MIMAC 2006

International conference on
Marine Incidents Management

"Provinciaal Hof"
Markt 2, 8000 Bruges, Belgium
19-20 October, 2006

Marine Incidents Management Cluster (MIMAC) Research in the framework of the BELSPO Supporting Actions SPSD II

Annemie Volckaert, Dirk Le Roy, Marnix Vangheluwe, Bram Versonnen, Katrien Arijs, Frank Maes, Jan-Bart Calewaert, Jan Mees, Nancy Fockedey, Simon Claus and Colin Janssen (Eds)

VLIZ SPECIAL PUBLICATION 34

Research in the framework of the BELSPO Supporting Actions – SPSD II

BELGIAN SCIENCE POLICY

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MARITIEM INSTITUUT

ONDERZOEKSGROEP MILIEUTOXICOLOGIE

VLIZ

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Edited by

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PREFACE

The North Sea is an intensely used marine area and contains one of the most busy merchant shipping routes in the world. The interest and engagement of society to improve the quality of the sea and the coast and to protect the marine environment has led at national and international level to increased attention. This is shown amongst others by recent changes in the EU legislation and steps taken by the EC to speed up enforcement of the ERIKA regulations. It is also aligned with the Bergen declaration of the 5th North Sea Conference in which the Ministers invited OSPAR to develop an appropriate system of risk assessment and risk profiles connected with relevant human activities (e.g. shipping and aquaculture) in particular regions and localities. The final aim is risk reduction of hazardous substances. Increased attention is also found in EC environmental policy documents for protection of the marine environment (communication of the European Commission to the European Parliament and Council of Ministers 'Towards a strategy to protect and conserve the marine environment').

To keep the risk of unwanted incidents at sea as low as reasonably feasible and/or acceptable, appropriate measures, both technical and organizational, need to be defined and taken. However, such preventive and mitigating measures can only be taken on the basis of a sound analysis of the risks involved. As marine environmental risks are border-crossing, the approach should have an international character.

The MIMAC project and the resulting report aims to integrate the results of two projects describing technical (RAMA, DIMAS) and organizational (RAMA) measures related to marine incidents management. The project was made up of an interdisciplinary team of experts in marine biology, ecotoxicology, shipping patterns, risk analysis and contingency planning.

The valorisation of the MIMAC project will result in an added value through different forms of integration and communication between the different partners and with international experts in the field of marine management. The project aims at improving the visibility, dissemination and exploitation of the results of complementary studies about marine incidents management.
Our acknowledgements go to the Belgian Science Policy for their financial support and all the members of the 'end-users committee' for their participation to the international conference.

On behalf of the MIMAC-team

Annemie Volckaert
Co-ordinator of the MIMAC project

INTRODUCTION

MIMAC brings together two projects: RAMA (Risk Analysis of Marine Activities in the Belgian part of the North Sea) and DIMAS (Development of an Integrated Database for the Management of Accidental Spills). Both projects are focused on different aspects of marine accidents. The first project deals with the analysis of the risks and hazards related to shipping, the potential environmental impact of spills and the development of recommendations for improvement of existing contingency plans. The second project aims at developing a database of priority contaminants relevant in case of marine accidents and spills, amendable for interpretation, providing reliable, easy to interpret and up-to-date information on marine specific issues.

A first objective of the cluster is to create added value through a structure which will increase and optimize the already existing communication and interaction between the different partners in both projects thereby avoiding duplication and overlap of efforts and data generation. It will integrate the results and data of both projects. This has been attained through the organization of official and informal partner meetings. In these meetings focus lied on harmonization of data, methods and results as well as on the joint identification of knowledge gaps. This in its turn has led to more efficient data gathering and increase in the width and relevance of both projects.

The cluster also aims at improving the visibility, dissemination and exploitation of the results of both projects by international networking, improving participation of potential end-users and integrating recommendations to policy makers. This has led to the creation of a cluster website and the organization of an international conference. On the international conference the integrated results will be presented and guest speakers with different background (scientists, policy makers, port authorities, administrators, response and care professionals) have been invited.

Finally MIMAC has given the possibility to explore opportunities to combine the expertise of both project teams in further research projects.

The results of the objectives have been combined into an integrated report. First of all a brief summary is given of both the RAMA (chapter 1) and DIMAS (chapter 2) project. In chapter 3, attention has been given to the interactions between the two projects that have resulted in an added value of both projects. The final chapter (chapter 4) includes the programme of the international MIMAC conference and the contributions of the guest speakers (extended abstracts).

RISK ANALYSIS OF MARINE ACTIVITIES IN THE BELGIAN PART OF THE NORTH SEA (RAMA)

ANNEMIE VOLCKAERT

RISK ANALYSIS OF MARINE ACTIVITIES IN THE BELGIAN PART OF THE NORTH SEA (RAMA)

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The Belgian Part of the North Sea (BPNS) is an intensely used marine area. It is a rather small part of the southern North Sea but nevertheless it contains one of the most intensive merchant shipping routes in the world. Besides shipping it is also used for a wide and increasing variety of human activities. All these human activities are posing a certain danger to the environment. However, the frequency of incidents with environmental damage and the severity of these are only poorly known.

The interest and engagement of society to improve the quality of the sea and the coast and to protect the marine environment has led at national and international level to increased attention. This is shown among others by recent changes in the EU legislation and steps taken by the EC to speed up enforcement of the ERIKA regulations. It also shows from points in the Bergen declaration of the 5th North Sea Conference in which the Ministers invited OSPAR to develop an appropriate system of risk assessment and risk profiles connected with relevant human activities (e.g. shipping and aquaculture) in particular regions and localities. Besides this, they also pointed toward the importance of risk reduction relating to hazardous substances and the need for action to reduce the risks and minimise adverse effects on ecosystems, habitats or naturally occurring species. At present, the Bonn Agreement is also considering ways in which relevant environmental considerations could be established in trans-boundary pollution response incidents in the North Sea area. The Bonn Agreement concluded that a key issue to that respect is the establishment in advance of knowledge about environmental sensitivities within the North Sea area and the development of and exchange of information on environmental sensitivity mapping.

To be able to keep the risk (the product of probability and impact) of unwanted incidents as low as reasonably feasible and/or acceptable, appropriate measures, both technical and organizational, need to be defined and taken. However, such preventive and mitigating measures can only be taken on the basis of a sound analysis of the risks involved.

It is in this light that RAMA 'Risk Analysis of Marine Activities in the Belgian Part of the North Sea' was funded by the Belgian Science Policy (BELSPO), in the framework of the Second Scientific Support Plan for a Sustainable Development Policy (SPSD II).

RAMA aims to assess the environmental risks of spills by commercial shipping activities on the Belgian Part of the North Sea (BPNS).

Methodology (chapter 1)

Within the quantitative and qualitative approaches of risk assessment a wide range of methods exists, each with its own characteristics, advantages and disadvantages and fields of application. Despite the diversity of approaches, we can state that in general 7 steps can be identified in an Ecological Risk Assessment (ERA): Problem Formulation, Hazard Identification, Release Assessment, Exposure Assessment, Consequence or Effect Assessment, Risk Characterization and Estimation and Risk Evaluation.

Whatever method chosen, two major topics that need to be taken into account throughout each consecutive step of the risk assessment are (1) uncertainty rating and (2) quality assessment of the input. Identification of potential gaps is also an important topic of risk assessment in order to assure the quality and relevance of the available information.

Problem formulation and hazard identification (chapter 2)

At the Belgian part of the North Sea several human activities take place that are posing a certain danger to the marine environment. Shipping as major contributor to marine incidents resulting in environmental damage has been the focus of the RAMA project.

The RAMA project focuses on the shipping lanes on the BPNS (excluding the traffic in the Scheldt). An inventory of the shipping activities from the total Belgian Continental Shelf (BCS) could not be made due to missing activity data of the northbound fairway of the Noordhinder TSS. This bottleneck will be solved in the future because AWZ will map activities from sea-going vessels on the BPNS with the Automatic Identification System (AIS).

In total 57.791 voyages (or about 320.000 ship movements) took place on the shipping routes of the BPNS for the period April 2003-March 2004. The general conclusions of the shipping analysis are:

- 40% of the transport on the BPNS consists of dangerous goods (oils and Hazardous and Noxious Substances (HNS)) (total 149.653 CTSMRS (CTSMRS =Cargo Type Ship Movements per Route Segment);
- 60% of the dangerous transport is in packaged form (ST4, 6-8), 40% in bulk (ST1-3, 5) (ST= Ship Type);
- the average quantities of dangerous goods per CTSMRS for bulk transport are higher (up to 40.000 ton) than for packaged transport (up to 3.800 ton);
- 74% of transport is done with ship type 1 (oil tankers), ship type 4 (RoRo + car carriers + Ropax) and ship type 7 (container ships);
- cargo type 7 (HNS with low environmental danger) accounts for an average of 45% of the dangerous good transports;
- the products with the highest environmental risk (CT1 & CT2) are mainly transported in oil tankers (ST 1), chemical tankers (ST 2) and container ships (ST 7). The maximum share of both products (4%) is taken by the oil tankers.

Release assessment (chapter 3)

Release assessment is the identification of the potential of the risk source to introduce hazardous agents (oil and HNS) into the marine environment. The quantitative estimation of the probability of release has been approached from both the historical and the modelling approach.
Despite the long-time series of historical accidents (1960-2003), a release assessment based on the historical approach is considered inadequate due to lack of relevant spill quantity data, difference in reporting trends which may lead to an underestimation of number of accidents, etc. Therefore a release assessment based on the MARCS model has been worked out for the Belgian Part of the North Sea (BPNS) based on the ship movement analysis described in chapter 2.

The results of the marine risk analysis of the BPNS show that:

- risk parameters, such as accident frequency (accidents per year) and cargo spill risk (tonnes of cargo spilled per year) tend to follow the number of vessel-miles defined in the shipping pattern input data. The quality of this input data is therefore of critical importance to the output from this risk analysis;

- the risk reduction measures that are predicted to be effective are those that may reduce the frequency of powered grounding and collision accident types, such as pilotage, vessel traffic services and traffic separation schemes;
- the total frequency of dangerous goods spilling accidents is once every 3 years;
- the highest risk is predicted in subarea SA3 (the entrance of the Scheldt Estuary);
- the highest risk is predicted to arise from spillage of Class 8 from containers;
- cargo spill risks of the two most dangerous product classes vary between 12,3 tonnes per year (Class 1: Marine Pollutants + category A products) and 101 tonnes per year (Class 2: crude oils).

Description of the effects of the incidents (chapter 4)

The analysis of probability of occurrence of incidents and the release assessment was done for 8 different ship types (ST), 7 types of accidents and 10 cargo types (CT). A discussion of the effects of all these scenarios is unfeasible in the timeframe of the project and a selection of two incident scenarios was made:

- worst case scenario of an oil spill (crude oils (CT2); 17.000 ton/accident);
- worst case scenario of a HNS spill (acetone cyanohydrine (CT1); 8.000 & 1.000 ton/accident).

The impact analysis is firstly aimed at estimating the impact on different communities. Focus has been directed towards birds, fish and benthic organizms. As far as possible the ecosystem approach is guarded during this impact analysis. If an ecosystem approach was not feasible for certain incidents, indicator species are used to estimate the impact.
To be able to assess correctly the impacts, a sensitivity-analysis is carried out that includes besides biological values also socio-economic parameters. The sensitivity analysis is set up to identify the vulnerable areas in the coastal and marine zone of Belgium. As the interests (sensitivity) of the different users of the BPNS vary in time, three different scenarios leading to different sensitivity maps have been identified as the impact and response to a spill will also depend on these seasonal interests:

- general scenario: a scenario in which all parameters are evenly important;
- summer scenario: a scenario in which the tourist and recreational values of the coastal and marine areas have been given special attention;
- winter scenario: a scenario in which the nature values (wintering-, foraging- and spawning areas) of the coastal and marine areas have been given special attention.

In general, the western part of the Belgian marine zone (Flemish Banks area), the area around the harbours of Zeebrugge and Oostende neighbouring the important coastal municipality Blankenberge-De Haan are the most sensitive zones for spills in terms of ecological (focus marine waters/ winter scenario) and socio-economic value (focus coastal municipalities/ summer scenario).

The presented sensitivity maps must be seen as dynamical maps. In the GIS-based methodology the sensitivity scores can be adapted according to the needs or the availability of new data/ parameters. So as more detailed or new information becomes available, especially in GIS format, the sensitivity analysis can be updated and refined.

The effect analysis of the selected scenarios is restricted to an ecological impact assessment. The effect analysis is subdivided into three ERA steps:
- exposure assessment quantifying the Predicted Environmental Concentration (PEC) based on the calculated release rates and spill models;
- the consequence assessment estimating the consequences or effects of release in terms of the Predicted No Effect Concentration (PNEC) or the 50% mortality Concentration (LC50);
- the risk characterization (ecological impact) based on the PEC/PNEC or PEC/LC50 ratio.

Due to lack of quantitative data assumptions have been made in both scenarios (oil & HNS). Furthermore, in contrast to oil spills, a specific operational chemical model estimating the magnitude of the HNS spill does not currently exist in Belgium. The best approach is however being obtained by using the sediment transportation model as a basis for the chemical spilled. So the ecological impact assessments can certainly be improved. However the results can be interpreted as representing worst case effects and show the possible outcomes/magnitude of a selected oil and HNS spill. It is a first attempt of ecological impact assessment of both an oil and HNS spill and should be refined when new methodologies become available.

The effect of oil and chemical spills is different. Oil spills have an effect both at open sea and at the beach (stranding), while the effect of a HNS spill is generally limited to the marine area. In contrast to HNS spills, oil spills have a severe impact on the bird population. In our case study the total number of bird casualties is estimated at about 471 birds (open sea) and 3336 birds (Zwin). Due to the physico-chemical characteristics of the hazardous products the assessment of the ecological impact area is also different. A generalisation of results is thus not possible.

Risk estimation (chapter 5)

The overall estimation of the risk is defined as the multiplication of the consequence for each damage-causing event with the frequency of that event. The frequency of an event is a result of the hazard identification and release step (Chapter 3). The consequence of a damage-causing event is usually defined as casualty probabilities [direct loss (mortality)] (Chapter 4).
The risk of commercial shipping at the BPNS can be summarized as follows:
- the highest risk can be found in the high risk subareas SA3, SA5, SA6, SA7 (range once every 13 (SA3) to 43 (SA6) years) characterized by sandbank formations and/or presence of harbour (intense shipping traffic is not the determining factor [e.g. SA1 (every 119 yr)] ;
- in the first place oil tankers and container ships pose a high risk for almost the total BPNS due to the fact that they transport the most hazardous cargo types (60% of CT1 and 97% of CT2) and that in case of a spill accident high quantities of dangerous goods are spilled at sea (related to high transported quantities) [Max. cargo spill quantity per year in SA3: 124 ton (oil tankers) & 247 ton (containers)];
- secondly also transport with chemical tankers and RoRo traffic are risky, in particular in the high risk subareas, respectively due to the hazardous characteristics of the products transported by chemical tankers (notice the low spill quantity) and a medium frequency (Max. in SA3: every 150 yr) and spill quantity (Max. in SA3: 24 ton/yr) of accidents with RoRo ships;
- the risk from bulk, general cargo and other (passenger ships & other ships) transport is rather low.

Examination and recommendations of existing contingency plans (chapter 6)

The valorisation of the RAMA project results in a thorough analysis of the current status of the shipping at the North Sea in relation to the issue of safety. The scope of the project will however go beyond the mere result of a fundamental risk analysis of the commercial shipping at the North Sea. It is also aiming at the formulation of recommendations to improve the safety level for the environment and at an optimisation of response in the framework of the Belgian 'North Sea Disaster Plan'. These recommendations are part of the remaining chapter of the RAMA report.

Final report

The final report, figures and additional information can be found on the webpage of the RAMA project: http://www.vliz.be/projects/RAMA/

DEVELOPMENT OF AN INTEGRATED DATABASE FOR THE MANAGEMENT OF ACCIDENTAL SPILLS (DIMAS)

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DEVELOPMENT OF AN INTEGRATED DATABASE FOR THE MANAGEMENT OF ACCIDENTAL SPILLS (DIMAS)

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Introduction

The North Sea is one of the most productive ecosystems in the marine environment, but significant input of toxicants from very diverse sources occurs which may harm this ecosystem. Up till now, little attention has been paid to sea-based sources of pollution (e.g. accidental spills or leakage from platforms). Although most of the public interest has gone to oil spills and the quantity of chemicals transported is substantially less than oil, the potential harm for the marine environment from a given amount of chemicals spilled can be several orders of magnitude greater. Many of the chemicals transported by sea are highly toxic and/or persistent, can bioaccumulate or cause long-term effects. In case of an accident at sea, it is important that accurate information on environmental partitioning, bioavailability, (eco)toxicity is immediately available. A number of databases on physical and chemical properties of chemicals have already been developed, but little attention has been paid to specific issues such as the impact on marine life, environmental fate and bioaccumulation in marine food chains. Most often the interpretation is left to the expert user of the database. Should an accident occur in which substances are discharged into the sea, threatening to be washed up on the beach or even spilled by transportation over land, a prompt reaction to the calamity is essential in order to minimize the potential damage. The choice of effective measures to abate the pollution will depend to a large extent on the direct availability of reliable and up-to-date information on the fate, hazards and risk management procedures to be taken for the spilled product. In this regard it is imperative that all relevant information is made available in a proper format that is easily accessible and interpretable for all stakeholders concerned including the non-expert.

Database development

A tool in which environmental data of specific marine pollutants is made available to a broad range of possible end-users has been developed in the DIMAS project. Since the tool should facilitate and support the decision making in case of an accidental spill, involvement of different stakeholders belonging to different organizational levels was a prerequisite so that specific concerns over the complete chain of command could be taken into account. This was reflected in the composition of the proposed users committee that consisted of representatives of federal and municipal administrations, scientists, port authorities, clean-up and care professionals etc. As such it could be ensured that the developed database is tailored to the needs of the different end-users.
The project itself consisted of 4 consecutive phases:

- Identification and selection of the most important contaminants at the Belgian coast, the Belgian Continental Shelf and the Scheldt Estuary.
- Collection of physico-chemical and ecotoxicological information regarding the selected contaminants.
- Evaluation and interpretation of the gathered data.
- Development of an integrated database with a graphical user interface and modelling of the ecotoxicological data.

