigated.

A number of technical measures had already been identified, including the introduction of double hulls on new oil tankers in order to minimise the risk of oil spills in the event of an accident, new routing of ships carrying hazardous cargos, and stricter standards for discharges from refineries and offshore installations [11].

Finally, the Third International Conference had agreed that there should be: improved control and enforcement to deter ships from contravening the requirements of the MARPOL 73/78 Convention [25][3] and others, through increased coastal state jurisdiction using Exclusive Economic Zones; improved legal instruments to minimize accidental oil pollution from ships; improved availability of shore reception facilities, i.e. facilities made available in ports so that ships could discharge wastes safely rather than dispose of them at sea; and improved effectiveness of airborne surveillance.

The 1993 QSR concluded that "no real decreasing trend in pollution of the North Sea [could] be inferred" and that it would take some time before any beneficial effects of the agreed measures could be seen in terms of a reduction of oil pollution [11].

5.2 OSPAR Quality Status Report 2000

The 2000 QSR [12] comprised six volumes, the first of which covered the entire OSPAR region, and the other five remaining covering each of the Regional Seas. The 2000 QSR was the result of a decision of the OSPAR Commission, in 1994, to implement a commitment made when the OSPAR Convention was signed in 1992. That commitment was to prepare a Quality Status Report for the whole of the North-East Atlantic region by 2000 [12].

5.2.1 General overview across the OSPAR Maritime Area in 2000

As with the 1993 QSR [11], the 2000 QSR outlined the principle physical characteristics of the OSPAR maritime area. This included the chemical and biological properties of the area (Chapters 4 and 5), and the impacts of human activities

[3] Annex I of MARPOL 73/78 covers Regulations for the Prevention of Pollution by Oil. For further information on this Convention see: http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx

(Chapter 3), together with information on bottom topography, geology and sediments, coastal margins, and waves, tides and storm surges, for example (Chapter 2).

In relation to discharges from offshore oil and gas installations, these were identified as a significant source of oil inputs to the maritime area, particularly in Region II [12]. There had been an overall decrease in oil inputs from around 28,300 tonnes in 1985 to around 9,500 tonnes in 1997 (a reduction of approximately -66%). This was mainly as a result of a decrease in oil discharges via cuttings between 1985 and 1996 (from 25,800 tonnes to 6,000 tonnes). From 1997 there was a change to synthetic fluid muds, with 7,200 tonnes of oil discharged via cuttings in 1997. However, the 2000 QSR did identify an increase in the discharge of oil between 1985 and 1997 from produced water (from about 2,500 to about 8,500 tonnes).

The 2000 QSR also identified much of the increase in produced water was a result of a greater number of offshore installations, discussed in more detail at 5.3.3~~3~~1, and that an increase in the levels of oil, polycyclic aromatic hydrocarbons (PAHs, naturally occurring components of coal and oil) and other substances being discharged via produced water was a result of the increasing age of oil fields. Strict regulations had, however, been put in place in respect of operational discharges, together with prohibitions on the use of oil-based muds, for example.

The increase in the number of oil and gas platforms in production was as a result of major developments in the offshore oil industry in the North Sea, particularly in the UK and Norwegian sectors. There had been a doubling of offshore platforms between 1990/2 and 1996, primarily in that area. Platforms in the shallower waters around the southern UK, together with the Dutch and Danish sections were gas production platforms [12].

In relation to shipping as a source of oil, the 2000 QSR reported that there continued to be operational, accidental and occasionally illegal release of oil, along with inputs of hazardous chemicals through activities such as tank cleaning, releases of wastewater and loss of cargo, for example [12]. Across the whole OSPAR maritime area, operational discharges of oil from bilges and machine rooms was regulated so that there should be no visible signs of oil on the sea surface following any discharge.

Under the name North-West European Waters, OSPAR Regions II and III (the North Sea and the waters around Ireland) had received Special Area status under MARPOL 73/78 Annex I (oil) from August 1999. In Special Areas there was a total prohibition on the discharge of oily cargo residues at sea from any oil tankers, together with a limit of 15 parts per million in bilge waters and machinery space discharges [12].

