

## MARINE DISCHARGES OF OFFSHORE PRODUCED WATER: THE NORTH-EAST ATLANTIC MANAGEMENT STRATEGY

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### KEYWORDS

international law, north-east Atlantic, produced water, oil discharges, offshore installations

### ABSTRACT

This paper is devoted to the legal study, at the international level, of norms and strategies to prevent and eliminate pollution by oil and other substances caused by discharges of offshore produced water into the sea. We must bear in mind that there is no single international treaty of world-wide scope of application dealing with this polluting problem. In fact, there is only one regional marine area where legal norms and strategies have been recently adopted to face this polluting problem. The regional marine area is the North-East Atlantic, and the norm in question is the OSPAR Recommendation 2001/I for the Management of Produced Water from Offshore Installations, which was recently adopted at the Fourth Annual Meeting of the OSPAR Commission, held at Valencia, Spain, from 25 to 29 July 2001.

### OFFSHORE DISCHARGES UNDER THE CONVENTION FOR THE PROTECTION OF THE MARINE ENVIRONMENT OF THE NORTH-EAST ATLANTIC

On 22nd September 1992, Belgium, Denmark, Finland, France, Germany, Ireland, Island, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and the European Union adopted in Paris the Convention for the Protection of the Marine Environment of the North-East Atlantic, known as the OSPAR Convention <sup>[1]</sup>. The OSPAR Convention not only replaced and updated the previous Convention for the Prevention of Marine Pollution By Dumping from Ships and Aircrafts (Oslo, 15th February 1972) <sup>[2]</sup> and the Convention for the Prevention of Marine Pollution from Land-Based Sources (Paris, 4th June 1974) <sup>[3]</sup>; it also offers a new legal framework to address all sources of pollution of the marine environment and the adverse effects of human activities upon it <sup>[4]</sup>. We must bear in mind that the former Oslo and Paris Conventions only dealt with pollution by dumping or incineration at sea and from land-based sources. Therefore, both Conventions did not provide for an adequate control of some of the many sources of marine pollution, such as offshore pollution.

In deep contrast with these former Conventions, the OSPAR Convention does contain provisions dealing with "offshore activities", that is, activities carried out in the maritime area for the purposes of the exploration, appraisal or exploitation of liquid and gaseous hydrocarbons. This Convention also defines the concepts of "offshore sources" as offshore installations and offshore pipelines from which substances or energy reach the maritime area; "offshore installation" as any manmade structure, plant or vessel or parts thereof, whether floating or fixed to the seabed, placed within the maritime area for the purpose of offshore activities; and "offshore pipeline" as any pipeline which has been placed in the maritime area for the purpose of offshore activities. It is important to highlight that the Greater North Sea area is one of the several maritime regions comprised in the North-East Atlantic. This maritime region is the first offshore hydrocarbons producer in Europe, with more than 400 fixed platforms, either steel jacketed platforms or concrete gravity platforms. These platforms will discharge into the sea a high volume of pollutants (hydrocarbons, chemicals, produced water ...) before the oil field is fully exploited <sup>[5]</sup>.

The main provision of the OSPAR Convention devoted to prevent offshore pollution is its Article 5. According to it: "The Contracting Parties shall take, individually and jointly, all possible steps to prevent and

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eliminate pollution from offshore sources in accordance with the provisions of the (OSPAR) Convention, in particular as provided for in its Annex III". Annex III is entitled "On the Prevention and Elimination of Pollution from Offshore Sources". This Annex contains a complete set of provisions concerning the different aspects of offshore pollution, such as the dumping of disused offshore installations and pipelines, discharges from offshore sources and abandonment of offshore installations. In this paper, I am going to constraint myself to comment the provisions concerning offshore discharges.

In the first place, I shall mention that Article 2 of Annex III establishes a very general obligation. According to it, Contracting Parties have the duty to adopt programs and measures for the purposes of preventing and eliminating pollution from offshore sources, requiring the use of the best available techniques and the best environmental practice including, where appropriate, clean technology.