Phase 1: Identification and selection of the most important contaminants at the Belgian coast, the Belgian Continental Shelf and the Western Scheldt

The value of an environmental risk assessment depends to a large extent on the availability of reliable and up-to-date information. Since it would have been an enormous task to collect data for all hazardous substances that could be of possible concern to the marine environment, it was deemed necessary to restrict the current project to those substances relevant for the Belgian coast, Belgian Continental Shelf and the Scheldt Estuary that would be of highest concern for immediate action. Thus, in the first phase, the priority contaminants were listed to be included in the database. Selection was performed based on criteria such as bioaccumulation potential, toxicity, persistence, frequency of involvement in accidental spills, frequency of transport over sea and volumes transported. Furthermore, the intrinsic presence of contaminants in ships and the occurrence of contaminants in dumpsites were taken into account. This list was compared with other existing priority lists (OSPAR priority lists, ENECE POP list, EU Water Framework directive etc.) and validated against transport data from harbours. An overview of lists and databases used for selecting substances is given in Fig. 1.

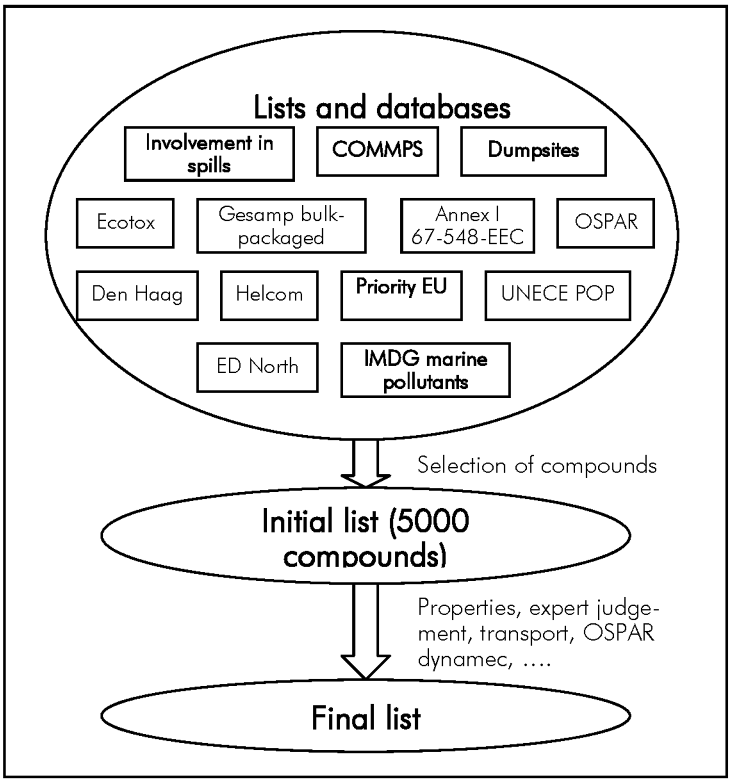

Fig. 1. Selection of substances.

Phase 2: Collection of physico-chemical and ecotoxicological information regarding the selected contaminants

In the second phase an extensive literature search was performed to gather all information necessary for the database. For each of the compounds, data were collected on physico-chemical properties, ecotoxicology, human effects and GESAMP hazard profiles. Most data on acute, subacute and chronic effects at different trophic levels (fish, algae, plants, invertebrates, micro-organizms) were gathered from international scientific literature. Next to peer reviewed literature, existing databases, national and international reports, research programmes etc. were searched.

- Physico-chemical properties were collected from ECB-ESIS (European Chemicals Bureau – official European chemical Substances Information System, containing IUCLID Chemical Data Sheets and Risk Assessment Reports), NSDB (Nordic Substance Database) and peer reviewed literature.
- Ecotoxicological data were mainly gathered from ECB-ESIS, the US-EPA ECOTOX database (US EPA, former AQUIRE database), the ED-North database (database on Endocrine Disruptors in the North Sea), the UGent ECOTOX database (with properties and risk and safety phrases of chemicals transported over the North Sea and ecotoxicological profiles on these chemicals) and peer reviewed literature. Water as well as sediment data were assembled on ecotoxicology. Since marine data were scarce for most compounds, freshwater data were also gathered to allow read across.
- Human toxicological data were mainly gathered from the UGent ECOTOX database and ECB-ESIS.

Phase 3: Evaluation and interpretation of the gathered data

In the third phase quality and relevance of the gathered data were assessed. This was of utmost importance for the data compiled on the effects on marine biota. Therefore, a detailed quality screening of marine data and a rough quality screening of the (less relevant) freshwater data were carried out. The marine data were classified based on the availability of the following information: performance of the tests according to internationally accepted procedures, information on the 'control', information on the test concentration range, availability of information on test characteristics, statistical analysis of the reported dose-response relationships and information on the analytic performance. Only relevant (marine) data that met high quality standards were used in the database. Procedures for risk management were also included. A broad range of organizms and endpoints were assessed, but if insufficient data for the marine environment were available, results from freshwater studies were used. Quality screening for freshwater studies was more limited than for the saltwater studies because the high number of freshwater data did not allow such a high detail level within the framework of the current project. Thus, freshwater data were given a quality score ('reliable', 'reliable with restrictions' or 'not fully verifiable') depending on the data source (e.g. data from EU risk assessment reports are classified as reliable whereas data from the US-EPA ECOTOX database are considered not fully verifiable).

Phase 4: Development of an integrated database with a graphical user interface and modelling of the ecotoxicological data

In the fourth phase the relational database with a graphical user interface was developed. Data were stored in a relational Access database (see Figs 2 and 3). The advantages of using a relational database over typical archive techniques are the powerful querying capabilities, ease for importing and exporting data in a variety of formats, and faster access to data. The database is made accessible to all end-users (experts and non-experts) as a fully web-enabled searching database using a simple graphical user interface and is retrievable via the project website (http://www.vliz.be/projects/dimas). In case of accidental spills, all end-users, public services, media and the general public will be able to easily gather objective, quality-assured information.

Information that was entered in the database includes physico-chemical characteristics of the compounds (physical state, melting point, boiling point, density, solubility, vapour pressure, log Kow, …), acute and chronic ecotoxicological data on different marine and freshwater species, risk and safety phases and GESAMP hazard profiles.

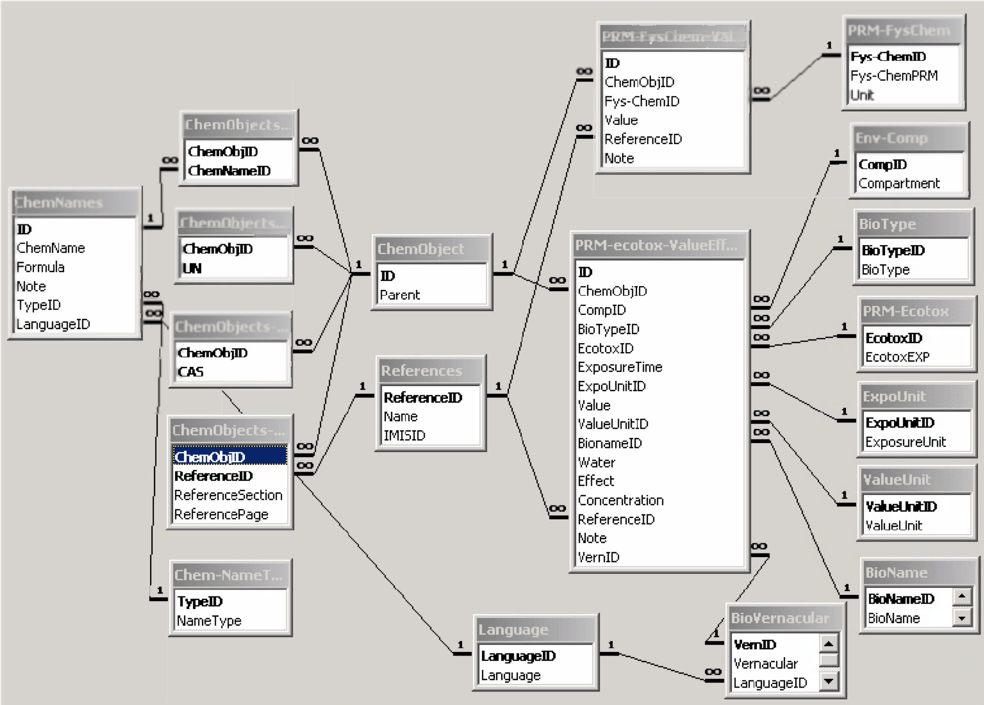

Fig. 2. Structure of the DIMAS database in Access.

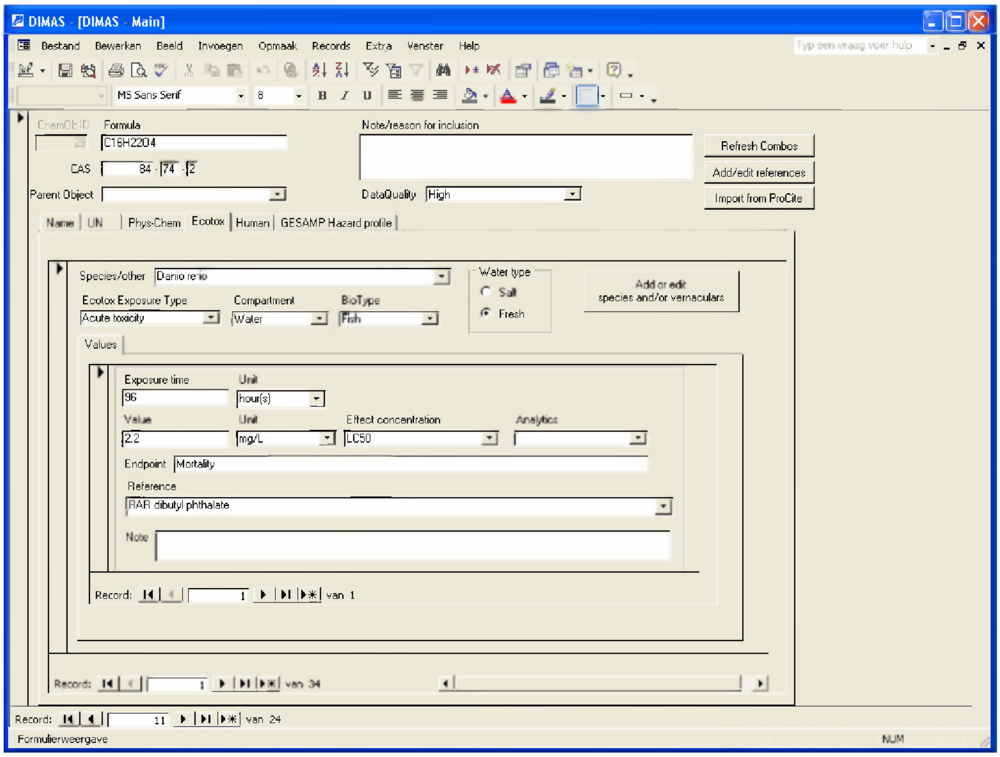

Fig. 3. DIMAS database in Access.

Based on the amount of the compound spilled and the physico-chemical properties of the compound, the water- or sediment concentration after an accidental spill is estimated (exposure modelling). To facilitate interpretation of the toxicity data, all relevant effect data for a given compound are modelled and visualized in PAF-curves (Potentially Affected Fraction) or compiled in a Predicted No Effect Concentration (PNEC). An example of a PAF-curve is given in Fig. 4. This curve allows an estimate of the % species that would be affected at a certain environmental concentration and can be calculated for acute and chronic data.

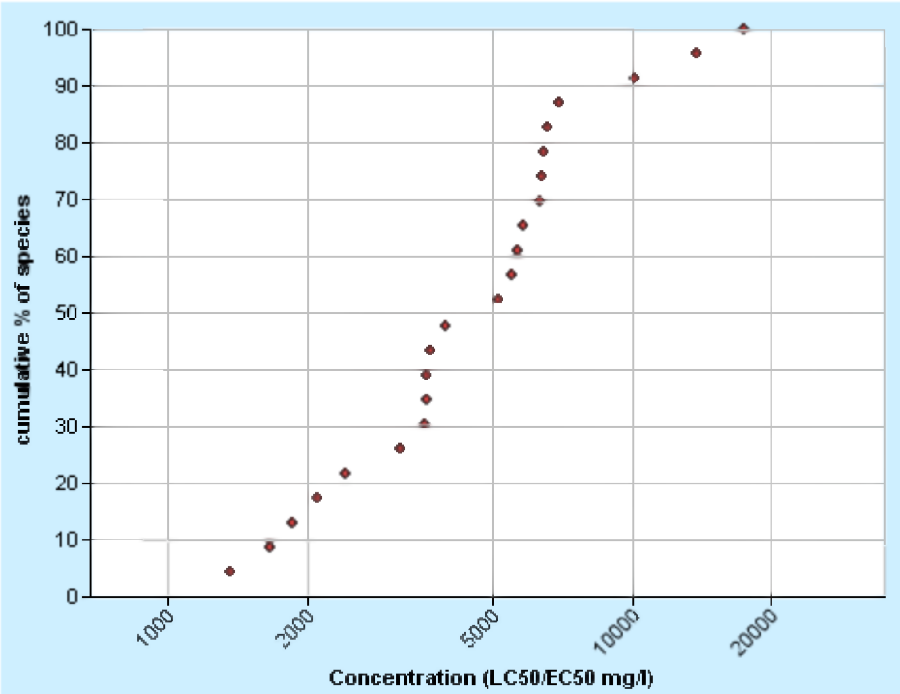

Fig. 4. PAF curve for acute effects acetonitrile (acute LC_{50} or EC_{50} plotted against the cumulative % of species).

The last step in the modelling part of the DIMAS project, was the environmental partitioning modelling. It is very important to estimate which of the compartments (water, sediment, air, biota or soil) is most affected by a chemical spill. This can be done by modelling the behaviour of the compound in the environment. For this purpose, the approach developed by Mackay *et al*. (1996abc) was integrated in the DIMAS database.

Mackay et al. (1996abc) describe a multimedia equilibrium criterion model (fugacity model), which can be used to evaluate the environmental fate of a variety of chemicals. The model treats chemicals that fall into three categories. In the first category the chemicals may partition into all environmental media, in the second they are involatile, and in the third they are insoluble in water. The model consists of level I, II, and III calculations. By sequentially doing level I, II and III calculations, increasing information is obtained about the chemical's partitioning, its susceptibility to transformation and transport, and the environmental process and the chemical characteristics that most influence chemical fate. Level I estimates the equilibrium partitioning of a quantity of organic chemical between the homogeneous environmental media with defined volumes, densities, organic carbon contents, and lipid fraction. There are no in- or out-flows of chemical, and no degrading reactions occur. Level II is similar to the Level I described above, but is a steady state model with a constant input rate, rather than single dose of chemical. There is both advective in- and out-flow of chemical from the unit world. Chemical losses can also occur through degrading reactions. Level III does not assume an equilibrium state, but only steady state. The program uses conventional expressions and typical parameters for intermedia transfer by processes such as wet deposition from the air, sediment deposition in the water, and soil runoff. However, for the DIMAS database, only level 1 calculations are performed as these require the least input information. Output data give a picture of the chemical's fate in an evaluative or generic environment. For DIMAS, the standard environment was adapted, by virtually eliminating the soil compartment.

For each of the compounds in the database, environmental partitioning can be modelled if enough input data is available (molecular weight, water solubility, vapour pressure, melting point, log Kow). The output of the environmental fate modelling is a partitioning of the compound between air, aerosols, water, sediment, suspended sediments, and biota (fish).

Dissemination

Active dissemination of the compiled information is of key importance for increasing public awareness and understanding by all stakeholders. This is done through a variety of means, e.g. publication of reports and through a project and cluster website, but the true valorisation of the results consists in the use of the integrated and multi-disciplinary database embedded in a fully web-enabled searching graphical user interface (http://www.vliz.be/projects/dimas). Data accessibility is improved by using standard formats simplifying data retrieval and use. As such the tool will increase transparency and allow for rapid communication. Furthermore, the output compatibility with already existing impact models was taken into consideration. The first beneficiaries of this tool are the people directly involved in the first phase of a contingency plan for an accidental spill. As such, initial decision making will be facilitated, for example when concerning the level to which the organization should be alerted or mobilized, whether action is required etc. The final indirect beneficiaries are the general public (scientists, journalists, general public, etc.) who will be better informed about the potential impact to man and the environment and ultimately better protected.

INTEGRATION RAMA & DIMAS

ANNEMIE VOLCKAERT, BRAM VERSONNEN, KATRIEN ARIJS & JAN-BART CALEWAERT

INTEGRATION RAMA & DIMAS

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Introduction

This cluster brought together two projects, *i.e.* EV/36: Risk Analysis of Marine Activities in the Belgian part of the North Sea (RAMA) and EV/41: Development of an Integrated Database for the Management of Accidental Spills (DIMAS). Both projects focused on different aspects of marine accidents. The first project dealt with the analysis of the risks and hazards related to shipping, the potential impact of spills and the development of recommendations for improvement of existing contingency plans. The second project aimed at developing a database of priority contaminants relevant in case of marine accidents and spills, amendable for interpretation, providing reliable, easy to interpret and up-to-date information on marine specific issues. The most important parts of this database are the quality-assured direct and indirect effects on marine biota.

Objectives

The objectives of the cluster were:

- to create a structure which will increase and optimize the already existing communication and interaction between the different partners in both projects;
- to avoid duplication and overlap of efforts and data generation and integrate the results and data of both projects;
- to increase the visibility, dissemination and exploitation of the results by international networking, improving participation of potential end-users and integrating recommendations to policy makers;
- to create added value both for the researchers as well as for the end-users of both projects;
- to minimize gaps in the knowledge by mutual exchange of specific information and data relevant for each others project;
- to explore opportunities to combine the expertise of both project teams in further research projects.