Across the OSPAR maritime area there had been five major shipping accidents between 1992 and 1999 resulting in the discharge of oil. There are outlined in Table 2.

Table 2: Major Shipping Accidents resulting in oil spills

Year	Ship Type and name	Location	Volume of oil spilled
1992	Tanker – *"Aegean Sea"*	Spanish coast, off Galicia	80,000 tonnes
1993	Tanker – *"Braer"*	UK, Shetland Isles	84,000 tonnes
1996	Tanker – *"Sea Empress"*	UK, Milford Haven	74,000 tonnes
1998	Cargo – *"Pallas"*	Germany, Amrum – Wadden Sea	25,000 m^3
1999	Tanker – *"Erika"*	France, south-western Brittany	14,000 tonnes*

*an additional 11,200 tonnes of oil was removed from the wreck in 2000.
Source: QSR 2000, Table 3.10, page 34 [12]

5.2.2 Conclusions from QSR 2000 for the OSPAR Maritime Area

In terms of the overall assessment of the quality status of the North-East Atlantic, the QSR 2000 reported that discharges of both mineral and vegetable oil from ships continued to be a major concern [12]. Positive measures to limit deliberate oil discharges from ships have been put in place, including stricter rules on discharges of oil or oily mixtures from shipping, and there was also improved provision of facilities in ports to receive oily wastes. Despite those measures, pollution from illegal activities remained high and the QSR reported no apparent downward trend.

In respect of oil from offshore installations, 90% of those installations had met standards set by PARCOM in its Recommendation 92/6, a standard for oil of 40 mg/l in produced water from those installations [12]. While reiterating that there had been a reduction by over 60% in inputs of oil from offshore oil and gas installations between 1985 and 1987, the 2000 QSR identified expansion of offshore oil and gas activities into deeper waters and environments that were seasonally covered by ice meant that there was an increased risk of accidents due to either the depth of operations or the difficulties of taking action to deal with operations in cold environments.

5.2.3 Review of Region II – The Greater North Sea

The Region II Greater North Sea volume of the 2000 QSR (Region II 2000 QSR) [26] covers the area set out in Fig. 2, and provides a detailed description of that region. As shown in Table 3, the number of offshore oil and gas installations in the region has increased in the period 1990/2 to 1996/8 – from 300 to 475. During the same period oil production almost doubled [26].

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The quantities of oil discharged in Region II waters declined by almost 50% between 1984 and 1995 with 11,800 tonnes being discharged in that year, made up of made up of 65% from produced water, 33% from cuttings and 2% from accidental spills. Flaring operations accounted from less than 0.01% [26]. In the case of accidental spills, there were 198 cases in 1986, increasing to 621 in 1995 but there was a decline in oil discharge from 3,800 tonnes to 270 tonnes during that same period [26].

Table 3: The number of oil and gas platforms in production 1990/2 and 1996/8

OSPAR Area	Total number of installations 1990/2 (year in brackets)	Total number of installations, 1996/8 (year in brackets0
Denmark	30 (1990)	36 (1996)
Germany	3 (1987-1990)	2 (1996)
Netherlands	68 (1992)	107(1996)
Norway	50 (1991)	80 (1998)
UK	150 (1991)	250 (1997)

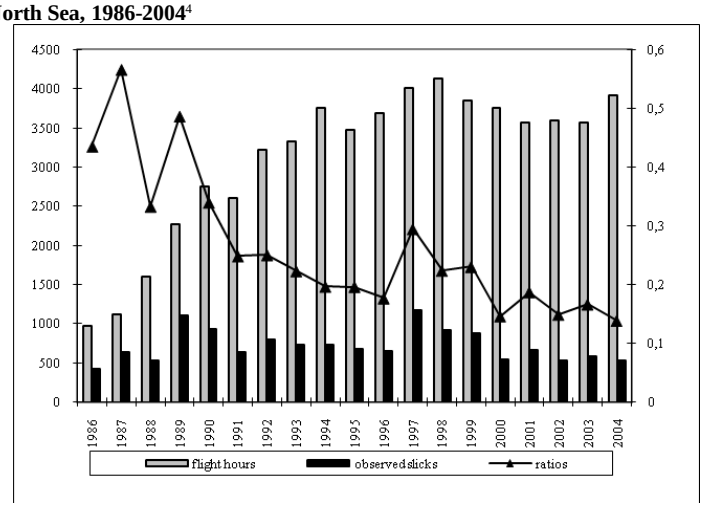
Sources: 1990/2 figures from QSR 1993, Table 1-6, page 17 [11]; 1996/8 figures from QSR 2000 Region II Report, Table 3.8, page 41 [26]