In the second place, it must be highlighted that, although there is not a full prohibition of discharges from offshore sources, the use on, or the discharge or emission from, offshore sources of substances which may reach and affect the maritime area shall be strictly subject to authorization or regulation by the competent authorities of the Contracting Parties (Art. 4.-1). Moreover, there is not an absolute freedom for each Contracting Party to grant those authorizations or to approve those regulations, as both of them shall, in particular, implement the relevant applicable decisions, recommendations and all other agreements adopted under the OSPAR Convention. In fact, the OSPAR Commission is empowered in general: (a) to supervise the implementation of the OSPAR Convention; (b) to review the condition of the maritime area, the effectiveness of the measures adopted, the priorities and the need for any additional or different measures; and (c) to draw up programs and measures for the prevention and elimination of pollution and for the control of activities which may adversely affect the maritime areas, including, when appropriate, economic instruments. In particular, in order to strengthen the environmental criteria to be taken into account when granting authorizations or approving regulations for offshore discharges, the OSPAR Commission is specifically empowered: (a) to collect information about substances which are used in offshore activities and, on the basis of that information, to agree lists of substances that have to be expressly authorized or regulated; and (b) to list substances which are toxic, persistent and liable to bioaccumulate and to draw up plans for the reduction and phasing out of their use on, or discharge from, offshore sources (Art. 10).

Lastly, as a guarantee to ensure the effective implementation of these provisions, the competent authorities of the Contracting Parties pledge themselves to provide for a system of monitoring and inspection to assess compliance with the authorizations granted or the regulations approved. Complementarily, each Contracting Party shall issue instructions to its maritime inspection vessels and aircraft and to other appropriate services to report to its authorities any incidents or conditions in the maritime area which give rise to suspicions that a contravention of these provisions has occurred or is about to occur (Art. 9).

These legal provisions, which are very general in nature, are not exclusive for the North-East Atlantic Ocean. Similar legal provisions do exist for other regional seas, such as the Baltic, the Mediterranean and the Black Seas. However, what marks the difference in the case of the North-East Atlantic is the legal implementation that these general provisions have received on the three following topics: (a) marine discharges of offshore chemicals; (b) marine discharges of organic-phase drilling fluids contaminated cuttings; and (c) marine discharges of produced water from offshore installations. This last topic is the subject-matter of the present paper.

### **MARINE DISCHARGES OF OFFSHORE PRODUCED WATER**

This paper is devoted to the legal study, at the international level, of norms and strategies to prevent and eliminate pollution by oil and other substances caused by discharges of offshore produced water into the sea. We must bear in mind that there is no single international treaty of world-wide scope of application dealing with this concrete polluting problem. In fact, there is only one regional marine area where legal norms and strategies have been recently adopted to face this polluting problem. The regional marine area is the North-East Atlantic, and the norm in question is the OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations, which was adopted at the Fourth Annual Meeting of the OSPAR Commission, held at

Valencia, Spain, from 25 to 29 July 2001. Therefore, this very recent legal norm might be used as an example and legal precedent for other subsequent legal developments, either for all oceans and seas or for particular regional seas.

We must take into account that, on the one hand, "produced water" means water which is produced in oil and/or gas production operations and includes formation water, condensation water and re-produced injection water; it also includes water used for desalting oil. On the other hand, "offshore installation" means any manmade structure, plant or vessel or parts thereof, whether floating or fixed to the seabed, placed within the maritime area for the purpose of offshore activities, that is, exploration and exploitation of mineral resources, including hydrocarbons and gas, from the seabed.

Taking into account these brief definitions, we can understand that the inputs of oil into the marine environment from discharges of offshore produced water is, since 1993, the biggest marine input of oil, even bigger than the inputs of oil into the sea through the use of organic-phase drilling fluids and the discharges of cuttings contaminated with organic-phase drilling fluids. The statistical data for the North-East Atlantic show that, in 1984, 24.959 oil tones were discharged into the sea with drilling fluids and muds via cuttings while only 1.717 oil tones were discharged in production water. This trend was inverted for the first time in 1993, when only 4.588 oil tones were discharged into the sea with drilling fluids and muds via cuttings while 5.485 oil tones were discharged in production water. This trend has been consolidated during the last years and the most recent available data for the year 1997 show that 7.234 oil tones were discharged into the North-East Atlantic with drilling fluids and muds via cuttings while 8.513 oil tones were discharged in production water in the same regional sea [6].

#### **THE OSPAR RECOMMENDATION 2001/1 FOR THE MANAGEMENT OF PRODUCED WATER FROM OFFSHORE INSTALLATIONS**

Facing this problem, the coastal States of the North-East Atlantic adopted, on 29 July 2001, the OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations [7]. This Recommendation was adopted by unanimity at the Fourth Annual Meeting of the OSPAR Commission, held at Valencia, Spain, from 25 to 29 July 2001.