Results

More structured co-operation (objective 1, 3, 4)

A structured co-operation was attained through the organization of official and informal partner meetings. In these meetings focus lied on harmonization of data, methods and results as well as on the joint identification of knowledge gaps. This in its turn has led to more efficient data gathering and increase in the width and relevance of both projects.

Overall, the official as well as the informal meetings were considered very useful by the different partners within the cluster:

- Both projects were clearly optimized in terms of avoiding overlap (e.g. sending out questions to the port authorities, environmental fate and distribution modelling, gathering effects data…).
- The interaction led to a number of new multi-disciplinary concepts for knowledge gaps in the DIMAS and RAMA projects as well as for future project proposals (mainly in terms of database structure, fate and distribution modelling; see also *'Further research'*).
- An active exchange of data between Ecolas and Euras has taken place. As indicated in Fig. 5 below, data on transported cargo and the resulting list of relevant dangerous goods were needed by both projects.
- Based on the shipping and cargo data gathered in the RAMA project, Euras was able to make up a dangerous goods cargo list of relevant products transported in the Belgian Part of the North Sea. In the DIMAS project, an extended list of compounds was drawn based on physico-chemical properties, intrinsic (eco)toxicity, occurrence on priority lists. From this extended list, the final list with compounds to be fully evaluated in the DIMAS project was made, based on for instance intrinsic properties and – more importantly – on transported quantities. The frequency and quantity of transportation over the North Sea was obtained from the RAMA project and checked with data from the harbour of Ghent.
- Ecolas on its turn, used the ecotoxicological knowledge of Euras for its effect analysis. Three incident scenarios were selected for the effect analysis and the ecotoxicological data of the dangerous cargo used in these scenarios were delivered by Euras. In this way, the quality assurance of the ecotoxicological data will be integrated in the impact analysis of potential spills. Further, the scenario development and choice of marine distribution model parameters in the RAMA project was performed after an informal meeting of Euras, Ecolas and MUMM where possible options and realistic scenarios were thoroughly discussed.

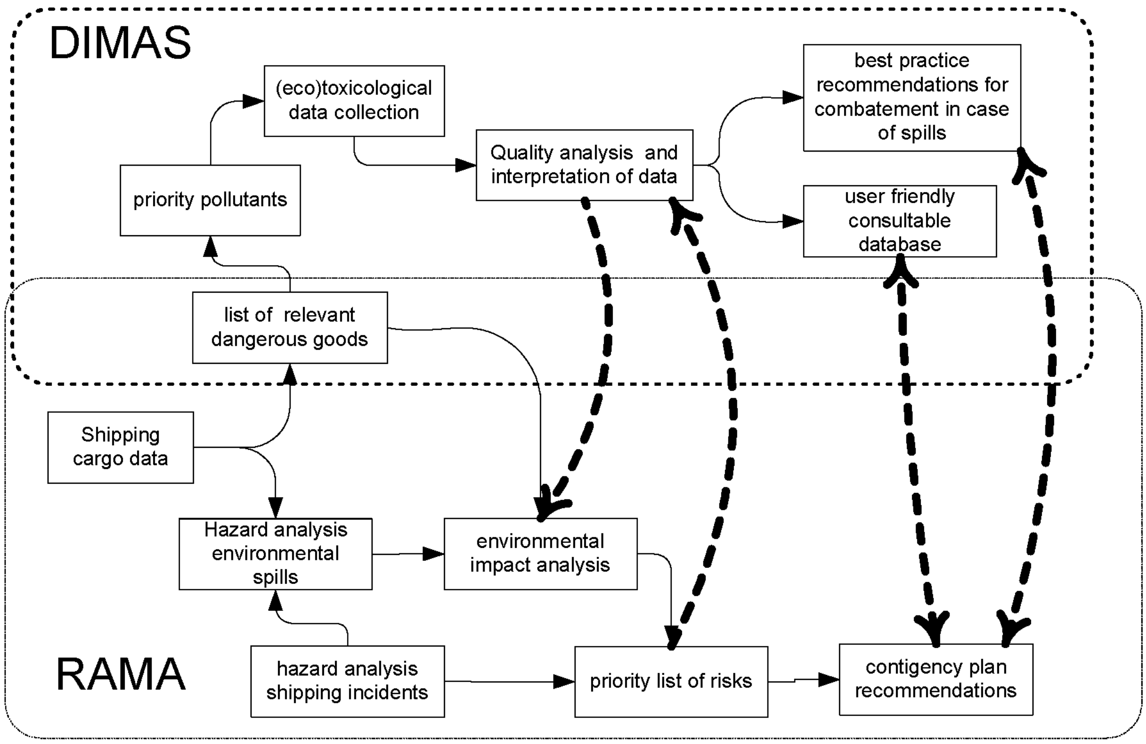

Fig. 5. Overview of the clustered project with mutual relationships.

Integration of results (objective 2)

The integration of results of both projects resulted in the present policy oriented integrated report. This report combines the relevant results and reports in an understandable language. The cluster also aimed at improving the visibility, dissemination and exploitation of the results of both projects by organizing a joint end-user meeting, the creation of a cluster website and the organization of an international symposium. During the partner meetings, it became apparent that a clear communication on terminology between RAMA and DIMAS was also necessary to optimize the integration of the two projects. Therefore, the terminology was made uniform and easy to interpret (e.g. on the website).

Important with respect to policy, is that both the results of RAMA and DIMAS as well as the outcome of the MIMAC symposium are ready to be used in contingency planning. Currently there are some new developments regarding preparedness and response planning related to spills at sea (organizational, operational, administrative). This provides an excellent opportunity to pick up and integrate some of the results and recommendations put forth by both RAMA and DIMAS. The risk analysis of RAMA forms a basis for the evaluation of the degree of preparedness (products, equipment, response) while the database developed within the DIMAS project forms an operational tool that can be used during pollution combating operations at sea.

Knowledge gaps (objective 5)

A number of knowledge gaps were identified and filled in both projects:

- RAMA:
  - data on ecotoxicity for the selected substances in RAMA were not readily available;
  - data on fate of chemicals were not available.
- DIMAS:
  - data on transport were very limited;
  - data on distribution of chemicals were not available.
- MIMAC: even after clustering the DIMAS and RAMA projects, some data gaps remained:
  - more information (modelling) is needed concerning fate and distribution of chemical spills on the North Sea; current modelling efforts are solely focussed on oil spills (see also *'Further research'*);
  - for a number of substances, marine-specific ecotoxicity data are lacking so that extrapolations from freshwater data were needed.

Data gaps for the RAMA and DIMAS projects were filled as much as possible. Through the clustering this could be done without duplication of efforts. Data gaps that are still present are further discussed in *'Further research'*.

Further research (objective 6)

A number of research options are suggested below.

- Ecotoxicological research to obtain ecotoxicity data based on marine species for the transported chemical compounds at the North Sea.
- Development of a new approach to assess environmental impact caused by oil and chemical spills. The methodologies for assessing environmental fate and distribution within DIMAS and RAMA are conservative and can supplement each other. A first attempt within RAMA (using the sediment transportation model) for estimating the spatial distribution of a 'Hazardous and Noxious Substance' (HNS) in water over time is novel, but somewhat limited as it assumes no breakdown of the chemical compound in the environment and does not take environmental distribution in the different compartments (air, water, soil, etc.) into account. The approach followed within DIMAS is also limited as only environmental distribution in a steady state

environment, without breakdown, is taken into account. Therefore following suggestions can be made:

- Development of adequate models for calculating the fate and distribution of chemical spills in the marine environment (ideally also taking into account biotic and abiotic breakdown of the product). Currently such models are not available or routinely used in Belgium (and neighbouring countries). This is in contrast to oil spills, where good models are used to evaluate marine pollution.
- The integration of the approaches of both the RAMA and DIMAS project can form the basis of this new model (Fig. 6):
  - a Mackay-like distribution of the compound in the environment (DIMAS) followed by
  - a spatial distribution in time (RAMA approach).
- Refinement of both of these approaches is however necessary to come to an operational and policy relevant tool.

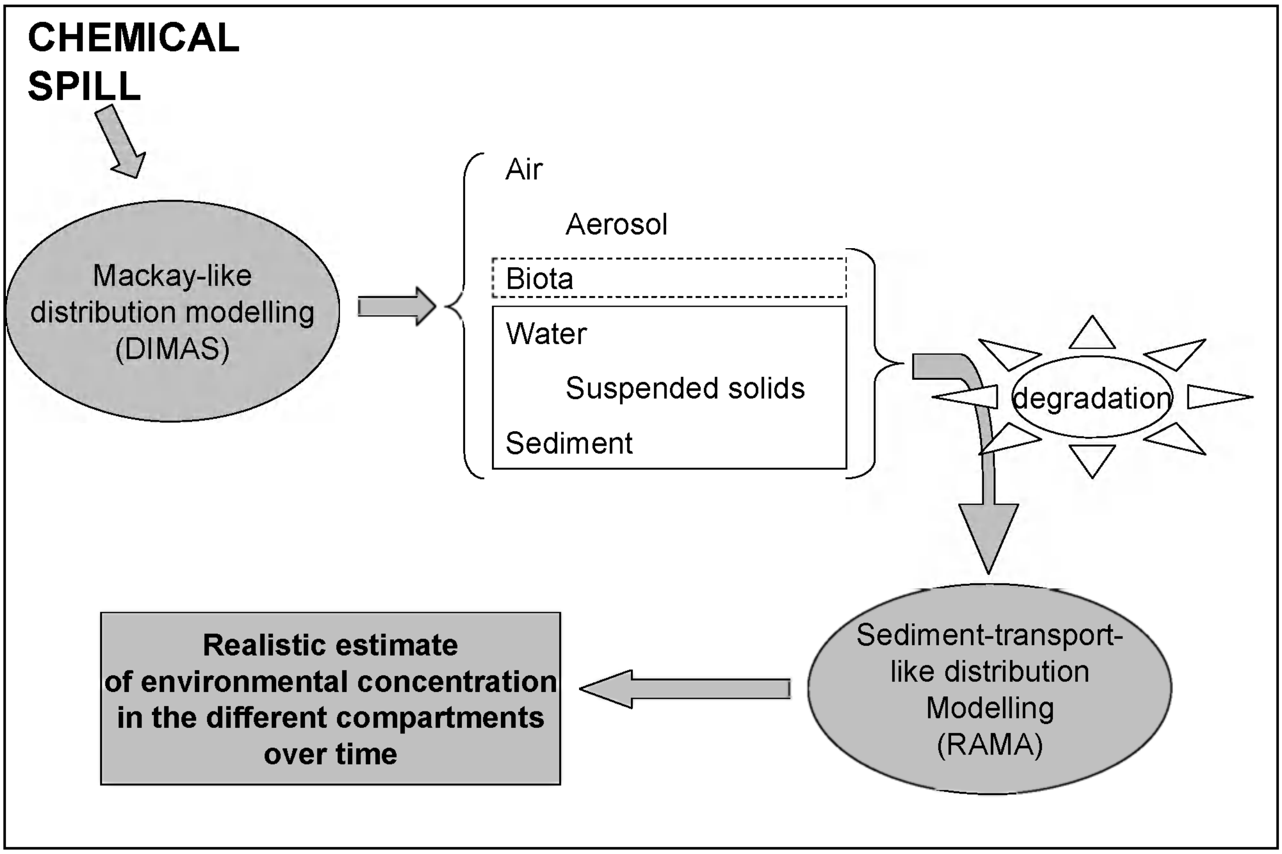

Fig. 6. Schematized approach for a realistic environmental fate and distribution modeling in the case of an accidental spill.

Conclusion

Clustering RAMA and DIMAS was considered to be very successful:

- The integration and bilateral adjustment of methods and data led to more efficient data gathering and increased the width and relevance of both projects by integrating each others experience.
- End-users of one project got acquainted with the results of the other project. They also gave valuable advice for the exploitation of the results by other potential end-users (e.g. data from

Ghent harbour that was obtained in the DIMAS project was cross-checked with transport data from the RAMA project; distribution modelling from the RAMA project was used as a starting point for developing an environmental fate and distribution model in DIMAS).

- Expertise in both projects was complimentary and this cluster brought together experts in environmental law (RAMA), environmental policy (RAMA), impact assessment (RAMA/DIMAS), risk analysis (RAMA & DIMAS), ecotoxicology and toxicology (DIMAS & RAMA), contingency planning (RAMA), database management (DIMAS). This has led amongst other to a number of future research options that are considered crucial in spill management/contingency planning, as discussed in *'Further research'*.

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Mackay D., A. Di Guardo, S. Paterson, G. Kicsi and C.E. Cowan. 1996a. Assessing the fate of new and existing chemicals: a five-stage process. Environmental Toxicology and Chemistry 15(9):1618-1626.

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INTERNATIONAL CONFERENCE
MIMAC 2006

PROVINCIAAL HOF, BRUGES, BELGIUM
19-20 OCTOBER 2006

SCOPE & OBJECTIVES

The North Sea is an intensely used marine area and contains one of the most intensive merchant shipping routes in the world. The interest and engagement of society to improve the quality of the sea and the coast and to protect the marine environment has led at national and international level to increased attention. This is shown amongst others by recent changes in the EU legislation and steps taken by the EC to speed up enforcement of the ERIKA regulations. It is also aligned with the Bergen declaration of the 5th North Sea Conference in which the Ministers invited OSPAR to develop an appropriate system of risk assessment and risk profiles connected with relevant human activities (e.g. shipping and aquaculture) in particular regions and localities. The final aim is risk reduction of hazardous substances. Increased attention is also found in EC environmental policy documents for protection of the marine environment (communication of the European Commission to the European Parliament and Council of Ministers 'Towards a strategy to protect and conserve the marine environment').

To keep the risk of unwanted incidents at sea as low as reasonably feasible and/or acceptable, appropriate measures, both technical and organizational, need to be defined and taken. However, such preventive and mitigating measures can only be taken on the basis of a sound analysis of the risks involved. As marine environmental risks are border-crossing, the approach should have an international character.

Policy makers, scientists and the final users of these risk and contingency plans all have every reason to learn from each other and exchange ideas and practical experience. To achieve this, the MIMAC team has organized a two-day international conference (19-20 October 2006) that focused on the current changes in policy concerning marine intervention and the risk management strategies of the North Sea countries (risk analysis and efficient database management).

PROGRAMME

Thursday 19 October 2006

Welcome and introduction

10.00-10.40: Registration – coffee

10.40-11.00: Welcome by the Minister of Economy, Energy, Foreign Affairs and Science Policy
Marc Verwilghen

11.00-11.20: Welcome by the Minister of Mobility and the North Sea
Renaat Landuyt

11.20-11.40: Introduction to the workshop MIMAC
Dirk Le Roy (Ecolas)

11.40-12.20: Current developments in the risk policy of the North Sea: from a Tripartite to a Quadripartite Bonn Agreement Responsibility Zone
Eric Donnay (FPS Environment)

12.20-14.00: lunch

Risk analysis North Sea – chair: Dirk Le Roy (Ecolas)

14.00-14.25: Risk analysis of marine activities in the Belgian Part of the North Sea (RAMA)
Annemie Volckaert (Ecolas)

14.25-14.50: State of the affairs of risk analysis of the Dutch part of the North Sea
Henk Offringa (National Institute for Coastal and Marine Management, RIKZ)

14.50-15.15: Risk analysis in the French part of the English Channel and North Sea
Jean-Christophe Burvingt (Préfecture maritime de la Manche et de la mer du Nord)

15.15-15.40: Very heavy fuel oils: risk analysis of their transport in UK waters
Kevin Colcomb, Matthew Rymell and Alun Lewis (Maritime and Coastguard Agency)

15.40-16.30: coffee

Risk assessment North Sea – chair: Marnix Vangheluwe (Euras) & Colin Janssen (UG - Letea)

16.30-16.50: Development of an Integrated Database for the Management of Accidental Spills (DIMAS)
Bram Versonnen (Euras)

16.50-17.10: Oil spills: effects and management
Sjon Huisman (RWS –North Sea Directorate)

17.10-17.30: Endocrine disruption in the marine environment
Mike Waldock (CEFAS)

17.30-17.50: Conclusions day 1

20.00: Conference dinner

Friday 20 October 2006

9.30-10.00: Registration & information – coffee

Contingency planning – chair: Frank Maes (UG - Maritime Institute)

10.00-10.30: Tricolor experience in the framework of the Contingency Plan Mancheplan
Jean-Christophe Burvingt (Préfecture maritime de la Manche et de la mer du Nord)

10.30-11.00: The sub-regional contingency plan between Denmark, Germany & the Netherlands (DENGERNETH)
Peter Søberg Poulsen (Admiral Danish Fleet)

11.00-11.30: coffee

11.30-11.50: The national contingency plan for the North Sea 'Rampenplan Noordzee': present state and critical evaluation – Organization
Johan Debyser (Cabinet governor West Flanders)

11.50-12.10: The national contingency plan for the North Sea: the shaping of operational arrangements
Thierry Jacques (Mumm)

12.10-12.30: Plenary session

12.30-14.00: lunch

EXTENDED ABSTRACTS

WELCOME BY MARC VERWILGHEN, MINISTER OF ECONOMY, ENERGY, FOREIGN TRADE AND SCIENCE POLICY

Ministry for Economy, Energy, Foreign Trade and Science Policy
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Our seas and oceans are vitally important for the cultural, social and economic well-being of the world's population. For an effective management of the marine environment, the sustainable use of the marine resources, as well as for the safety at sea, a better understanding is required of both the functioning of this system and of the human activities and their impact on social, economic and ecological levels. Marine research in which attention is given on all these aspects is then an essential requirement for an appropriate management and improvement of the ecosystem.

Since more than thirty years the Belgian Science Policy initiates and supports research programmes concerning the study of the North Sea ecosystem. The general objectives of these programmes are twofold. On the one hand their intent is to strengthen and support the scientific potential in Belgium within the concerned areas of research and in their integration within international research networks. On the other hand their intent is to provide scientific support to the policies of the various government authorities.