The overall decline in Region II occurred despite the increase in the number of offshore oil and gas installations from 143 to 458 during the same period. Oil discharged from cuttings was also reduced by 83% between 1984 and 1995 [26]. By contrast, however, the volume of oil discharged in produced waters from ageing oil fields increased from 1,717 tonnes in 1984 to 7,648 tonnes in 1995, with produced water becoming the main source of oil input from offshore installations in 1993 [26]. 2,429 tonnes (32%) was discharged as a result of 46 installations failing to achieve the 40 mg/l water target standard set out for installations (PARCOM Recommendation, 86/1, with 77% of those installations being located in the UK sectors (18% in the Norwegian sector) [26].

In respect of oil from shipping, there had been an increase in the levels of airborne surveillance conducted under the Bonn Agreement during the period 1989 to 1996, while the total number of observed slicks had fallen during that period [26]. This is highlighted in Fig. 3 which also shows a ratio of observed slicks to flight hours for the period 1986 to 2004, with the ratio of observed slicks to flight hours falling from a high of 0.57 slicks/flight hour at its highest level in 1987 slicks/flight hour in 1999 to 0.18 slicks/flight hour in 1996.

In addition to the trend of a reduction in observed slicks (apart from an increase in 1996), the Region II 2000 QSR reported that the average volume of identified oil slicks was also decreasing, with 519 of the 650 slicks in 1995 (79.8%) being less than $1m^3$ in volume and only 2 slicks being more than $100m^3$. The report does, however, offer a caveat that reported oil quantities may only represent around 10% of the actual discharges [26].

Figure 3: Bonn Agreement figures for flight hours and observed spills in the North Sea, 1986-2004[4]



Source: Adapted from Carpenter, A (2007), Figure 6, page 155 [27]

Other sources of oil inputs included refineries, atmospheric deposition and the dumping of material dredged in harbours, together with riverine sources [26]. 58 refineries in 9 OSPAR states were estimated to have discharged 607 tonnes of oil into coastal, estuarine and inland waters in 1997, compared to 9,047 tonnes in 1981 and 1,441 tonnes in 1993. 83% of the 1997 discharge was into estuaries, mainly in the UK and the Netherlands.

Atmospheric deposition was estimated at 430 tonnes in the Dutch sector in 1995 while the dumping of harbour dredging was estimated at 2,000 tonnes in the Dutch sector in 1995. Finally, estimates of riverine inputs varied widely and are limited geographically, mainly to rivers discharging into the sea from the Netherlands.

5.2.4 The impact of oil on ecosystems in OSPAR Region II

The Region II 2000 QSR has some discussion on the impact of various activities on ecosystems. There was little change in the information relating to drilling activities from the 1993 QSR, and also limited information on the impacts of production discharges although mention is made of a number of studies on the impact of hydrocarbons in produced water on marine organisms [26]. While the potential

[4] Figures 3 and 4 have been compiled using data from Bonn Agreement Aerial Surveillance Reports. Reports for the years 2008 to 2013 are available at http://www.bonnagreement.org/publications

for impacts from the construction or decommissioning of pipelines and offshore installations is mentioned, no information is available on those activities [26].

More information was available on the impact of spills and discharges from shipping, particularly in relation to beached bird data, with chemical analysis of both birds and contaminated beaches having been undertaken under an Oiled Seabirds Project which identified the main source of oil as discharged bunker residues from ships [26]. It was suggested that some of these discharges exceed the levels set out under MARPOL 73/78 Annex 1 [25], but also suggested that gradual implementation of that Annex may have contributed to a general trend of reduced levels of oiling rates of beached birds.