We must remind that the OSPAR Commission is the Commission established by Article 10 of the OSPAR Convention. The OSPAR Commission is an intergovernmental body, as it is made up of representatives of each of the Contracting Parties. One of its duties is to draw up, in accordance with the General Obligations of the OSPAR Convention, programs and measures for the prevention and elimination of pollution and for the control of activities which may, directly or indirectly, adversely affect the maritime area. To this end, the OSPAR Commission may, inter alia, adopt decisions and recommendations (Article 10.3 of the OSPAR Convention).

The differences of opinion about the legal nature of decisions and recommendations adopted by the OSPAR Commission were intensively discussed during the preparatory works for the adoption of the OSPAR Convention, without reaching any consensus on this topic [8]. Finally, this question was settled down by Article 13 of the OSPAR Convention. According to it, while decisions are legal binding instruments, recommendations, such as OSPAR Recommendation 2001/1, are legal instruments that shall have no binding force although States are expected to comply with their provisions.

#### **THE PURPOSE AND GOALS OF THE OSPAR RECOMMENDATION 2001/1**

In order to clearly understand the purpose and goals of the OSPAR Recommendation 2001/1 we must highlight that in the First Annual Meeting of the OSPAR Commission, held at the same time as the 1998 Ministerial Meeting of the Contracting Parties to the OSPAR Convention in Sintra, Portugal, from 22 to 23 July 1998, the Ministers for the Environment of these States adopted the Sintra Statement [9]. In this political understanding, the Ministers for the Environment agreed, among other things:

(a) to prevent pollution of the maritime area by continuously reducing discharges, emissions and losses of hazardous substances, with the ultimate aim of achieving concentrations in the environment near background values for naturally occurring substances and close to zero for man-made synthetic substances and

to make every endeavor to move towards the target of cessation of discharges, emissions and losses of hazardous substances by the year 2020. In order to make this agreement operational, the OSPAR Commission adopted in 1998 the Strategy with regard to Hazardous Substances; and

(b) that the OSPAR Commission should set environmental goals for the offshore oil and gas industry and should establish improved management mechanisms to achieve them. In this regard, the OSPAR Commission subsequently adopted in 1999 a Strategy on Environmental Goals and Management Mechanisms for Offshore Activities.

Implementing these political agreements, the OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations was adopted, entering into force the very same day of its adoption, that is, on 29 July 2001. In the Preamble of this Recommendation, the Contracting Parties to the OSPAR Convention recognized:

(a) that produced water is a source of oil contamination and potential pollution of the sea in the maritime area of the North-East Atlantic and needs to be controlled through the use of the best available techniques (hereinafter quoted as "BAT") and the best environmental practice (hereinafter quoted as "BEP"). It must be underlined that Appendix 1 of the OSPAR Convention contains the criteria for the definition of BAT and BEP in general or individual cases. This Appendix defines BAT as "the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste". It also defines BEP as "the application of the most appropriate combination of environmental control measures and strategies";

(b) that there is a need to control the volumes of produced water discharged into sea water, particularly in oil fields and specially as producing fields mature, with a view to reducing the discharges into sea water of oil, including aromatics, and other substances;

(c) that there is also a need to reduce the concentration of oil and other substances in produced water discharges; and

(d) that there is a need for controls with regard to the management of drainage water and displacement water, but they also acknowledged that this will be established through separate OSPAR programs and measures.

Therefore, with these premises the main purpose of the OSPAR Recommendation 2001/1 is to prevent and eliminate pollution by oil and other substances caused by discharges of produced water into the North-East Atlantic. In order to concrete its purpose, this Recommendation tries to describe very precisely what must be understood with the terms "oil" and "other substances". On the one hand, "oil" means the total of hydrocarbons determined by the appropriate sum of analytical results of the application of the agreed reference methods for dispersed oil and aromatic hydrocarbons. In the case of dispersed oil, until 2003 its concentration should be determined by the reference method or by any alternative method yielding equivalent results. The reference method for the determination of the dispersed oil content is the infrared method as given in the OSPAR Agreement 1997-16 on the Sampling and Analysis Procedure for the 40 mg/l Target Standard. The alternative methods may include on-line analysis techniques or continuous monitoring and they should be calibrated against the reference method and approved by the competent national authority. In any case, during 2002 the OSPAR Commission is reviewing, as a matter of priority, the method for the determination of the dispersed oil content with a view to establishing a new reference method, based on ISO 9377-2, supplemented, as appropriate, with a modification for the purpose of this Recommendation. In order to proceed to this review of the reference method, in 2002 the OSPAR Oil Industry Committee is developing a program for the comparison of analytical methods for the determination of the dispersed oil content and this program is to be carried out by the Contracting Parties to the OSPAR Convention before 31 December 2002. On the basis of the information gathered in this way, in 2003 the OSPAR Commission will approve the new reference method for the determination of the dispersed oil content. In the case of aromatic hydrocarbons, the OSPAR Commission will also approve in 2003 one or more reference methods for the determination of aromatic hydrocarbons and, as appropriate, other hydrocarbons with the exception of dispersed oil. In any case, as a minimum guarantee, it is provided for that when applying methods of analysis using solvents, regeneration equipment shall be applied to