It is within the framework of the Second Scientific Support Plan for a Sustainable Development Policy (SPSD-II) that the two concerted actions 'Development of an Integrated Database for the Management of Accidental Spills (DIMAS)' and ' Risk Analysis of Marine Activities in the Belgian Part of the North Sea (RAMA)' were financed by the Belgian Science Policy. These two research projects anticipate on several aspects of accidental pollution in the North Sea.

Together they form the 'Marine Incident Management Cluster (MIMAC)' which objective is to enhance cooperation and synergies between both projects. The current symposium is one of the results of this cluster.

The recent accidents involving the Prestige and the Tricolor and the resulting damage have, insofar as this was still required, underscored the importance of this research.

Knowing the importance of the issue the Belgian Science Policy has devoted around EUR 3.5 million in the frame of the Second Scientific Support Plan for a Sustainable Development Policy (SPSD-II – 2002-2006) to research projects dealing with (accidental) marine pollution and is also actively participating in the ERA-net project AMPERA 'European concerted action to foster prevention and best response to accidental marine pollution'. The objective of this ERA-net project amongst others is the opening of the national research programmes on accidental marine pollution. The participation to this ERA-net project will give a considerable added value to the research projects and research groups financed by the Belgian Science Policy. Firstly opportunities will be given, to the financed research groups, to collaborate with foreign researchers via the creation of international clusters of financed projects around the same topic. Secondly it will be possible for Belgian scientists to work in multinational projects that will be financed through joint calls organized by the AMPERA partners.

The topic (accidental) marine pollution makes also part of the research lines of the domain North Sea in the new research programme 'Science for a sustainable development (2005-

2010)'. This programme is the continuation of the SPSD-II. A budget of EUR 8 million will be devoted for marine research for the coming 4 years. The first projects will start at the end of 2006.

WELCOME BY RENAAT LANDUYT, MINISTER OF MOBILITY AND THE NORTH SEA

Ministry for Mobility and the North Sea
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1000 Brussel, Belgium

The Belgian part of the North Sea, although relatively small, is an intensely used marine area. It is crossed by some of the busiest shipping routes in the world linking the great harbours of Northwestern Europe with the rest of the world. When, on one hand, maritime transport is of vital importance for our economy, on the other hand, such a high concentration of vessels represents a significant risk of shipping accidents and marine pollution.

The last decade has been characterized by a continuous growth of the shipping traffic in the North Sea, both in terms of number of ships and in terms of increase of ship size. By the same time the volumes of transported oil and other hazardous substances have increased significantly. These substances could cause serious harm to the marine environment if spilled at sea. Experts foresee that these trends will continue during the coming years.

This situation clearly asks for a major concern for the protection of the North Sea ecosystems, which are known to be very important from an environmental point of view but are also very vulnerable. It is therefore the responsibility of the authorities to make sure that the risk of accidental marine pollution caused by ships and its associated negative impact on the marine environment are kept to a minimum and this, without impairing the economic function of shipping transport.

The prevention of shipping accidents is the first priority. This is mainly addressed by measures taken at international and European level aiming at improving the safety of vessels as well as the safety of navigation in the North Sea. However, the risk of an accident causing a major marine pollution will never be completely eliminated. It is therefore necessary to be well prepared to respond efficiently to maritime disasters in order to limit and mitigate the damage to the marine environment. Since a few years Belgium can rely on a national stockpile of pollution combating equipment that can be deployed at any time in order to respond to maritime emergencies. The response is organized according to the provisions of the national contingency plan, the disaster plan for the North Sea (Rampenplan Noordzee), and takes place in the regional cooperation framework of the Bonn Agreement. The ratification by Belgium of the international Convention for Oil Pollution Preparedness, Response and Cooperation (OPRC, 1990), together with its Protocol on Hazardous and Noxious Substances (HNS protocol), which is due to be completed soon, will strengthen the legal basis of a Belgian operational pollution response capacity and bring new obligations for regional cooperation in this field. Most of the OPRC requirements are already met by the active participation of Belgium in the Bonn Agreement.

Taking all this into account, it is clear that the results and recommendations of scientific studies such as RAMA and DIMAS represent valuable information for assisting the political decision-makers in their task of developing adequate strategies for the prevention of shipping accidents and the protection of the environment against ship-sourced pollution in the marine areas under Belgian jurisdiction. In my quality of federal minister for the North Sea, I welcome the work carried out within these two projects linked together under the MIMAC umbrella, as a support to my commitment for a safer and cleaner North Sea.

CURRENT DEVELOPMENTS IN THE RISK POLICY OF THE NORTH SEA: FROM A TRIPARTITE TO A QUADRIPARTITE BONN AGREEMENT RESPONSIBILITY ZONE

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Abstract

The intense shipping traffic in the North Sea results in a high risk of ship-sourced marine pollution. The Bonn Agreement offers an operational framework for regional cooperation between North Sea countries against pollution of the sea by oil and other harmful substances. The Tripartite joint responsibility zone established under this agreement between United Kingdom, France and Belgium in the southern part of the North Sea is an important instrument of this cooperation. The recent decision to extend the Bonn Agreement Tripartite zone to a Quadripartite zone through the participation of the Netherlands offers interesting perspectives for reinforced cooperation and better coordination of the national strategies for dealing with marine pollution response preparedness in the southern part of the North Sea. This on-going development will help the four countries concerned to be better prepared to meet the challenge of the increasing risk of marine pollution posed by the continuous growth of shipping in the North Sea, which is associated with an increase of the quantities of heavy oils and harmful or noxious substances carried on board vessels.

Background

When on 18 March 1967, the tanker *Torrey Canyon* ran aground on Seven Stones reef, west of Cornwall, United Kingdom, she caused the first major marine oil spill disaster in history. Since it was the first time, no plans had been prepared beforehand to deal with it. Unsuccessful attempts were made to contain and combat the oil spill such as dropping napalm in an attempt to burn the oil or spraying large amounts of detergents, which later proved to be inefficient and very toxic for the marine organisms. The Cornish and part of the French coast were contaminated and a great number of sea birds were killed. On that occasion, the public became aware of the dramatic impact of oil pollution on the marine environment. Furthermore, the authorities learned from the *Torrey Canyon* disaster that there was a real need to develop specific response techniques and equipment for dealing with oil spills at sea as well as to establish international cooperation mechanisms in this field. It is therefore not by coincidence that the eight countries bordering the North Sea (United Kingdom, Norway, Sweden, Denmark, Germany, the Netherlands, Belgium and France) decided in 1969 in Bonn, Germany, to sign an 'agreement for cooperation in dealing with the pollution of the North Sea by oil', later referred to as the 'Bonn Agreement'.

Since then, the Bonn Agreement has been amended in 1983 in order to extend its scope to harmful substances other than oil and to add the European Community to the list of contracting parties. The Bonn Agreement was the first regional agreement of its kind and as such it has been the precursor for similar agreements covering other European seas: the Helsinki convention (1974 and 1992) for the Baltic Sea, the Barcelona convention (1976) for the Mediterranean Sea and the Lisbon agreement for the Northeast Atlantic (1990) (NB: The Lisbon agreement has not yet entered into force). This international framework for cooperation in combating pollution is complemented by two European mechanisms: the 'Community framework for cooperation in the field of accidental or deliberate marine pollution' and a more recent instrument: the 'Community mechanism for reinforced cooperation in civil protection assistance interventions', which covers both civil protection and marine pollution. Fig. 1 illustrates how these regional agreements overlap and shows the central position of the European Community, which is party to all these agreements.

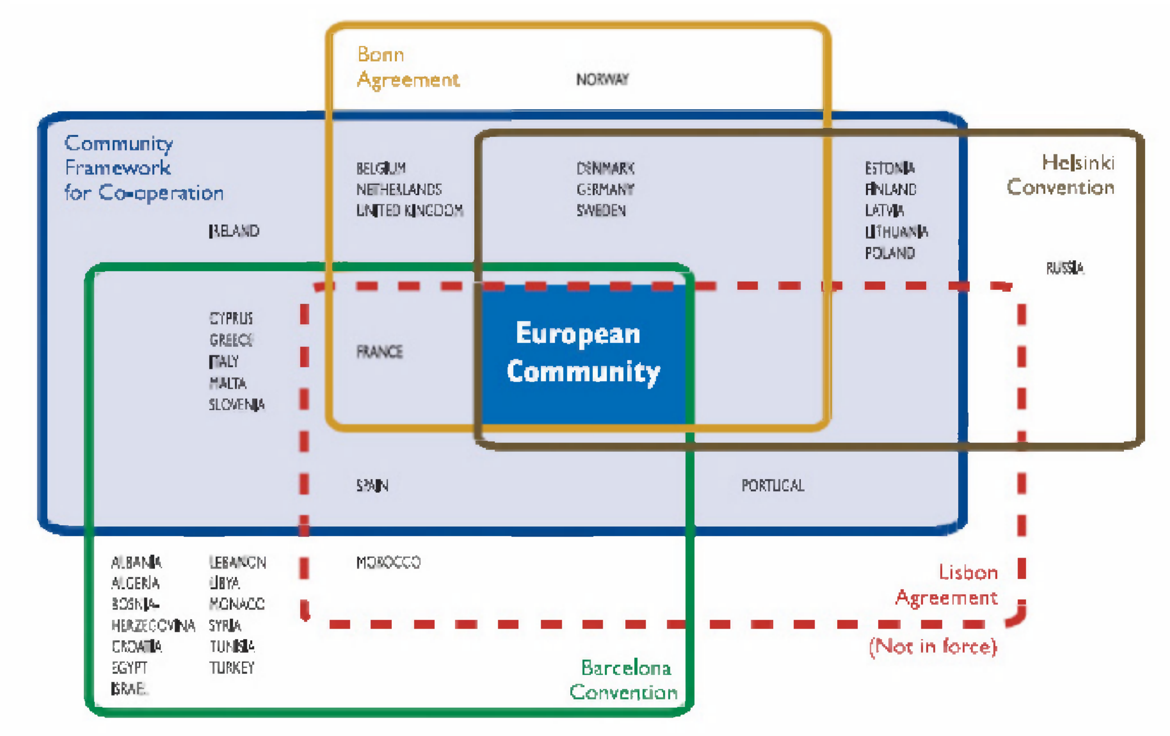

Fig. 1. International framework for cooperation in combating marine pollution in European waters (Source: EMSA).

More recently, in 2002, during the aftermath of the ERIKA accident, the European Commission decided to create a European Maritime Safety Agency (EMSA). This agency is mainly dealing with maritime safety issues (*i.e.* the reduction of the risk of maritime accidents, marine pollution from ships and the loss of human lives at sea) but it has also received the task for providing technical assistance to member states in the field of operational response to marine pollution. In this respect, EMSA must be considered as a pan-European platform that gives access to technical support to member states when they request assistance while responding to a major pollution accident. The response to marine pollution belongs indeed to the competency of the member states, which have established ways to cooperate and to provide mutual assistance through regional agreements that address their specific (regional) needs. Therefore EMSA's support must be unambiguously seen as a complement to the assistance that member states can obtain through the respective regional agreements and not as a way to replace these agreements. On the contrary, EMSA's contributions are likely to reinforce the participation of the European Community in the different regional agreements to the benefit of each of them.

The Bonn Agreement: an operational instrument against marine pollution

The Bonn Agreement is focused specifically on operational and technical aspects of combating marine pollution and encourages the North Sea countries to jointly improve their response capacity. The terms of reference of the Bonn agreement can be summarized as follows:

- Promote sharing of information and resources in response to a spill.

- Encourage sharing of surveillance resources as an aid to detecting and combating marine pollution and prevent violation of anti-pollution regulations.
- Encourage Contracting Parties to come to the aid of others by providing pollution response assets and other resources when needed.

For the purposes of marine pollution monitoring and control, the geographical area covered by the Bonn Agreement is divided up to eight 'zones of responsibility' with supervisory responsibilities being assigned to each of the contracting states as illustrated in Fig. 2 below.

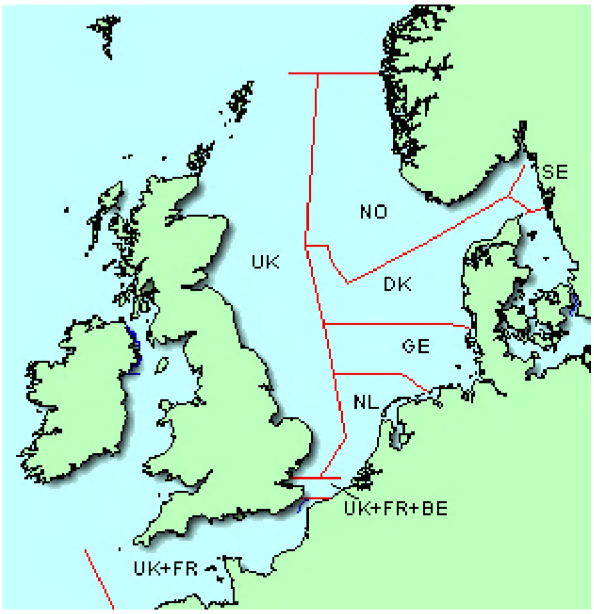

Fig. 2. The Bonn Agreement area and zones of responsibility (Source: Bonn Agreement).

The zones of, respectively, the southern part of the North Sea and the Channel area are placed under the responsibility of groups of Contracting Parties and are for that reason called 'zones of joint responsibility'. The interventions of the Contracting Parties within these zones of joint responsibility are subject to the provisions of technical arrangements agreed between the Parties concerned.

The guidelines and procedures for the provision of assistance in pollution response by one Contracting Party to another are presented in the 'Bonn Agreement Counter Pollution Manual', which is continually updated. Another important Bonn Agreement operational guide is the 'Aerial Surveillance Handbook', which provides for uniform guidelines and standard procedures for the aerial monitoring and control of marine pollution.

Joint operations are carried out on a regular basis under the umbrella of the Bonn Agreement according to a yearly calendar of operations. Joint exercises (BONNEX) are organised for training for the deployment of pollution combating equipment and the testing of the operational coordination. Contracting parties are also joining their efforts in coordinated flight campaigns for the control of marine pollution.

The Bonn Agreement working group OTSOPA meets on a yearly basis in order to continuously review the state of the art developments of all relevant operational, technical and scientific matters related to monitoring and combating marine pollution. In this way Bonn Agreement experts always remain at the forefront of knowledge and expertise, what allows them to maintain a leading position in the field of operational response to marine pollution since the beginning of the Bonn Agreement. The pioneer function of the Bonn Agreement is illustrated by the fact that all Bonn Agreement countries have set up national marine pollution response capacities and procedures for mutual assistance well before it became an international requirement with the entry into force in 1995 of the International Convention on Oil Pollution Preparedness, Response and Cooperation 1990 (OPRC, 1990).

The risk of marine pollution: assessment and evolution

In a general way, shipping can have a negative impact on the marine environment due to the discharge of oil and wastes, cleaning and venting tanks, air pollution, loss of cargoes containing harmful substances (50% of goods transported at sea can be described as dangerous), discharges of ship's ballast water which may contain non-indigenous species and the use of anti-fouling paints containing biocides (OSPAR, 2000).

The accident of the *Torrey Canyon* pointed out the risk associated with tankers. However ship-sourced marine pollution is not exclusively the result of accidental discharges. Ships are also deliberately carrying out operational discharges of oily waste at sea. While large accidental oil spills cause spectacular environmental damages in a well defined geographical area at a given period of time, operational discharges are responsible for a permanent background concentration of pollutants affecting the whole North Sea area. This latter form of pollution is more diffuse and less visible than major spill accidents, but it gives rise to the same level of concern since it is likely to have a long-term detrimental effect on the marine ecosystems.

A diminution of the risk of ship's accidents is addressed by continuous effort for improving safety standards in shipping transport. The main legal instrument for the regulation of operational discharges from ships is the International Convention for the Prevention of Pollution from Ships and its annexes (MARPOL 73/78). An important measure for the protection of the marine environment of the North Sea against oil pollution is the designation of the North Sea as 'special area' under MARPOL 73/78 annex I (oil), which became effective in 1999. Under this provision ships are exclusively allowed to discharge ship-generated oily waste from machinery spaces using an oil separator device producing oil concentrations not exceeding 15 ppm. Such a low concentration does not produce visible trace or film at the sea surface and is considered to be harmless for the marine environment.

Despite these measures the risk of pollution, either accidental or deliberate, is still significantly present in the North Sea. The fact remains that the North Sea area contains some of the busiest shipping routes in the world. The high density of shipping in the North Sea logically leads to a higher risk of accidents and a higher probability of illegal discharges compared to the level of these risks in areas with lesser shipping density. Furthermore, it should be noted that due to the shallow depths in the southern part of the North Sea, vessel traffic is confined within narrow navigation channels forcing ships to come at close range of each other and limiting the possibilities for collision avoidance manoeuvres. Therefore the southern part of the North Sea must be considered as a high-risk area for shipping accidents likely to cause significant marine pollution.

The main source of information for assessing the situation of marine pollution in the North Sea is the aerial surveillance carried out in the framework of the Bonn Agreement. The data on observed marine pollution collected by the aerial surveillance program of each Contracting Party is compiled by the Bonn Agreement secretariat and published in an 'Annual report on aerial surveillance'. This data has been collected during many years using standardised observation procedures and reporting formats. This report is therefore a valuable reference for assessing the current situation and the recent trends in the evolution of marine pollution in the North Sea. However one should keep in mind the fact that this data only reflects the number of spills observed during surveillance flights and therefore only represents a fraction of the actual number of spills. A study carried out by the Management Unit of the North Sea Mathematical Models (MUMM) indicates that spills observed by the Belgian surveillance aircraft during the period 1991-1995 could represent only 15% to 30% of the actual total ship-sourced pollution (Schallier *et al.*, 1996). This does not affect the fact that the Bonn Agreement aerial surveillance data clearly shows a decreasing trend in the number of observed spills per flight hour (Fig. 3).