Some coastal areas of the Netherlands had seen a decline in oiling rates over a 30 year period, with the decline in those rates being greater in the Wadden Sea than along the Netherlands North Sea coast. The Netherlands is, however, identified as having higher rates than areas around the Shetland Isles, while the west coast of Denmark has a constantly higher level than other regions of the North Sea.

5.2.5 Conclusions from the Region II 2000 QSR

Four classes of impact are set out relating to human pressures, Classes A (Highest Impact) to Class D (Lowest Impact), and there are a total of thirty-two pressures defined in the Overall Assessment of the North Sea and placed within those classifications [26]. Amongst the highest impacts are fisheries and the introduction of trace organic contaminants – excluding oil and PAHs - from land, air and water. The lowest impacts include physical disturbance such as noise from shipping and electromagnetic disturbances from power cables. Inputs of oil (and PAHs) from the offshore oil and gas industry and from shipping are categorised as Class B, Upper Intermediate Impact [26].

The Region II 2000 QSR highlighted the difficulty of assessing the volumes of oil entering the marine environment of the North Sea and noted that the 1993 QSR indicated a range of anything from 86,000 to 210,000 tonnes per year from a range of sources. No more recent figure was provided.

In evaluating changes in inputs of oil over time and the effectiveness of the measures in place to reduce those inputs, it was reiterated that: there was a lack of data on inputs from riverine sources, other than in the Dutch sector; there had been no systematic assessment of legal and illegal discharges from shipping but stricter controls were in place in the North Sea under its designation as a Special Area under MARPOL 73/78 Annex I; the majority of refineries met the stipulated discharge standard of 5mg/l total oil (PARCOM Recommendation 89/5) and oil discharges had decreased by over 90% between 1981-1997; and oil inputs from the offshore oil and gas industry had decreased significantly between 1985 and 1993, although factors such as the maturation of oil fields and the increased volume of produced water meant discharges from that source were increasing. [26]

The report put forward a number of recommendations [26]. These were that action should be considered to establish better estimates of oil (and PAH) inputs from all land-based sources and that the objectives of the OSPAR Strategy for offshore gas and activities should be fulfilled. It also noted that existing measures to

prevent illegal discharges of oil from ships should be strengthened through, for example, measures to increase provision of reception facilities in ports (being considered by the European Commission at that time), and by the development of tools for fingerprinting and tagging oil.

5.3 OSPAR Quality Status Report 2010

The Quality Status Report 2010 (QSR 2010) [13] once again considers the whole OSPAR area and follows up on both the QSR 2000 and earlier North Sea QSRs. It examines the collective efforts made by Contracting Parties between 1998 and 2008 to "manage, monitor and assess the many pressures on the diverse ecosystems of the North-East Atlantic and the impacts that they bring" [13]. It notes that the OSPAR Convention is firmly rooted in global obligations and commitment including the 1994 United Nations Convention on the Law of the Sea, that OSPAR works closely with international organisations such as the IMO and UN Economic Commission for Europe (UNECE), and that the EU Marine Strategy Framework Directive (EU MSFD) [28] is an important driver for OSPAR's future work.

The QSR 2010 [13] is available electronically and includes an interactive map allowing the reader to see comments on various issues and inputs such as chemical concentrations, threats to species and habitats, levels of fish stock levels, and amounts of litter. The website also offers brief summary pages on the key points from the report, together with links to download the individual chapters.

As with the QSR 2000, there is a description of the geography, marine and coastal ecosystems, the physical system and biology of the OSPAR maritime area. Each region is then briefly described, as are challenges and common pressures. Separate chapters then consider issues including climate change (Chapter 3), eutrophication (Chapter 4), hazardous and radioactive substances (Chapters 5 and 6), for example. There are also brief Regional Summaries outlining key issues in the different OSPAR Maritime Regions (Chapter 12).