recover and reuse the solvents as many times as possible, in order to keep discharges, emissions and losses of these solvents to the environment as low as possible.

On the other hand, the term "other substances" means all or any of the following five kinds of substances:

- (a) solid particles from the reservoir;
- (b) substances from the reservoir such as heavy metals;
- (c) particles of scale and corrosion products;
- (d) residues of chemicals injected at various points in the production system, for purposes such as controlling scaling, corrosion, foaming, bacterial growth or emulsion; and
- (e) chemicals used in drilling and completing wells which are reintroduced into the production system during clean-up operations.

An important precision consists in that, although the main purpose of the OSPAR Recommendation 2001/1 is to prevent and eliminate pollution by oil and other substances caused by discharges of produced water into the sea, this Recommendation does not apply to all offshore installations in the North-East Atlantic. In fact, it only applies to those offshore installations that discharge produced water into the sea. Therefore, by this way, the Contracting Parties to the OSPAR Convention are promoting other ways for the management on land of produced water resulting from offshore activities.

After defining very precisely its main purpose and with the aim of reaching it, the OSPAR Recommendation 2001/1 provides for a common strategy with the following three overall goals:

- (a) to reduce the input of oil and other substances into the sea resulting from produced water from offshore installations, with the ultimate aim of eliminating pollution from those sources;
- (b) to ensure that an integrated approach is adopted, so that reduction in oil discharge is not achieved in a way that causes pollution in other areas and/or other environmental compartments; and
- (c) to ensure that effort is made to give priority to actions related to the most harmful components of produced water.

More concrete goals are established in the short and medium term, that is, for the years 2006 and 2020, respectively. Accordingly, in the short term the main goal of the OSPAR Recommendation 2001/1 is to achieve that each Contracting Party shall ensure that the total quantity of oil in produced water discharged into the sea in the year 2006 from all offshore installations under its jurisdiction has been reduced by a minimum of 15% compared to the equivalent discharge in the year 2000 from all offshore installations under its jurisdiction at that time.

In order to ensure compliance with this concrete goal in the short term, three guarantees are established. First, a system of implementation reports. According to it, Contracting Parties with offshore installations that discharge produced water into the sea shall present to the meeting of the Offshore Industry Committee in 2002 their respective plans for implementing this Recommendation. An assessment of the progress of these plans shall form part of the 2003 review of the Offshore Strategy. Subsequent reports on implementation shall be made on a regular basis to be decided by the Offshore Industry Committee. In order to harmonize all this information and to facilitate its evaluation, when reporting on implementation, the format as set out in the Appendix 1 to the OSPAR Recommendation 2001/1 shall be used as far as possible.

Second, a final reporting system. Pursuant to it, Contracting Parties shall report to the meeting of the Offshore Industry Committee in 2008 their compliance with this goal. These national reports shall include an evaluation where appropriate of the BAT and BEP for their installations or other relevant factors, including the options:

- (a) which have been implemented in order to meet this goal;
- (b) which have not been considered feasible including the reasons for this, so as to ensure that information is available on the reasons why these offshore installations cannot contribute to achieving this goal;
- (c) any other reasons why this goal has not been reached.

Third, a substantive duty, as far as from 1 January 2002 onwards each Contracting Party shall ensure that plans to construct new offshore installations, or to modify substantially existing offshore installations, shall take as a point of departure the minimization of discharges and, where appropriate, the achievement of zero discharges of oil in produced water into the sea.