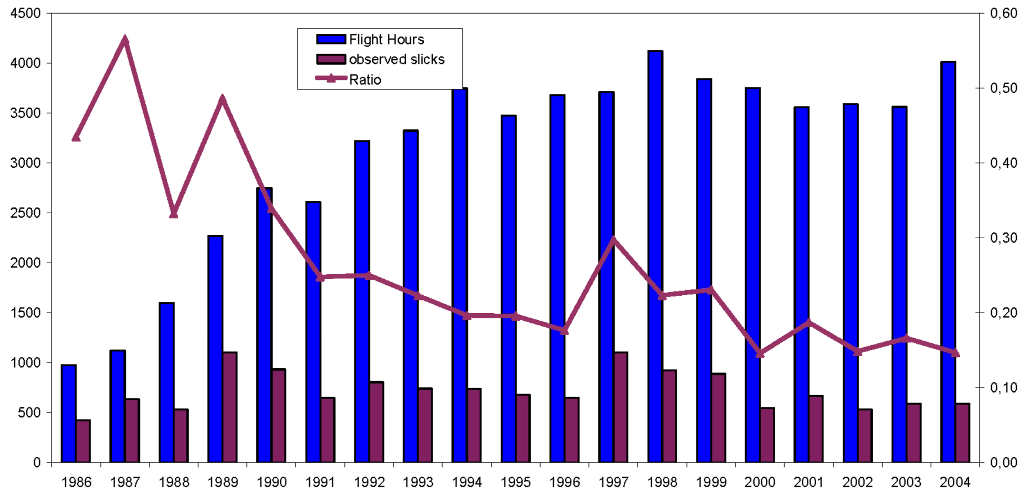

Fig. 3. Total numbers of flight hours and observed slicks for the period 1986-2004 and their ratio (Source: Bonn Agreement).

The relative diminution of the number of observed spills during the last decade is generally considered to result from the deterrent effect of aerial surveillance as well as from a greater environmental awareness of ship's crews and ship's operators encouraging them to pay more attention to observing anti-pollution regulations.

EMSA's Action Plan for Oil Pollution Preparedness and Response (EMSA, 2004), which is based on a risk assessment study carried out in 2003 by the International Tanker Owners Pollution Federation (ITOPF) at the request of the European Commission (DG TREN), presents some information on the expected evolution of the risks related to the causes of ship-sourced pollution. Most of the information combined with the assessment of the Quality Status Report (QSR) 2000 for the North Sea area (OSPAR, 2000) can be summarised as follows:

- The volume of shipping transport is expected to continue to grow significantly during the next decade in terms of increasing volumes of transported cargo, increasing number of vessels and increasing ship's sizes.
- The development of Russian oil export from ports in the Baltic is causing an important change in trading patterns for the transportation of crude and heavy fuel oils. This change will continue to increase in the coming years resulting in a significant growth of tanker traffic through the Baltic Sea and the North Sea.
- Non-tanker vessels have generalised the use of heavy fuel oil for their propulsion engine. The pollution risk posed by these vessels is in line with the increasing size of vessels and consequently the increasing size of bunkers carried on board.

This forecast indicates that the risk of pollution posed by shipping in the North Sea will continue to exist and could significantly increase during the coming years. It also points out the fact that the main threat of marine pollution is related to the increasing quantities of heavy fuel oils and hazardous and noxious substances carried on board of ships.

From a tripartite to a quadripartite zone of responsibility

The tripartite joint responsibility zone between United Kingdom, France and Belgium covers the southern part of the North Sea. It extends over the main navigation route between the Dover Strait and the mouth of the River Scheldt. As mentioned before, it is an area characterised by very dense vessel traffic, which places it in the category of zones presenting a high risk for marine pollution accidents.

The interventions of the three countries concerned in the tripartite joint responsibility zone are defined by technical arrangements between UK, France and Belgium dating from 1972. The key provision of these technical arrangements is the fact that the three countries are allowed to intervene in waters of the other countries within the boundaries of the tripartite zone without the necessity of a formal authorisation or request for assistance. These arrangements proved to work well and have been a particularly useful instrument for the joint response to the accident with the *Tricolor*. However the experience showed that pollution incidents occurring in the Tripartite zone also represent a threat for the Dutch waters and that the Netherlands should logically also be involved in the joint response to these incidents. This is the reason why – when the Contracting Parties decided in 2003 to amend the Bonn Agreement in order to realign the limits of the responsibility zones with the boundaries of the Exclusive Economic Zones (EEZ) – Belgium proposed to extend the joint responsibility zone from a tripartite to a quadripartite zone including part of the Dutch responsibility zone. All concerned countries agreed in principle on an extension to the north of the existing joint responsibility zone in such a way that the northern limit coincides with the northern edge of the Belgian EEZ (Fig. 4).

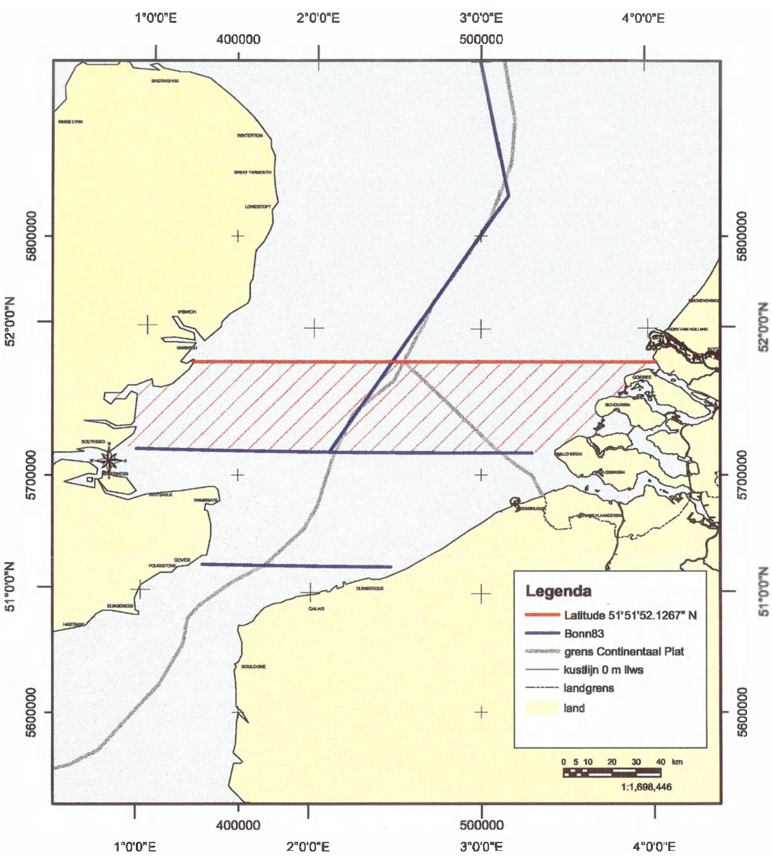

Fig. 4. Illustration of the extension to the north (shaded area) of the existing Tripartite zone to form the new Quadripartite zone of joint responsibility (Source: Rijkswaterstaat).

However, amendments to the Bonn Agreement have to go through long administrative and diplomatic processes before entering into force. Therefore Belgium proposed to the other countries concerned to already commence with the discussion for the preparation of new technical arrangements for the future Quadripartite zone before it takes effect. It is the view of the four countries that the Bonn Agreement Quadripartite zone offers interesting perspectives for a reinforced cooperation as well as for a better coordination of national strategies for marine pollution response preparedness in the southern part of the North Sea.

Conclusions

The North Sea area, and more especially the southern part of it, is a zone presenting a high risk of ship-sourced marine pollution incidents due to the very high density of vessel traffic. Despite all measures developed to improve ship and navigation safety and to enforce anti-pollution regulations, this risk will persist and may continue to increase with the predicted growth of shipping in the North Sea. The main concern for marine pollution is caused by the increasing quantities of heavy fuel oils and Hazardous and Noxious Substances (HNS) carried on board of vessels.

The Bonn Agreement offers through provisions for cooperation and mutual assistance for combating marine pollution an adequate operational framework for marine pollution response and preparedness that meets the specific needs of the North Sea countries at regional level. The experience gained by participating in the Bonn Agreement exercises and the Bonn Agreement working group places the marine pollution experts of the North Sea countries at the forefront of the knowledge and technical expertise in the field of response to marine pollution accidents.

The Bonn Agreement joint responsibility zone between United Kingdom, France and Belgium that covers the southern part of the North Sea responds to the particular needs for a reinforced cooperation in this zone confronted with a particularly high risk for marine pollution. The recently approved extension of the Tripartite zone to a Quadripartite zone including the Netherlands offers new perspectives for reinforced cooperation between the countries concerned in their common fight against marine pollution in the North Sea.

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Schallier R., L. Lahousse and T.G. Jacques. 1996. Aerial Surveillance national activity Report 1991-1995 (Toezicht vanuit de lucht: nationaal activiteitenrapport 1991-1995). MUMM, Brussels, 51p. + annexes.

Useful internet links

http://www.bonnagreement.org

http://www.emsa.eu.int

http://www.ospar.org

STATE OF THE AFFAIRS OF RISK ANALYSIS OF THE DUTCH PART OF THE NORTH SEA

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Background

In order to make a proper risk analysis of the transport of hazardous substances on the North Sea, a good overview is needed of the hazardous substances transported and the sensitive coastal areas possibly under threat. In the Netherlands, this process received input a number of years ago by a detailed inventory study of hazardous substances transported to and from the major Dutch sea ports (including Rotterdam) in the year 2000. This study revealed that the larger proportion of such transport comprised crude oil and heavy fuel oil. Also, it became apparent that the transport of hazardous substances in ships only passing (but not calling at) Dutch ports was an unknown factor. For this reason, the Ministry of Transport, Public Works and Water Management decided to join the Safety at Sea project in the Interreg IIIB Program (North Sea region). In this presentation, the preliminary results of this on-going project will be discussed.

Inventory of oil transport streams

In Safety at Sea, partners from public and private organisations in Belgium, Denmark, the Netherlands, Norway (Lead Partner), Sweden and the UK join forces to work on different safety aspects related to maritime activities. The Netherlands together with Norway are making an inventory of oil transport and sensitive areas in order to improve the risk analysis of oil transport on the Dutch part of the North Sea. Information on oil transport has been collected for the year 2004, not only from the major Dutch ports but also from oil ports in the other participating Interreg countries. Importantly, Norway and the UK as major oil producers and exporters are part of the study. This inventory has led to a much improved picture of oil transport on the Dutch part of the North Sea. This will be illustrated by a number of transport maps.

Risk analysis

These basic transport data are currently being processed in order to calculate the risk of outflow of oil due to collisions, grounding etc. of oil transporting ships. This work is being carried out by MARIN, using the SAMSON-model (Safety Assessment Model for Shipping and Off-Shore North Sea). The first results will be presented. A comparison will be made to the results obtained earlier based on the year 2000 data (see above).

Sensitive areas

A lot of effort has gone to defining ecologically sensitive areas off the Dutch coast. In turn, these areas are based on a tool to discern the sensitivity of various species and habitats and distribution maps during different seasons (Fig. 1).

An example of a relative sensitivity map for heavy fuel oil, based on the presence of 34 species (fish, benthos, avifauna and mammals) and their sensitivity values is given in Fig. 1. Other example maps of sensitive areas will be shown and the process to create these maps will be explained during the presentation.

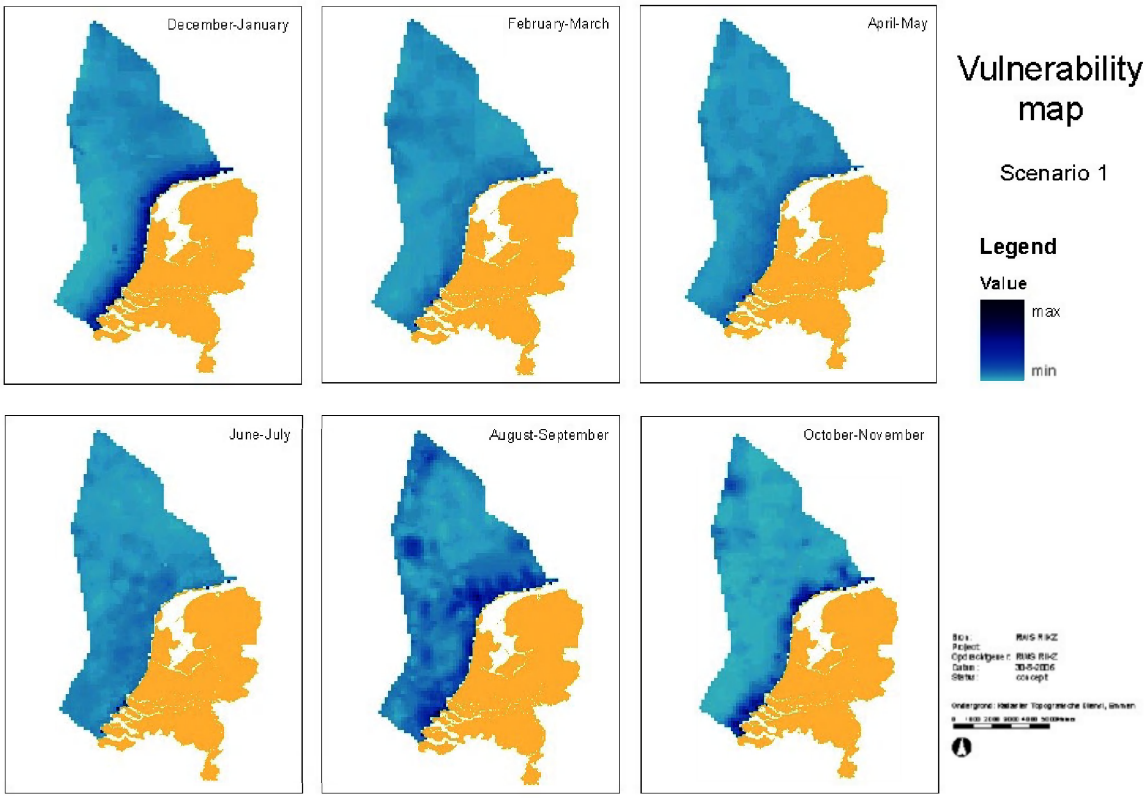

Fig. 1. Relative sensitivity map for heavy fuel oil.

The last challenge in the project is to combine the results of the risk assessment with these sensitivity maps, in order to arrive at an equivalent of the Marine Environmental High Risk Areas, a concept developed previously in the UK.

RISK ANALYSIS IN THE FRENCH PART OF THE ENGLISH CHANNEL AND NORTH SEA

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Abstract

Risk analysis is of a paramount importance for coastal states if we want to have fitting contingency plans and appropriate structures and equipments. The objectives are to prevent, to protect and to fight. Like many other coastal states we have been practising risk analysis for years in France and risk analysis is getting more and more accurate in time. Investigations on board a vessel with an assessment team, or sending an aircraft to evaluate pollution are a way to make a case by case risk analysis, but the risk analysis method is to gather a lot of information to prevent and to cure. My intention is to illustrate my words with examples. So I will show you some figures and pictures that will speak clearly. Let me present the Channel and the North Sea which is the smallest maritime zone in France but which is a good example of all threats we have to face.

Identification of the threats

What are the threats?

It is important to know precisely what the global maritime traffic in the area is. If we study the figures for the Channel we are impressed by the importance of maritime activity in this area which matches with the Malacca Strait.

Busy means risky, you can not have a high density of maritime flow without a certain level of risk, we have to do our best to reduce this risk taking in mind that risk zero does not exist.

The second step in studying the traffic in an area is to take into account all the maritime routes or links. It gives you a more precise idea of the places where we must focus our attention.

The third step is to have accurate and updated information about the very nature of the goods transported. This information is important for response in case of an accident.

Another concern are the prevailing weather conditions and currents in the zone.

Identification of the vulnerable zones

The vulnerability has to be considered from different points of view: ecological point of view, economic point of view, national interest, …

Ecological point of view

All sensitive areas having regards with International conventions or EU regulations have to be taken into account.

In the English Channel which is a special area within the MARPOL convention, we have some smaller zones which are protected on behalf of the UN Ramsar convention, or on EU Natura 2000 directive, and we have national nature reserves.

Economic point of view

We have to take into account all the coastal industrial equipments, coastal industrial estates, nuclear power plants , harbors, fishing farms, oyster-farming, touristic beaches (in summer).

The use of data concerning risk analysis

Prevention of accidents, emergency response and a good risk analysis allow States to take relevant pro-active and reactive measures.

Past uses of the gathering of data concerning risk analysis

The first use of risk analysis was to prevent accidents. Studying maritime accident figures led us to propose TSS implementation in the Channel in the seventies (in close cooperation with our British colleagues). It led us to set up MRCC in these areas (seventies) and to settle Emergency Towing Vessels (eighties).

The high density of the traffic led us to prohibit some activities (unorthodox crossing in the Dover Strait, swimming in the Dover Strait, ship to ship transfers in the French territorial waters) (nineties) and to request mandatory reports for tankers.

Risk analysis: current use

Risk analysis is now part of a big project to provide relevant information for maritime authorities. Risk analysis is more reactive now and risk analysis is helpful in emergency situations.
France is preparing a new device that will provide all kinds of information for maritime authorities when we face a threat. This new software device is called Geographic Information System.

The problem of place and port of refuge is typically a question of risk analysis that combines database and information collected by an assessment team.

But risk analysis is a method that is also useful when we study new economic projects such as marine aggregates extraction or settlement of wind-farms.

VERY HEAVY FUEL OILS: RISK ANALYSIS OF THEIR TRANSPORT IN UK WATERS

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Abstract

The UK Maritime and Coastguard Agency has conducted an assessment of the risk to UK Waters from a spill of Very Heavy Fuel Oil (VHFO), which is defined here as fuel oil with a viscosity greater than 380cSt at 50°C. A data gathering exercise has been conducted to determine the annual tonnages of VHFO passing along routes through UK waters, both as cargoes and bunkers, and to determine how these have changed over recent years. In 2003, it is estimated that approximately 30 million tonnes of VHFO passed through the Dover Strait, with a significant proportion originating in Russia and former Soviet Union countries. VHFO cargoes transported within UK waters as a whole increased from approximately 26 million tonnes in 1998 to approximately 50 million tonnes in 2003. Using preliminary data, VHFO bunker movements through UK waters are estimated to be 30 million tonnes in 2005, an increase from 23 million tonnes in 1998. Risk maps of the impact of a VHFO spill to UK waters and coastlines have been conducted using oil spill trajectory probability modelling and environmental sensitivity data and are presented here.