5.3.1 General overview across the OSPAR Maritime Area in 2010

OSPAR's work has, since 2003, been guided by an ecosystem approach which is also a main element of the EU MSFD. That approach allows the "sustainable exploitation of natural resources while maintaining the quality, structure and functioning of the marine ecosystems" where a good understanding of the ecosystem, and the development of appropriate indicators and methodologies, means that the ecosystem can be assessed in response to pressures from human activities [13]. As a result of the ecosystems approach, a number of Ecological Quality Objectives (EcoQOs) have been developed for the North Sea on aspects of biological diversity, commercial fish stocks/food webs, eutrophication, contaminants, and marine litter[5].

[5] For more information on the North Sea Ecological Quality Objectives see: http://qsr2010.ospar.org/en/media/chapter_pdf/QSR_Ch11_EN.pdf

Looking at the whole OSPAR maritime area, inputs from oil from a range of sources remains an issue. The total amount of oil and gas produced from the offshore oil and gas industry across the OSPAR area had declined by 14% between 2001 and 2007, although the number of offshore installations had increased and around 60% of operational installations reported both air emissions and discharges to the sea [13].

Oil discharged in produced water had fallen by 20% on average across the OSPAR area, including in Region II, and this was achieved through a combination of injecting produced water into sub-sea formations and efforts by the industry to optimise processes and introduce new water treatment technology [13]. Most countries had met an OSPAR 15% reduction target, i.e. OSPAR Recommendation 2001/1 on management of produced water and 15% reduction target for oil discharges with produced water. However, the volume of produced water continued to increase, in line with the earlier QSRs [13].

The main environmental pressures from oil and gas operations were greatest in Region II, the location of the majority of production platforms and pipelines. However, QSR 2010 indicated that operations had peaked in that region and were declining [13]. Other areas were likely to see increased production, for example the Barents Sea, and offshore areas of Greenland, the Faroe Islands and northern Norway, all in Region I Arctic Waters, where significant oil and gas reserves are located.

Spills from other sources were much reduced. 95% of accidental oil spills were less than one tonne in volume, although ageing pipelines and other infrastructure may result in more spills over time. Discharges from contaminated cuttings from wells had largely ceased by 2005, and although oil contaminated cuttings can be discharged at sea if they are below 1%, new technologies were available to reduce that still further. Where cuttings remain an issue is in the potential for release from cutting piles through leaching or disturbance of the area around an installation (including decommissioning, trawling and dredging).

Shipping also remained a source of marine pollution by oil and other toxic substances through accidental, operational and illegal discharges [13]. No information on levels of spills are provided in the report, although it does indicate that there are some signs of decreasing oil pollution in the North Sea [13] and this is discussed at 5.3.3.

No major oil spills were identified since 1999, other than the oil spill resulting from wreck of the single-hull tanker *"*Prestige*"* off the Galician coast of Spain (Region IV Bay of Biscay and Iberian Coast) in 2002 [13]. In that case an estimated at 64,000 tonnes of oil was spilled along 1,000 km of coastline. 20,000 oiled birds were collected from beaches in the aftermath of the spill but it was estimated that up to 100,000 were affected by oil, the vast majority not washing ashore. While the measurable effects of the *"*Prestige*"* oil spill were seen to decrease between 2002 and 2005, indicating an improvement in water quality, knowledge remained limited on the long-term effects of the oil pollution on the seabed and biological communities in the area.

5.3.2 Conclusions from QSR 2010

Across the whole OSPAR Maritime Area, although there have been significant reductions in some forms of oil discharges, there were still concerns about the impact of the offshore oil and gas industry on the marine environment. These included increased volumes of produced water required in maturing oil reservoirs, and the impacts of historic cutting piles and atmospheric emissions.

A number of priorities for action were set out and, in relation to oil. These were that there would be: continued work towards a reduction of discharges of oil in produced water to the sea, to ensure that "discharges will present no harm to the marine environment by 2020"; a move towards a risk-based approach to managing produced water; and more generally continued monitoring and assessment, and improving the evidence base "for future assessments of the impacts of the offshore industry on marine ecosystems" [13].

Action was also proposed to examine issues relating specifically to ageing installations and infrastructure, and to whether current OSPAR measures were suitable for the northern part of Region I where, as discussed at 4.2.2, there are areas of deeper waters and environments that were seasonally covered by ice.