The goals that Contracting Parties shall achieve in the medium term, that is, by the year 2020, are the following:

(a) a reduction of oil in produced water discharged into the sea to a level which will adequately ensure that each of those discharges will present no harm to the marine environment; and

(b) in accordance with the objective and the timeframe of the OSPAR Strategy with regard to hazardous substances, a continuous reduction in discharges of hazardous substances *via* produced water, by making every endeavor to move towards the target of cessation of discharges of hazardous substances with the ultimate aim to achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances.

In order to implement those goals and to achieve these results for the years 2006 and 2020, this Recommendation provides for different programs and measures which are commented in the next section.

### **PROGRAMS AND MEASURES IN PURSUING THE GOALS OF THE OSPAR RECOMMENDATION 2001/1**

In pursuing the goals of the OSPAR Recommendation 2001/1, the Contracting parties have agreed on a series of general principles and have also established different performance standards. On the one hand, the general principles agreed by the Contracting Parties are the following:

First, Contracting Parties shall ensure that BAT and BEP are applied on each installation and that BAT and BEP are regularly reviewed. In order to proceed to this review, and bearing in mind the dynamic nature of BAT and BEP, each Contracting Party shall at least every five years carry out an assessment and evaluation of the application of BAT and BEP in order to ensure that each individual installation takes account of the latest developments in BAT and BEP. Where needed to ensure the application of up-to-date BAT and BEP to individual offshore installations, the Contracting Party shall arrange for an improvement program to be drawn up for such installations and require it to be implemented;

Second, the prevention and elimination of pollution by oil and other substances caused by discharges of produced water into the sea shall be achieved by a reduction of the volume of produced water discharged into the sea (e.g. by injection, downhole separation or water shutoff) and/or a reduction of concentrations of oil and other substances in produced water;

Third, Contracting Parties shall encourage operators under their jurisdiction to include the prevention and reduction of discharge into the sea of produced water, and oil and other substances contained therein, as a priority item for continuous improvement in their environmental management systems; and

Fourth and last, Contracting Parties shall ensure that when offshore installations, or relevant parts of them, are relocated for use elsewhere in the maritime area, an assessment and evaluation shall take place to ensure that the relocated installation, or the relevant relocated part of an installation, performs according to BAT and BEP in respect of produced water.

On the other hand, the Contracting Parties have established six performance standards that must lead to the achievement of the goals settled down by OSPAR Recommendation 2001/1. These performance standards are the following:

First, no individual offshore installation shall exceed a performance standard for dispersed oil of 40 mg/l for produced water discharged into the sea;

Second, by the end of the year 2006 no individual offshore installation shall exceed a performance standard for dispersed oil of 30 mg/l for produced water discharged into the sea;

Third, Contracting Parties shall report to the meeting of the Offshore Industry Committee in 2008 the offshore installations which fail to meet the performance standard for dispersed oil of 30 mg/l for produced water discharged into the sea by the end of the year 2006. For each such installation, the report shall include an evaluation of the BAT and BEP for that installation, including the options:

(a) which have been considered in order to meet this performance standard, but

(b) which have not been considered feasible including the reasons for this,

so as to ensure that information is available on the reasons why these offshore installations cannot meet the

performance standard;

Fourth, by six weeks before the meeting of the Offshore Industry Committee in 2006, each Contracting Party shall have:

- (a) collected information on the sources and quantities of oil and other substances discharged with produced water within their jurisdiction;
- (b) reviewed BAT and BEP for the management of produced water including achievable concentrations of oil and other substances;
- (c) reported to the Committee the information collected and the conclusions reached in the review.

On the basis of this information, the Offshore Industry Committee shall review the goals for the reduction of discharges of oil and recommend to the OSPAR Commission goals for loads and/or concentrations of oil and other substances as appropriate;

Fifth, by the end of 2001 Contracting Parties shall exchange information on methods of analysis of aromatic hydrocarbons on the basis of work in hand. Contracting Parties shall collect data on aromatic hydrocarbons in produced water in particular with regard to:

- (a) concentrations of different groups of aromatic hydrocarbons;
- (b) methods of sampling and analysis for aromatic hydrocarbons;
- (c) BAT and BEP for the reduction of the concentrations of these substances in produced water.

On the basis of this information, the Offshore Industry Committee shall prepare for the OSPAR Commission in 2003 a proposal for one or more performance standards, including appropriate reference analytical methods, and a timetable for the dates by which any such performance standards shall be met; and

Sixth and last, the dilution of treated or untreated produced water for the purpose of lowering the average concentration of oil or achieving compliance with the performance standard shall be prohibited.