Background

The transport (as cargo) and use (as bunker fuel oil) of Heavy Fuel Oil (HFO) by ships poses the risk that these oils might be spilled at sea and these spills could occur in or near UK waters. The recent oil spills from the *Erika* and the *Prestige* (both of which passed down the English Channel prior to the spills) have highlighted the risks of transporting HFO as cargo. These incidents have caused the countries involved to take certain actions aimed at reducing the threat to their coastlines; single-hulled tankers carrying HFO as cargo are now banned from the EEZs of France and Spain, even though this breaches UN law. The EU and the IMO are now considering further measures to tackle the risks posed by the transport of HFO as cargo.

The threat posed by spills of bunker fuel oil is not as severe as those from large cargoes of HFO. The maximum quantity of bunker fuel that could be spilled is much lower but given the persistence of HFO, the consequences of a spill of 'only' a few thousand tonnes of bunker fuel oil would not be negligible. Some of these bunker fuel oils have almost identical properties to that spilled by the *Erika* and *Prestige*.

Spills of bunker fuel oil from damaged or sunken ships does not occur that often; the sunken *Tricolor* withstood collisions from two ships after she sank without any significant loss of the IFO-380 fuel oil that was on board. However, there is a 'track record' of oil spills from non-tanker ships.

Not all spills of HFO will be the same. The physical and chemical properties of different grades of HFOs cover a wide range, depending on the crude oils from which they are made and the refinery process route. The behaviour of the spilled oil and the feasibility of spill response options will be influenced by the precise properties of the HFO that has been spilled. The ecological effects of the spill will also be affected by the chemical and physical properties of the spilled oil, in addition to the resources that might be affected.

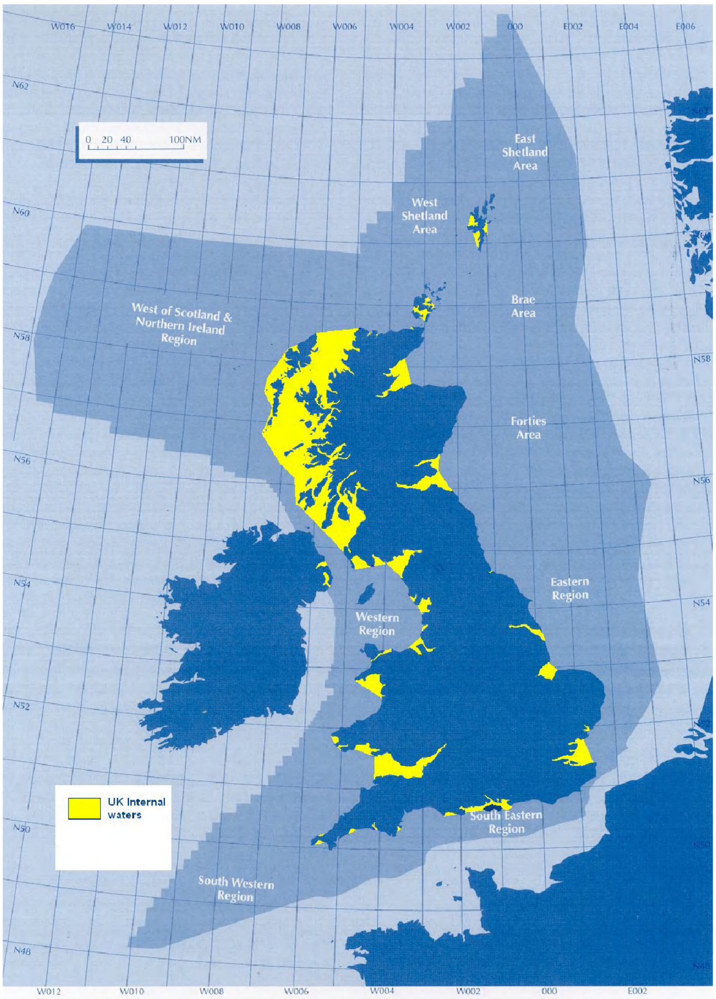

Fig. 1. The UK Pollution Control Zone.

Definition of VHFO

VHFO was defined within the study as being fuel oil with a viscosity exceeding 380cSt at 50°C. The term is not a standard industry definition but was used to distinguish heavier fuel oils which can present particular difficulties during marine spill response: they are very persistent oils which show very limited response to dispersant application and can have very low or neutral buoyancy.

VHFOs are carried at sea as:

- Residual Fuel Oil (RFO) cargoes. RFO is a by-product of the refining of crude oil into petrol and other more valuable fuels. RFO as a cargo almost invariably falls into the definition of VHFO above. The cargoes of Erika and Prestige were typical examples, having viscosities at 50°C of 555cSt and 615cSt, respectively (Cedre Website, www.le-cedre.fr).

- Heavy fuel oil marine bunkers. These are derived by blending RFO with lighter distillates to produce a bunker fuel of the appropriate viscosity for the vessel requirements. Vessels with slower speed engines are able to use bunker fuels that have viscosities falling within the definition of VHFO. Under the ISO 8217:1996 bunker fuel standard, these fuels are categorised as 'RMH45' and 'RMH55' but are often referred to by the industry definition of 'IFO500' and 'IFO700'.

VHFO tonnages in UK waters

A prime objective of the study was to determine the quantities of VHFO bunkers and cargo passing along routes within and through the UK Pollution Control Zone (UKPCZ), to assess whether these had increased in recent years and whether such trends might continue.

Initial activities focused on the gathering of RFO and bunker volume and transport data directly from industry sources such as oil refineries, oil traders, bunkering agents and port authorities. However, it soon became apparent that such data were not readily available because of the commercially sensitive nature of the fuel oil trading markets.

A different approach was adopted, using statistical trading and shipping information available through sources such as the European Union's EUROSTAT database (www.epp.eurostat.cec.eu.int), UK Trade Info (www.uktradeinfo.com), and UK Maritime Statistics (www.maritimestatistics.org), operated by UK Government departments, and data from the International Energy Agency (www.iea.org).

2002 and 2003 have generally been used as the base years for annual volume and routeing statistics, as these were the latest full data sets available at the time of the study. There were some discrepancies between data and some of the details reported here varied between the sources, but there was broad agreement on the overall pattern of volumes.

VHFO cargoes

UK RFO imports, exports and domestic traffic

The UK has nine major crude oil refineries, located on the Thames (1), Forth (1), Humber (2), Tees (1) and Mersey (1) Estuaries, Southampton Water (1) and Milford Haven (2). In 2003, these distilled crude oil into 84.5 million tonnes of refined oil products, including 11.5 million tonnes of RFO (DTI, 2005). 6.4 million tonnes of RFO were exported but the UK also imported 0.4 million tonnes.

Table I shows how the RFO was consumed in the UK (differences between RFO availability and consumption result from stock changes and statistical error factors). 0.9 million tonnes was supplied as bunkers to international shipping and 3.6 million tonnes was consumed within the UK: approximately 2 million tonnes by the refineries themselves and approximately 1.5 million tonnes for other purposes.

As RFO is too viscous to travel over large distances by pipe, and it is impractical to move large quantities by road or rail, it is probable that a large proportion of the 1.5 million tonnes not consumed at refineries was supplied to local oil terminals via sea routes around the UK coast.

Annual production of RFO in the UK remained fairly static between 1998 and 2004, varying between 10 and 13 million tonnes (DTI, 2005). However, there has been a slight increase in the amount of RFO imported into the UK and a larger increase in the amount of RFO exported from the UK during the same period. The main trading partners are other European countries: France, Ireland, Netherlands, Italy and Germany.

Table I. UK RFO supply and consumption tonnages (DTI, 2005)

	Fuel oils (thousands of tonnes)
Production	11,517
Imports	394
Exports	6,385
International marine bunkers	867
Total UK consumption	3,562
Internal refinery use	2,022
Industry and energy	1,346
Inland waterways transport	50
Other	144

EU Traffic

Six countries within the EU produced over 10 million tonnes of RFO in 2003. In descending order these were Italy, the Netherlands, Germany, Spain, France, and the UK. Aside from Italy, each of these countries produced more than they consumed and were net exporters. In addition, some countries, notably the Netherlands and Belgium, act as trading hubs for RFO and both import and export large quantities of RFO. Based on EUROSTAT figures for 2003, the Netherlands was Europe's largest importer (15.5 millions tonnes) and exporter (12 million tonnes) of RFOs, was Europe's second largest producer of RFOs (13 million tonnes), but was one of the smallest consumers of RFO (<0.3 million tonnes). Fig. 2 shows the RFO production, import, export and supply figures for NW European countries in 2002.

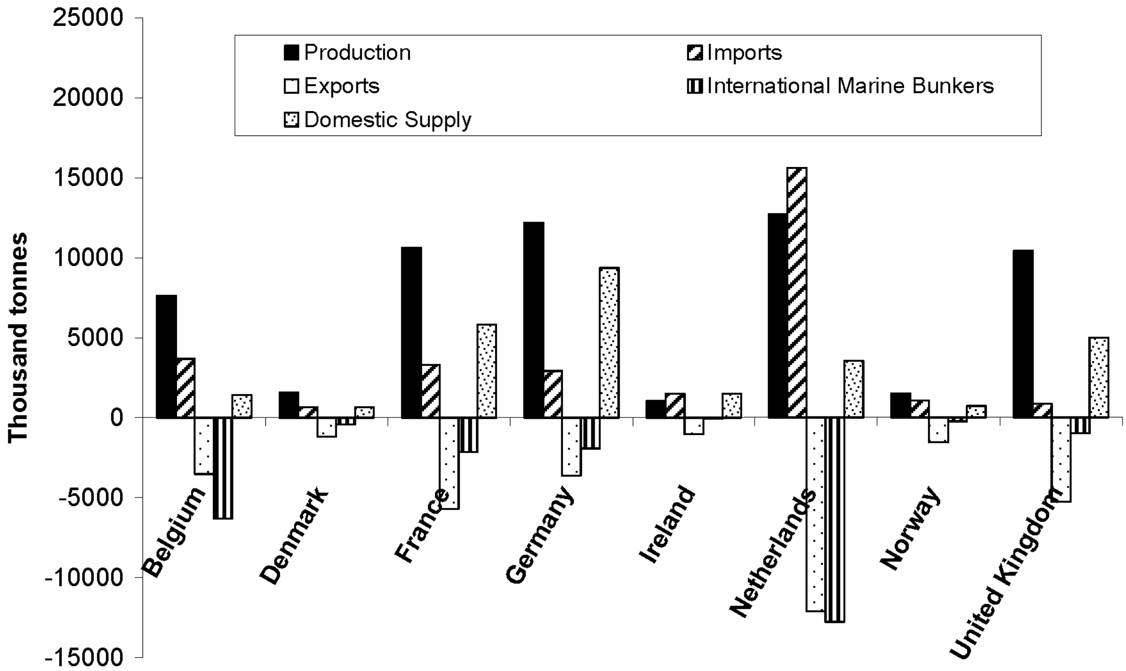

Fig. 2. 2002 RFO production, import, export and domestic supply in Northern European countries (International Energy Agency, 2003).

From EUROSTAT, it was possible to determine the tonnages of RFO traded between pairs of countries, which were used in the routeing calculations presented later. A discrepancy was noted between the UK RFO import and export figures given by EUROSTAT and the UK data discussed in the previous section. EUROSTAT reports higher figures for UK RFO imports in 2003 (3.8 million tonnes) but lower exports (4.3 million tonnes). No reason for this discrepancy could be determined, but there is not a significantly large difference between the combined import-export tonnage in each case when comparing it to other traffic in the UKPCZ (the difference is 1.3 million tonnes).

Over the period from 1993 to 2003, the total production of RFO in the main EU refining countries fell slightly but imports in some NW Europe countries, and the Netherlands in particular, showed a significant increase. (These were matched by a correspondingly significant fall in RFO imports to Italy but these did not involve any significant traffic passing through the UKPCZ.) Fig. 3 shows import data for the top 4 European RFO importers from 1993 to 2003. Recently available data show that RFO imports to the Netherlands increased in 2005 to 17 million tonnes (Fig. 4).

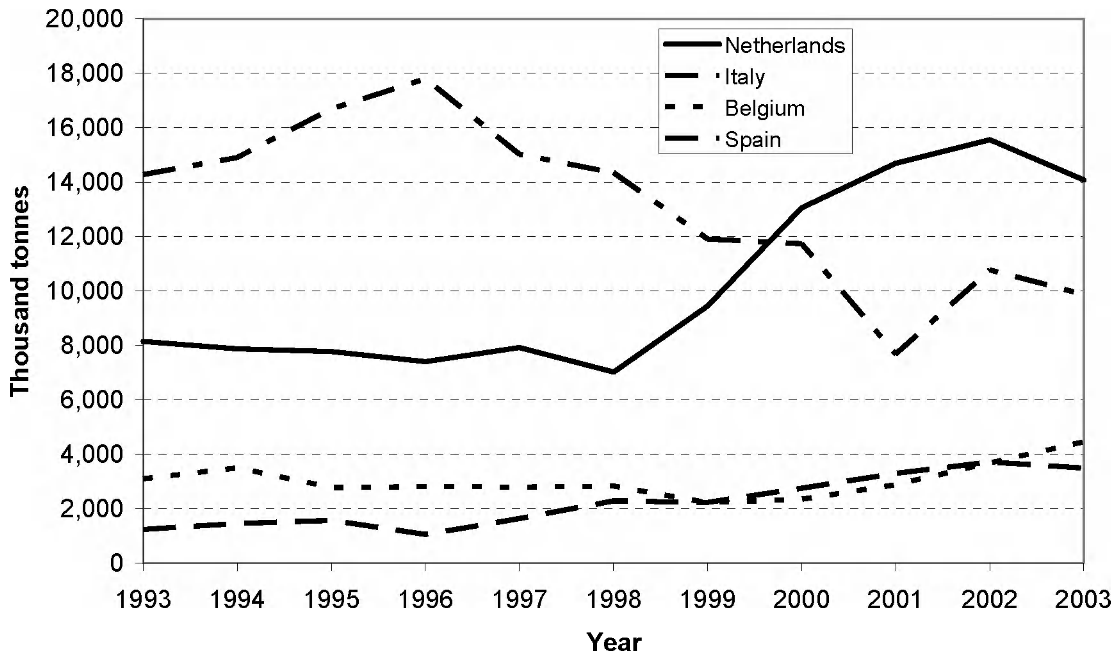

Fig. 3. RFO imports 1993-2003 for the four largest EU importers (International Energy Agency, 2003).

The main source of the RFO imports to the Netherlands was Russia, which has shown a large increase in its exports of both crude oil and oil products in recent years. Russia has 42 oil refineries, mainly in the west of the country, compared with 97 in the EU and Norway. In 2002, Russia produced almost 60 million tonnes of RFO, significantly more than any single EU country (Fig. 5) (International Energy Agency, 2002). RFO use is decreasing in Russia (US EIA, 2002) and in 2002 Russia exported over 35 million tonnes of RFO (International Energy Agency, 2002); 29 million tonnes of this was exported through the Baltic Sea (Axelrod, 2005).

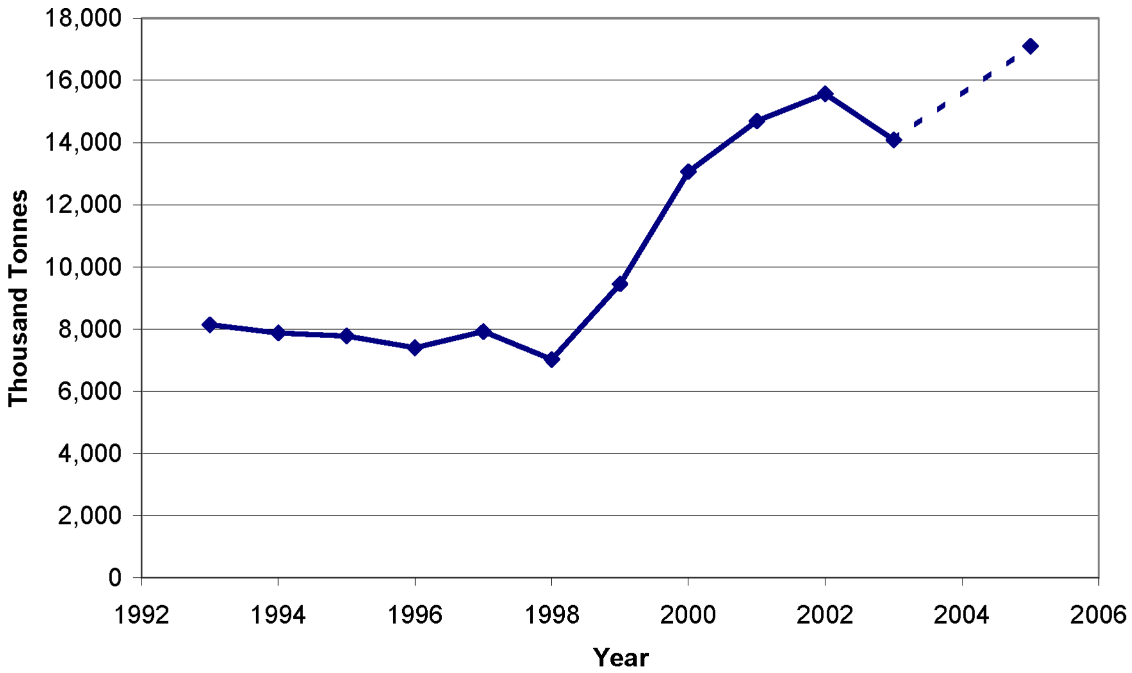

Fig. 4. RFO imports 1993-2005 in the Netherlands, showing continuing increases after 2003. Pre-2003 data are from the International Energy Agency (2003). 2005 data are from EUROSTAT.