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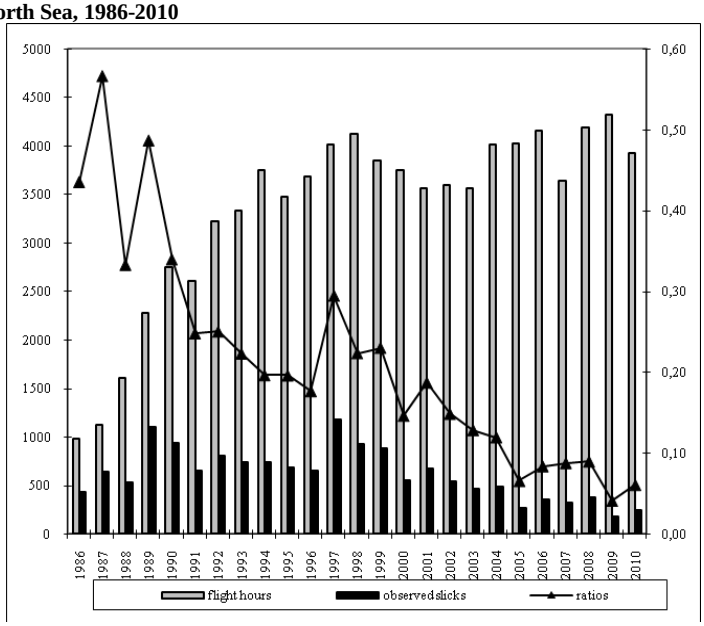
In respect of ship-source marine pollution, OSPAR has continued to work the IMO, the EU and the Bonn Agreement. While no data is provided on the number of observed oil spills in the North Sea in QSR 2010, data is available from the Bonn Agreement for the period 1984 to 2010 and this is presented in Fig. 4. This expands on the data presented in Fig. 3 (see 5.2.3) and illustrates that, apart from a spike in the number of observed spills in 1997, there continued to be a decline in the number of observed slicks between 1999 and 2010, and the ratio of observed slicks to flight hours had fallen from 0.22 slicks/flight hour in 1999 to 0.04 slicks/flight hour in 2010. As noted at 5.2.3, around 80% of slicks were less than $1m^3$ in volume in 1995 and Bonn Agreement aerial surveillance data indicates that slick size have remained at similar levels since 1998 with the vast majority (around 80%) of slicks being less than $1m^3$ in volume and only around 1% being greater than $100m^2$.

Special Status under MARPOL 73/78 [25], together with EU Directives to prevent accidents at sea and the establishment of the European Maritime Safety Agency (EMSA) should, it is suggested, help reduce oil inputs from shipping, together with substances such as chemicals or garbage. However, QSR 2010 notes that many of those measures had only recently taken place and so it was not possible to assess their effectiveness. Effective surveillance, investigation and prosecution were therefore deemed essential to protect the marine environment from pollution from ships [13].

Despite the comment on the effectiveness of various measures, the QSR 2010 does provide some positive findings on the level of oil pollution in the North Sea. It highlights that based on the North Sea EcoQO on the average proportion of oiled common guillemots in winter months (November to April), there appears to have been an overall decrease in oil pollution levels in some parts of the North Sea. However, there are wide variations, with higher levels of oiled birds being found in areas around the Netherlands, Belgium and south-east England (southern North Sea) compared to areas around Orkney (northern North Sea) [13].

Figure 4: Bonn Agreement figures for flight hours and observed spills in the North Sea, 1986-2010



As accidental spills are less frequent, and there are strict limits for operational discharges, it is suggested that better enforcement of current regulations and awareness raising activities are necessary to reduce illegal oil discharges. One source of such illegal oil discharges is oily ballast and tank washing water or oily bilge water which should be retained by ships until they arrive in a port. Under EU Directive 2000/59/EC on port reception facilities [29] EU ports are required to provide waste facilities for a range of wastes, including oily wastes set out under MARPOL 73/78 Annex I [25]. However, a lack of data on volumes and types of waste handled by ports creates difficulties in identifying whether all wastes are discharged appropriately [13] presenting an opportunity for ships to discharge illegally into the sea.