Showing not only a high degree of flexibility, but also a strong wish to reach the goals settled down by OSPAR Recommendation 2001/1, the Contracting Parties have also agreed that, for those offshore installations failing to meet the performance standard for dispersed oil of 40 mg/l (or, by the end of the year 2006, 30 mg/l) for produced water discharged into the sea, the Contracting Parties shall, once the failure to meet the targets has been established, report to the next meeting of the Offshore Industry Committee the content of the pertinent improvement program, including the problems that they are addressing:

- (a) for offshore installations discharging not more than 2 tones of dispersed oil per year, the average concentration of dispersed oil, the quantity of produced water discharged, the total quantity of dispersed oil discharged and the type of treatment equipment installed;
- (b) for offshore installations discharging more than 2 tones of dispersed oil per year, the details as in indent (a) above, together with a full account of measures taken or planned in order to achieve compliance with the performance standard.

The amount of dispersed oil as referred to in the indents above should be calculated on the basis of the daily average quantity of water discharged (m<sup>3</sup>/day) and the consequent monthly average values of dispersed oil discharged into the sea. All this information shall subsequently be recorded in the implementation report from the Contracting Party in question.

## FINAL CONSIDERATIONS

Comparing the marine polluting activities by oil and waste waters carried out by the offshore industry and by the shipping industry, International Law shows an important difference in facing those activities. While since the 1970's there are mandatory and binding legal rules for marine pollution from ships implying oil and waste waters and imposing strict environmental standards and duties for shipping activities, no similar rules exist for the offshore oil industry. It seems as if there is no environmental concern for offshore drilling operations while, at the same time, there is a strong environmental concern for oil transportation by ships and for waste waters generated on board.

This legal trend to a more generous environmental treatment for the offshore oil industry than to the shipping industry has been broken for the first time in the North-East Atlantic with the adoption of OSPAR Recommendation 2001/1. This Recommendation is the first legal instrument containing a management strategy for the marine discharges of offshore produced water, pursuing their final elimination in a progressive way.

However, the equality in the environmental treatment of both kinds of industries is far from being reached. As I have mentioned above, the recommendations adopted by the OSPAR Commission are not legal binding instruments but exhortatory instruments, that is, legal instruments that have no binding force although States are expected to comply with their provisions. Nevertheless, in cases of non compliance there can no be any legal sanction for the infractor. Therefore, the OSPAR Recommendation 2001/1 must be seen as a very timid first step towards the introduction of environmental standards for the offshore industry. More legal action on this topic is urgently needed.



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[<sup>2</sup>] Its text is published in International Legal Materials, 11, (1972), pp. 262 et seq. The Oslo Convention was amended by the Protocols of 2nd March 1983 and 5th December 1989.

[<sup>3</sup>] Its text is published in International Legal Materials, 13, (1974), pp. 352 et seq. The Paris Convention was amended by the Protocol of 26th March 1986).

[<sup>4</sup>] BEURIER, J. P., (1990), La protection des mers régionales. In: Actes de Journées de l'Environnement du Centre International de la Recherche Scientifique (CNRS), organisées par le Programme Interdisciplinaire de Recherche sur l'Environnement PIREN, Nice, 30 novembre-1er décembre 1990, pp. 269-284, at p. 277.

[<sup>5</sup>] OIL & GAS JOURNAL DATABASE, (1995), Energy Statistics Sourcebook, 10th ed., Tulsa, Penn Well, 582 pages, at pp. 492-493.

[<sup>6</sup>] OSPAR COMMISSION, (ed.), (1999), Point and Diffuse Sources. Discharges from Refineries, 1981-1997. Discharges, Waste Handling and Air Emissions from Offshore Installations for 1996-1997, London, 54 pp.

[<sup>7</sup>] Its text can be consulted at the following Internet address: <http://www.ospar.org>

[<sup>8</sup>] DE YTURRIAGA BARBERÁN, J. A., (1990), Evolución de los convenios europeos de Oslo y París sobre contaminación marina, Revista de Instituciones Europeas, 17/3, pp. 903-905; JUSTE RUIZ, J., (1990), Algunos aspectos jurídicos sobre los Convenios de protección del medio ambiente en el Mar del Norte, Anuario de Derecho Marítimo, 8, pp. 239-240.

[<sup>9</sup>] Document OSPAR 98/14/1-B, OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic. Ministerial Meeting of the OSPAR Commission. Sintra: 22-23 July 1998. Summary, Annex 45.