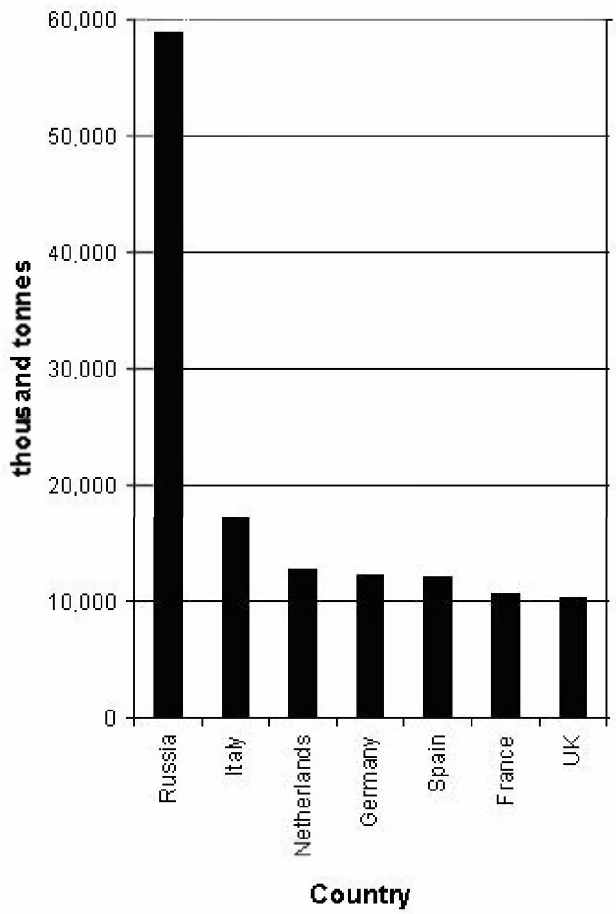

Fig. 5. Russian RFO production compared with the six largest EU producers (International Energy Agency, 2002).

Axelrod (2005) discusses recent trends in Russian RFO exports. Fig. 4 shows the increase in exports through both the Baltic and Black Seas between 1998 and 2004. In recent years, a significant amount of this RFO has been shipped to China; it is exported from the Baltic and Black Seas because of the pipeline and refinery infrastructure in Russia. RFO is often shipped to China in large tankers, including Very Large Crude Carriers (VLCCs >200,000 tonnes dwt), despite the lack of heating coils required to discharge RFOs. VLCCs are too large to enter the Baltic and RFO is loaded into them either at ports such as Rotterdam or through ship-to-ship transfers outside the Danish Straits and in other areas around the North Sea, including inshore UK waters. Axelrod (2005) reports that such transshipments are increasing: from 8 VLCC transshipments in the North Sea/Baltic in 2002 to 22 in 2004, with an average RFO cargo of 276,000 tonnes.

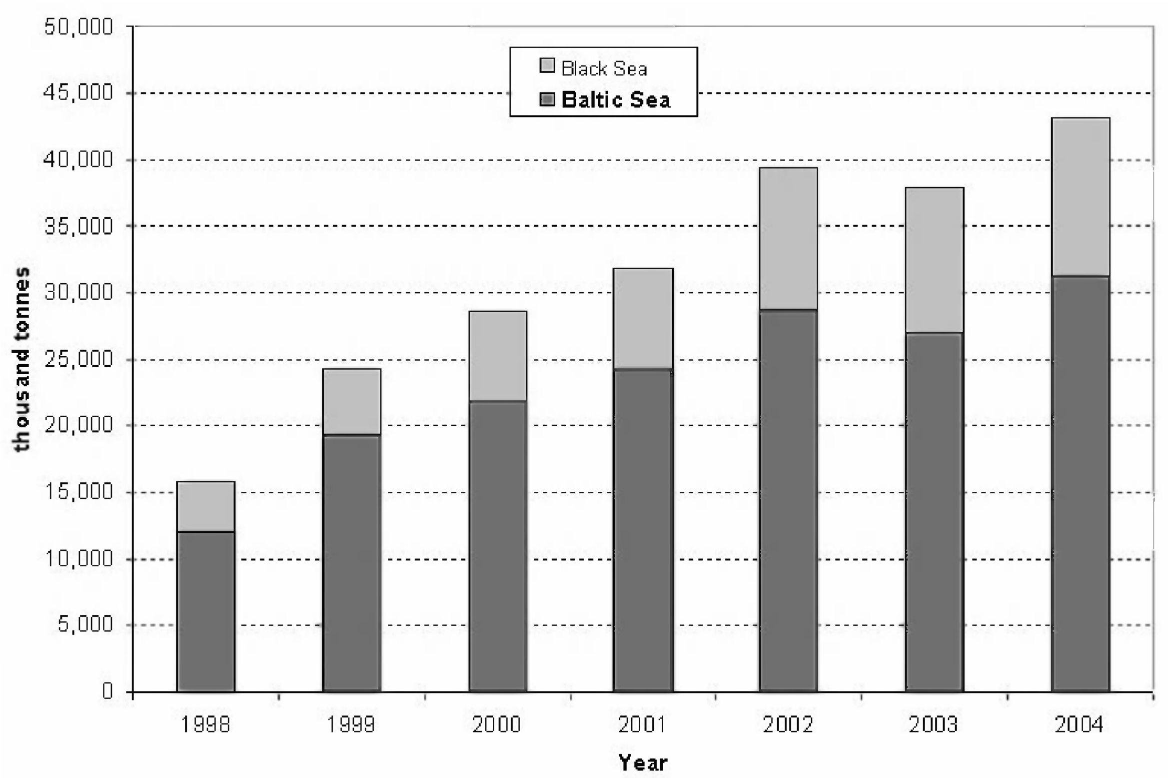

Fig. 6. Seaborne Russian RFO exports through Baltic and Black Seas 1998-2004 (based on data in Axelrod, 2005).

Currently, only a small amount of RFO is imported into NW Europe through the northern Russian ports and the Barents Sea. However, this has been increasing in recent years and there are plans to increase its capacity (Barents' Secretariat, 2003).

Major VHFO trades passing through UKPCZ

Table II shows the major RFO cargo transfers (>0.5 million tonnes) between countries that passed through the UKPCZ in 2003. In total, it was determined that approximately 50 million tonnes of VHFO cargoes passed through the UKPCZ in 2003.

Table II. Largest VHFO cargo transfers between countries that passed through UKPCZ in 2003

From	Quantity (thousands tonnes)	To
Russian Federation	16,811	Non W. European destinations
Russian Federation	3,916	Netherlands
Estonia	2,167	Netherlands
Germany	1,621	United States
United Kingdom	1,540	United Kingdom
Russian Federation	1,283	France
France	1,258	United Kingdom
United Kingdom	1,169	Italy
United Kingdom	949	Spain
Belgium	875	United States
United Kingdom	812	United States
Italy	762	United Kingdom
Russian Federation	638	Spain
Netherlands	634	United States
Sweden	628	United Kingdom
Netherlands	536	United Kingdom

VHFO bunkers

Ships use a variety of fuels ranging from light distillates to heavy fuel oils. In general, large ships with slower running engines will use the heavier residual fuel marine bunker fuels and smaller ships with faster running engines will use distillates. The IMO (2000) estimated that in 1996, the world consumption of marine bunkers was 72% residual fuel oils and 28% distillates. Similar figures have been reported for the different EU nations (Beicip Franlab, 2002) although Davies *et al.* (2000) show variations in the proportions sold by different nations. Residual fuel oils are cheaper than distillates and ships will tend to use the heaviest fuel oil allowed by their engines; large, modern ships are often designed to use more viscous fuel oils than older ships. The largest ships can carry more than 7,500 tonnes of heavy fuel oil (Michel and Winslow, 2000).

The Intermediate Fuel Oil (IFO) system is widely used to refer to residual fuel oil grades, and an International Standards Organization 'Residual Marine' classification is also in operation for bunkers. There are two popular grades of heavy bunker fuel oil: IFO180 and IFO 380, which have maximum viscosities of 180cSt and 380cSt at 50degC respectively (they broadly correspond to the ISO RME25 and RMG35 grades, respectively). There are also heavier grades classified as IFO 500 and IFO 700, with maximum viscosities of 500 cSt and 700 cSt at 50degC respectively (corresponding to the ISO RMH45 and RMH55 grades, respectively). There are several other sub-categorised IFO grades but in practice only these main grades are available from most bunker agents. In this study, we considered fuel oils exceeding 380cSt at 50degC, which covers IFO 500 and IFO 700, although analysis of IFO 380 was also conducted.

Determining accurate information on the quantities of different grade bunkers passing through the UKPCZ is difficult:

- Bunkers are made by blending RFO with distillates to produce the appropriate grade of fuel oil. This process may occur at the point of sale to a vessel and details are commercially sensitive, making direct knowledge of quantities of each grade delivered difficult to ascertain.
- Although statistical data about the amount of RFO supplied by each country for 'International Marine Bunkers' use exist, they are not broken down by grade, and probably cannot be for the reasons explained above. They also do not cover domestic traffic.

- It is not possible to accurately break down different vessel classes and sizes by the fuel type they use, although 'rules of thumb' exist, and this relationship can't accurately be applied to statistical shipping data.
- Even where 'rules of thumb' are applied regarding fuel grade and bunker tank volume for different vessel sizes and classes, it is not possible to determine how full each vessel's tanks will be as it passes through the UKPCZ.

For broad figures, the EUROSTAT database contains data indicating the volume of RFO sold for 'international marine bunkers' purposes, which shows sales of around 30 million tonnes of bunkers within NW Europe and the Baltic (excluding Russia) in 2003. The Netherlands and Belgium were the leading suppliers at 12 million tonnes and 6.5 million tonnes respectively. In the EU as a whole, approximately 40 million tonnes of RFO was sold as marine fuel. Russian sales of residual bunker fuel were 12 million tonnes, mainly through the Baltic and Black Sea.

Most of the traffic in NW Europe and the Baltic will pass through the UKPCZ and therefore at least 30 million tonnes can be expected to enter the UKPCZ (of all grades). Whilst there is no definitive division, a general approximation is that most vessels greater than 20,000 tonnes DWT will use IFO380 bunkers (or IFO500 or IFO700), rather than IFO180. Data regarding all 2004 ship movements through the Dover Strait were obtained from the Maritime and Coastguard Agency, which included data on ship type and size. Vessels greater than 20,000 tonnes DWT were separated and their numbers are presented in Table III.

Table III. 2004 vessel movements and average sizes for vessels >20,000 DWT tonnes passing through the Dover Strait

Vessel Type	Number of movements	Average DWT tonnage
Container ship	5,980	50,213
Bulk carrier	4,248	78,519
Crude oil tanker	2,137	122,505
Oil products tanker	1,518	37,222
General cargo ship	1,234	33,109
Oil/chemical products tanker	740	40,606
Chemical tanker	569	42,612
Vehicles carrier	381	24,736
Container Ro-Ro cargo ship	298	45,923
Bulk/oil carrier	265	91,171
LPG tanker	206	37,376
Ro-Ro cargo ship	112	30,820
Ore carrier	104	263,650

Michel and Winslow (2000) give average bunker capacities for tankers, container ships and bulk carriers of a range of sizes: these are on average approximately 2.9%, 10.0% and 3.3% of DWT tonnage for each, respectively. Applying these capacities to the data above (appropriately substituting these categories for other vessel types), total potential IFO380+ bunkers passing through the Dover Strait would be approximately 60 million tonnes. Assuming that these vessels are on average half-full – for example, because those northbound were low on bunkers and about to call at Rotterdam and those southbound were nearly full having just called at Rotterdam (or a similar argument for other bunkering locations) – then 30 million tonnes of IFO380/IFO500/IFO700 bunkers would pass through the Dover Strait. An ongoing task in the study will also add traffic passing north of the UK in this assessment.

Internationally, sales of IFO 380 account for 70% of heavy bunker fuel oils, IFO 180 for around 25% (BP, 2004) and IFO 500 for less than 5% (personal communication with an oil industry contact suggests that this is probably between 2 and 4%). Therefore, of the 30 million tonnes passing through the Dover Strait, up to 1.7 million tonnes might be IFO500.

Although the global production of RFO is falling, the demand for RFO for marine bunkering purposes is increasing (Fig. 7) and has risen from about 140 million tonnes in 1990 to 180 million tonnes in 2004. By 2020 marine residual bunkers demand is predicted to be 225 million tonnes (BP, 2004).

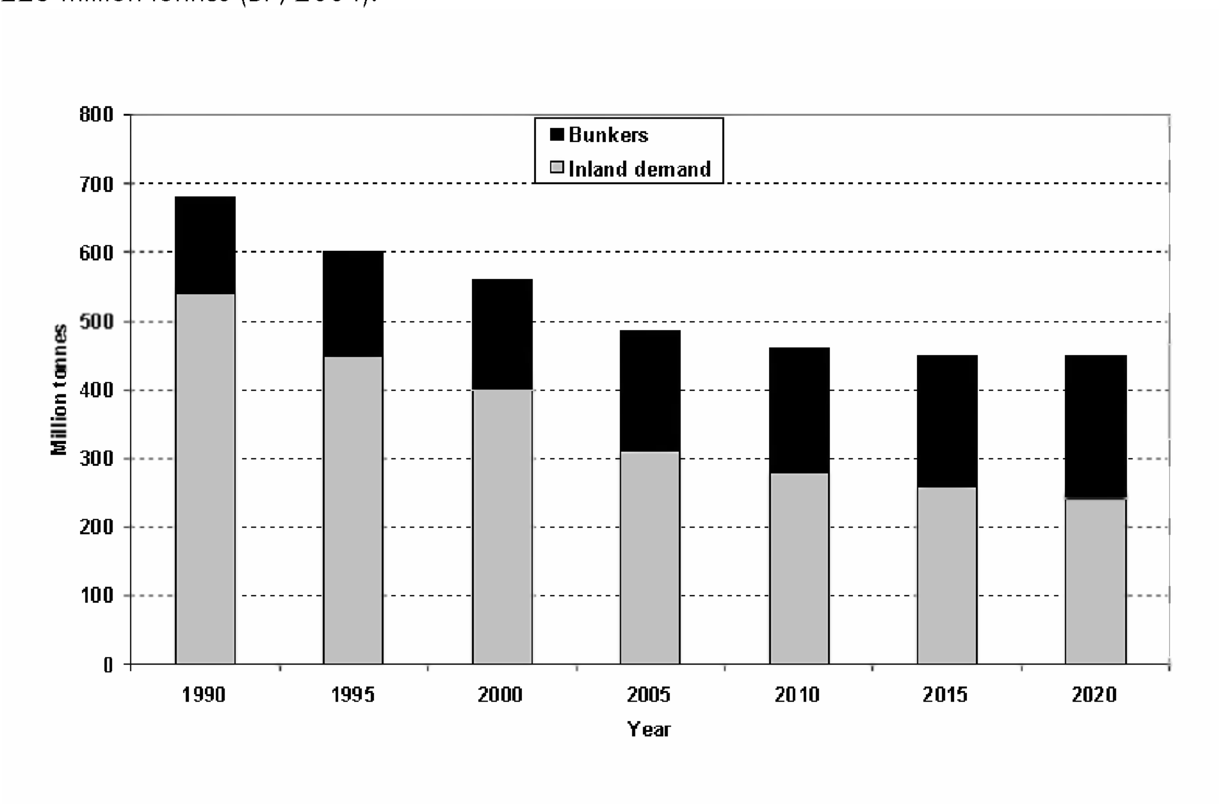

Fig. 7. Trends and forecasts for RFO bunker and inland demands (BP, 2004).

Routes

Very little direct RFO cargo or bunkering route data were available: tonnages of RFOs passing along routes have had to be estimated indirectly. This has been done using information from EUROSTAT, which includes data regarding the destinations of oil products and other goods for each port in the EU.

Cargo routes

The study determined the quantities of RFO traded between pairs of countries. This information was split into routes by proportioning each value according to the quantities of oil products exported from each port within the dispatching country and by the quantities of oil products imported into each port of the receiving country.

Bunker routes

Attempts were made to split the quantities of IFO380+ bunkers determined in the study into routes using information regarding this size of ships calling at individual EU ports but, unfortunately, no partner port information was available. Therefore, bunker routes have been determined using a similar approach to that for cargoes but using total goods. A downside of this approach is that it does not capture non-merchant shipping, e.g. ferries, warships etc.

A network of routes was plotted and the quantities of RFO passing along each section were determined using a 'shortest route' approach between ports. Further work is ongoing to determine the proportion of shipping passing north of the UK rather than through the Dover Strait. The approach takes into account transfer of RFO by barge between countries on the River Rhine.

The combined bunker and cargo results are shown in Fig 8.