6. CONCLUSIONS

The OSPAR Convention [1] was introduced in order to better prevent and eliminate pollution from the marine environment of the north-east Atlantic from sea, land and air, and to protect the sea area against the adverse effects of human activities. It also sought to safeguard human health, to conserve marine ecosystems

and, where practicable, to restore marine areas that had already been impacted by human activities such as the oil and gas industry and shipping, discussed in this Chapter.

Through harmonised programmes and strategies, Contracting Parties to OSPAR are required to carry out monitoring activities to assess the quality of the marine environment, and to produce regular reports on those assessments. In addition, a commitment was made to produce Quality Status Reports for the entire OSPAR Region, with reports being subsequently issued in 2000 and 2010 [12, 13], building in the framework of the earlier 1993 QSR [11].

The QSRs identify that, in the period 1984 to 2007, there was an increase in the total number of offshore installations in Region II Greater North Sea, together with an increase in the number of installations discharging to the sea. In the QSR 1993 the main source of oil entering the marine environment from platforms was from cuttings from the use of water-based and oil-based muds [11]. By 1997 oil inputs from cuttings were less than 25% of 1985 levels (down from 28,300 to 9,500 tonnes) [12]. By contrast, in 1985 oil in produced water formed only a small proportion of the total volume of oil discharged to sea (2,500 tonnes) but this had increased 8,500 tonnes in 1997 [12].

The volumes of produced water have subsequently continued to increase as a result of, for example, the maturation of oil fields. This, in Region II, led to an increase in produced water from 1,717 tonnes in 1984 to 7,648 tonnes in 1995 [25]. Overall discharges of oil in produced water continued to increase despite most contracting parties achieving the OSPAR target for a 15% reduction of oil discharged with produced water, the increase being as a result of the volume of produced water being discharged [13].

While there is limited information on actual inputs of oil from shipping for the whole OSPAR maritime area, the number of major accidental spills in that area has fallen from 5 major shipping accidents in the years 1992 to 1999 (see Table 2) to a single major spill from the Prestige in 2002 (see 5.3.1).

More comprehensive information on oil spills from shipping is available for Region II as a result of aerial surveillance activities conducted under the Bonn Agreement [3], the Bonn Agreement having direct links to the OSPAR Commission through OSPAR's North Sea Network of Investigators and Prosecutors, established in 2002 (see 5.1). As highlighted in Fig. 3, there was an increase in the number of flight hours conducted under the Bonn Agreement between 1989 and 1996 and a decline in both the number of observed slicks and the volume of oil in those slicks (see 5.2.3). While the QSR 2010 does not make reference to Bonn Agreement aerial surveillance data, Fig. 4 shows that, other than a spike in the number of oil spills in 1997, the ratio of slicks to flight hours has continued to decline with the vast majority of slicks being less than $1m^3$ by volume.

Overall, since the inception of the OSPAR Convention [1] and its predecessors, the Oslo and Paris Conventions [5], [8], there has been a reduction in the volumes of oil entering the North Sea since the late 1980s. Work has been undertaken to identify oil inputs from all sources – land, sea and atmospheric inputs. Work has also been undertaken to identify the impacts of oil pollution on ecosystems and

marine organisms, for example, an ecosystem approach that is a main element of the EU's Marine Strategy Framework Directive [27].

Targets put in place by OSPAR have already resulted in a reduction in oil discharges. However, the ageing oil and gas production infrastructure in the North Sea presents challenges for the future of the region, with the QSR 2010 identifying a need to examine specific issues in that respect [13]. In order to continue to reduce oil inputs OSPAR has therefore set as a priority for future action the "reduction of oil in produced water discharged to sea to a level which will ensure that the discharges will present. no harm to the marine environment by 2020" [13].

Finally, in relation to shipping as a source of oil pollution, OSPAR also identifies the need to continue to assess the effectiveness of measures developed internationally by the IMO and also by the European Union, for example. In particular, this relates to illegal oily discharges where there is a need to improve existing enforcement measures and raise awareness of current regulations [13]. It also relates to better collection of data associated with ships discharging oily wastes into port reception facilities in EU ports, to ensure that ships do not intentionally discharge wastes at sea [13].

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