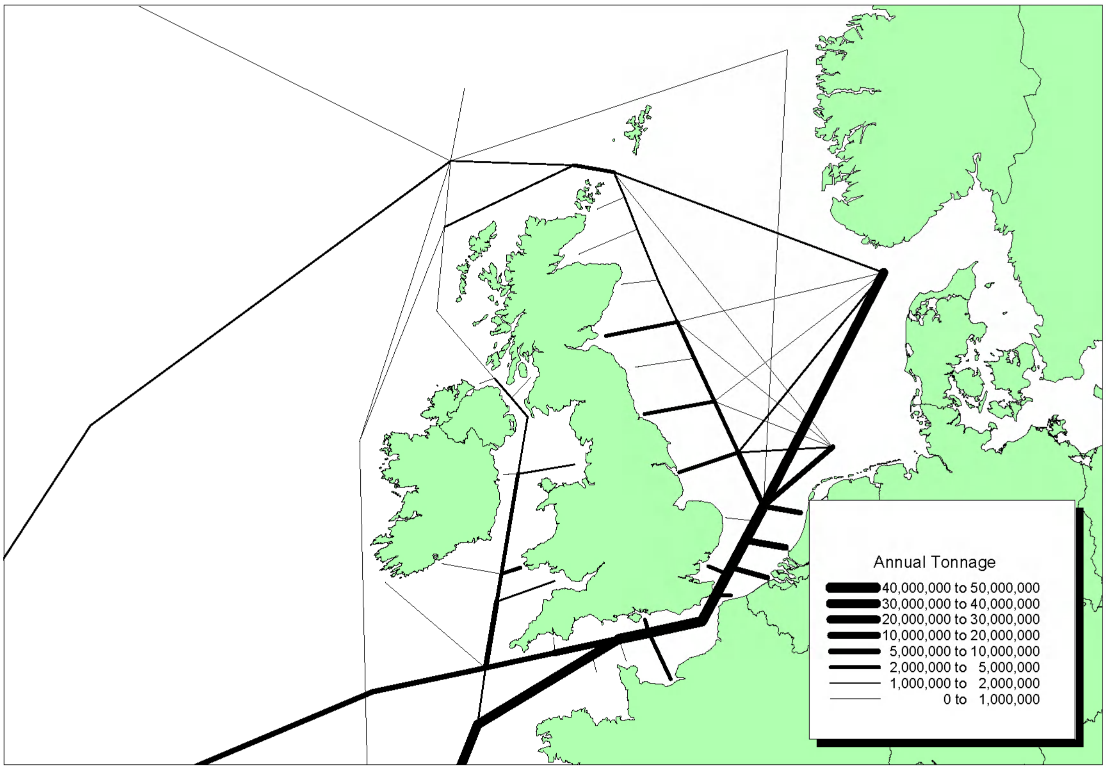

Fig. 8. Quantities of RFO passing along routes through the UKPCZ both as cargoes and bunkers.

Trends in VHFO Transport

RFO cargoes have increased from 26 million tonnes in 1998 to 50 millions tonnes in 2003. More gradual increase in bunkers, perhaps from 23 million tonnes to 40 million tonnes, based on increases in all IFO bunkers during this period.

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OIL SPILLS: EFFECTS AND MANAGEMENT

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Abstract

When discussing maritime incidents involving oil, one should bear in mind that 99,8% of all transported oil volumes arrive safely at their destination. Furthermore, tanker incidents like the ones with 'Exxon Valdez', 'Sea Empress' and 'Prestige' attract huge media attention, while the daily operational discharges (MARPOL violations) are sometimes more harmful and more difficult to manage.

Introduction

Marine oil spills vary widely in size and in type of oil and therefore the effects, or threat to the marine environment and other vulnerable areas vary as well. The management of different oil spills will in general follow very similar procedures. However, management can sometimes be more difficult in a small slick than in a large incident.

Ecological effects

A coastal state that is prepared to respond to a maritime incident, will have a risk analysis and a contingency plan, that also identifies the sensitive areas. Seasonal effects with regard to presence of wildlife, taking into consideration migrating birds, have been studied and the data are converted into GIS maps. At least one oil drift model is available to advise the Response Team on the behaviour of the oil that is spilt into the marine environment. Therefore, in case of an incident, estimations can be made on the possible damaging effects in specific sea areas or coastal zones.

Identifying the effects in time is important because the restoration starts soon after the beginning of the incident and is part of the response measures.

Oil spill management

In case of an incident, the source is easily identified and contact with the responsible can be established. Representatives, such as a P&I club will be assisting the authorities and the Fund provides advice and assistance. Information on the type of oil involved is available and quantities of spilt oil can be mathematically calculated. With all this information, the Response Team will make their strategic and operational response plan.

However, there is more to oil spill management. Other measures that need to be taken include:

On board measures

When tanks of a tanker are ruptured as a result of a collision, the crew – possibly assisted by a salvage team – may undertake attempts to pump oil from these tanks into other tanks if storage space is available. Although solidifiers for oil exist, their use is not a very viable option to stop the leakage, due to the fact that mixing them with the oil is a difficult task.

Transhipment

If a tanker is ruptured due to grounding on pinnacles or in case the on board measures fail, another tanker can be brought near the casualty and cargo can be transported from the damaged tanks into the tanker brought alongside. Usually however, the required tanker will not be available. In that case, a sea going barge could be used as a temporary storage facility. Transhipment is not an easy operation and safety procedures are to be closely attended, due to the flashpoint of the oil. As oil is leaking, there is risk of explosive gases in the area.

Monitoring, first phase

To follow the outflow of oil from the tanker, continuous monitoring of the situation is necessary. A possible way to do this is to follow the leakage from the tanker instruments, but that strongly depends on the situation of the casualty. Alternatively, aerial surveillance can be performed, supported by satellite images. Both detection instruments and visual observation in combination with the Bonn Agreement Colour Code will provide details on extensions of the slick, the assessed volume and the drift of the slick. Aircrew can also give guidance to response vessels in case of mechanical recovery. The rule of thumb that after a few hours 90% of the recoverable oil is in 10% of the slick may help. Dispersant spraying, depending on the type of oil and the weather conditions, requires dedicated guidance from experienced surveillance crew.

Monitoring, second phase

Monitoring may continue, but with another objective, when oil has entered into a sensitive area or at the coastline. If removal of the oil is impossible or dissuasive, because removal may cause more damage than the oil itself, natural degradation and also the restoration process should be monitored.

Response at sea and at the coastline

Based on the information gathered through communication with the captain and with the crew of the surveillance or observation aircraft, supported by oil drift trajectory models, the response options are defined. Some coastal states apply dispersants, of which the advantage is the rapid deployment, but one of the disadvantages is that the oil is not removed from the environment. Furthermore, the dispersants could fail because of the type of oil.
Mechanical recovery is costly but effective in the sense of removing oil from the marine environment and, if deployed quickly and well managed, it is efficient.
Also depending on sea conditions, sometimes the only response option is waiting for the oil to reach the coastline and start the clean-up operation. However, coastal clean up is recognized to be very difficult and sometimes dangerous, depending on the type of coast. Pictures taken at the Spanish coastline, rocky and open to strong waves, express the difficulties encountered. On the other hand, the sandy coastline and smooth slope of the coastline of the Dutch coast appears to be a relatively easy job.

Protection of sensitive areas

Studies on sensitivity have been made with the objective to protect the same in case of a floating oil slick. So, if possible, the sensitive area should be protected.
Floating oil booms to guide the oil to another area could be considered, but require a discussion on the acceptance to sacrifice another area. Moreover, using booms as a barrier to protect an area is difficult and depends on the weather conditions.

Logistics

Response needs logistics, not only for deployment of equipment in the right area but also for transport of collected waste (oil/sand/debris mixtures) from the coastline to a waste treatment. Recovered oil at sea needs to be brought to a refinery or a temporary storage facility. Protective measures are to be considered as the recovery ship may be contaminated with oil from the spill site: oil may stick to the hull and leave a sheen when sailing or berthed in port.

Administrative aspects

Managing an oil incident includes various administrative aspects, such as the legal side (liability), registration of equipment deployed, contracting commercial supporting companies, contracting temporary storage and waste treatment, logging and drafting situation reports. Preparative work to file a claim also starts here. Claim management is an important subject in oil spill management.

Press

Depending on the size of the incident and the ecological and social effects, media attention consumes enormous manpower. Press releases and press conferences need to be well prepared. The press officer has to play a very active role in the response team meetings.

International co-operation

A tanker incident occurring in the EEZ of a coastal state may also affect the interests of an adjacent state and even if not, their assistance is required for combating the oil slick.
The Bonn Agreement, for instance, identifies specific co-operation in case of incidents. Sharing information but also active assistance through surveillance operations or recovery vessels have proven to be a strong chain of the regional co-operation.
Contracting Parties to the Bonn Agreement and similarly those in HELCOM or Barcelona agreed to co-operate in case of emergencies and this also requires training and exercise. Understanding the equipment and procedures of member states and the skills and level of preparedness create a solid basis to rely on in case of need of assistance.
A 'strike team' can operate independently as long as the National On-Scene Commander co-ordinates the response units.

All the aforementioned subjects, although in brief, give some indication what managing oil incidents implies. Each subject in itself could be thoroughly discussed in a day's meeting.
The Response Team leader, no matter in what way organisational arrangement have been made, is to co-ordinate all these aspects. Obviously, experts in the various fields will carry out the tasks, but a good view on all aspects is required.

The other slick

Knowing the party to talk to and co-operate with, in case of an oil incident, is an obvious necessity. The coastal state authorities have identified the responsible and liable party that may even contract a salvage team or response assistance. Although it requires time to settle the claim, at least there is a party to negotiate or quarrel with.

In cases where coastal authorities are confronted with a so-called mystery slick, still requiring a response operation, finding the perpetrator is less obvious.

Sample analysis may give information on the type of oil and could give an indication of weathering; AIS data may even identify some vessels in the area where the slick was found, but solid prove that a ship has discharged oil is another piece of cake.
Operational, bilge discharges (MARPOL violations) are often found without a trace of the polluting vessel. Bilge discharges or slob tank cleaning can result in considerable volumes of oil at sea, requiring a response operation.

The example of the 'Borcea'

In the case of the motor vessel 'Borcea' (1989), the Dutch authorities were dealing with an unidentified source of pollution that had spilt several hundreds of tons of heavy fuel oil that washed ashore between the Western Scheldt and Scheveningen. Also birds contaminated with oil were found, a few hundred were killed and only a limited number could be cleaned and brought back into their habitat.

The response operation, as was clear from the first report and inventory, would be a costly operation. But who and where was the polluter?

A message was put in the Paris MOU box and faxes were sent to Bonn Agreement focal points. The amount of oil spilt, so much was clear, certainly must have come from a bunker or cargo tank. This was not a MARPOL violation.
Fortunately through the Bonn Agreement network the vessel was found and later on it was proven that she had spilt the oil.

From a management point of view, the response operation took some nine days (beach cleaning), but the investigations to find the polluter and the work resulting in a court case required many more days thus affecting the workload of the organization.

Although the effects of the pollution may not be different, the managing part has a different content and also requires detective forces. In the Netherlands the so-called water police plays an important role.
Obviously sample analysis is of utmost importance to find specific characteristics in the oil.

In the case of the 'Borcea' the laboratory experts concluded that the oil was a poorly refined product coming from wells in the Caucasus. That information limited the number of vessels to investigate and on the basis of the oil drift trajectory model, the time frame could be defined. This combination of information of data compared with ships registered in Eastern European Countries that had been in ports in France, Belgium or the Netherlands simplified the research.
However, the fortunate discovery in Norway identified the vessel as she had required assistance to repair a ruptured fuel tank.

In Response Organizations the person in charge has to be prepared to deal with all these aspects. There is no specific study in this field. Seminars and workshops, co-operation in regional agreements and the exchange of experiences should be used to get skilled.

ENDOCRINE DISRUPTION IN THE MARINE ENVIRONMENT

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The link between endocrine disruption and marine incidents management is not an obvious one. This paper provides some background information on the problem of endocrine disruption, the current position in marine waters and poses the question of the contribution of shipping to the problem, rather than answering it.

The term endocrine disruption came into common use following the observation that fish showed intersex conditions in UK rivers. Male fish were found to have egg-like structures in their testes and egg yolk protein (vitellogenin) at high levels in their bloodstreams. Work at CEFAS and Brunel University in the UK demonstrated that if fish (trout) were held in the diluted effluent of sewage treatment works they quickly developed high levels of vitellogenin (VTG) in their blood (e.g. Purdom *et al.,* 1994, Routledge *et al.*, 1998). Further from sewage inputs the levels of VTG were lower and it seemed that the effect was caused by chemical(s) in sewage. The chemicals causing the effect were isolated and identified by CEFAS. They were found to be a number of different human derived steroids such as estradiol and the active ingredient of the contraceptive pill; ethinyl estradiol (Desbrow *et al.*,1998; Routledge *et al.*, 1998).

These compounds were not the only chemicals found to cause fish to change sex and laboratory work on exposures to fish or to cell-lines have produced a long list of industrial and biocidal compounds that are able to mimic natural hormones that have profound effects on reproductive cycles. This list of reproductive endocrine disrupters includes some surfactants such as nonyl-phenols, phthalates used as plasticizers and even some classically persistent and toxic pesticides such as the breakdown product of DDT – ppDDE. (Jobling *et al.*, 1995).

The activity is not always estrogenic in effect (*i.e.* mimicking female hormones), but can be androgenic (mimicking male hormones) or even more subtle such as anti-androgenic or anti-estrogenic. As more processes and pathways have been examined it has become clear that reproductive effects are not the only targets of hormone mimics and other vital functions such as growth and behaviour can also be affected. Some flame retardant compounds for example can have effects on the thyroid system and impact growth.

The evidence base for widespread effects has been growing rapidly over the last decade. Effects that were previously described as reproductive toxicity have been reconsidered to be a result of endocrine disruption and there are examples of effects from birds (egg shell thinning as a result of DDT exposure) to alligators (penis malformations from pesticide exposure). The reviews by for instance Metzler (2001) and Damstra *et al.* (2002) gather the evidence together. Most of these effects are close to point sources and it seemed likely that in marine systems the dilution, dispersion and breakdown of chemicals (particularly steroids) would reduce concentration below effect levels. There is, however, at least one very good example of a widespread effect of a chemical in coastal waters at very low levels due to bioaccumulation in animals; the case of TBT is well documented.

Tributyltin (TBT) was introduced as a biocide in antifouling paints in the 1960s and was widely used on pleasure craft and ships by the mid 1970s. Research at CEFAS in the 1980s showed that in estuaries with large numbers of pleasure craft Pacific oysters would not grow normally and laboratory experiments showed TBT to be the culprit (Waldock and Thain, 1983). Marine snails proved to be even more sensitive to TBT and at single nanogram per litre (part per trillion) concentrations female whelks (Nucella lapillus) grew a penis and died as a result of the vas differens blocking the oviduct. These effects were described as imposex (male features imposed on females) (Matthiessen and Gibbs, 1998).

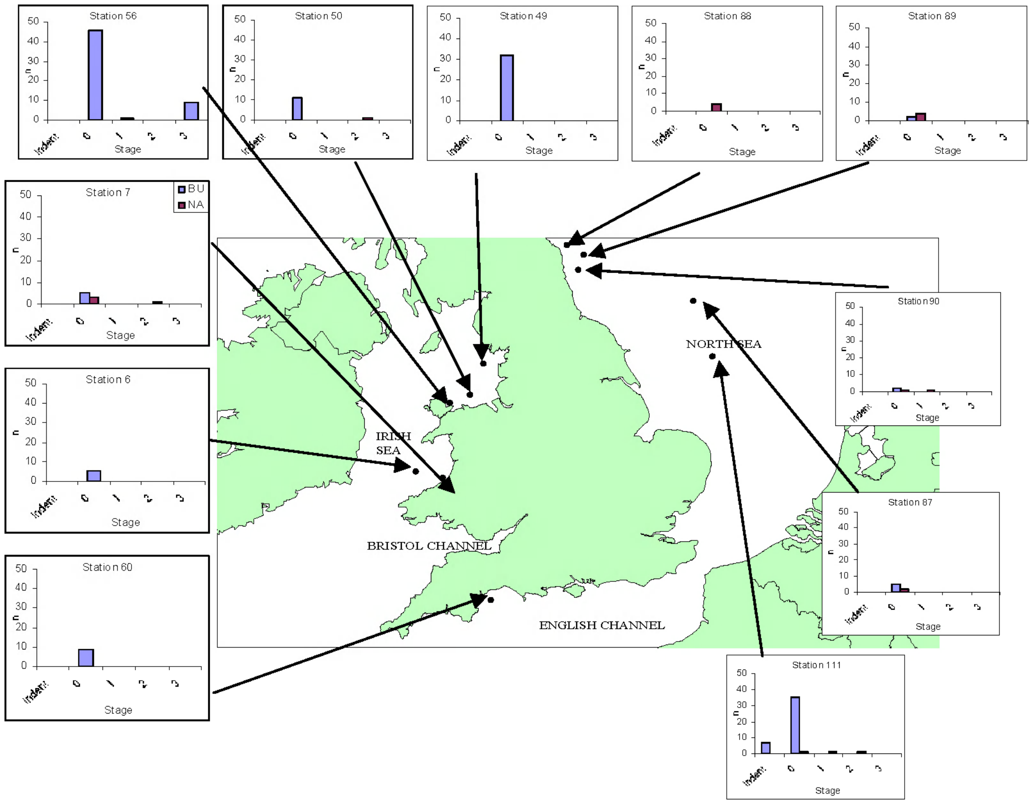

Fig. 1. Imposex in whelks sampled in 1998 (*Buccinum undatum* = blue bars; *Neptunea antiqua* = purple bars. Stages 0 to 3 indicate increasing severity of effect (N= the number of animals tested). (CEFAS unpublished data).

This example is a coastal one since *Nucella* is found on rocky shores. It seemed unlikely at the time that whelks offshore would be affected, but work in the Netherlands (ten Haller-Tjabbes, 1996) and by CEFAS (unpublished data shown in Fig. 1) showed extensive imposex in larger whelks (*Buccinum* sp. and *Neptunia* sp.). The effects were particularly marked in shipping lanes and close to disposal sites for dredged material.

Is there similar evidence that fish might show endocrine disruption in marine waters? CEFAS used the flounder as a sentinel species to look for effects in estuaries (Allen et al 1999). The results showed that in waters historically impacted by industrial and domestic discharges the level of VTG in male fish was high and there was evidence of intersex in some individuals. During a five-year study (Kirby *et al,* 2004) the severity of effect was seen to decrease as sewage discharges were replaced and water quality in UK estuaries generally improved. One exception to this trend was the River Tees in the North of England where levels of VTG remained high year on year. Sewage inputs appeared to be the major driver of effects on fish and if the causative compounds were steroids, they should degrade and not affect animals offshore.

One way to test this assumption was to place fish in cages offshore. This opportunity arose during an international workshop evaluating biological effects techniques (BECPELAG) http://www.iis.niva.no/PELAGIC/web/index.htm. In this experiment cod were deployed in cages along putative pollution gradients from land and from offshore oil platforms. The results showed that a very low level of VTG was indeed induced in male cod and those closer to oil platforms had a higher level than those further away.

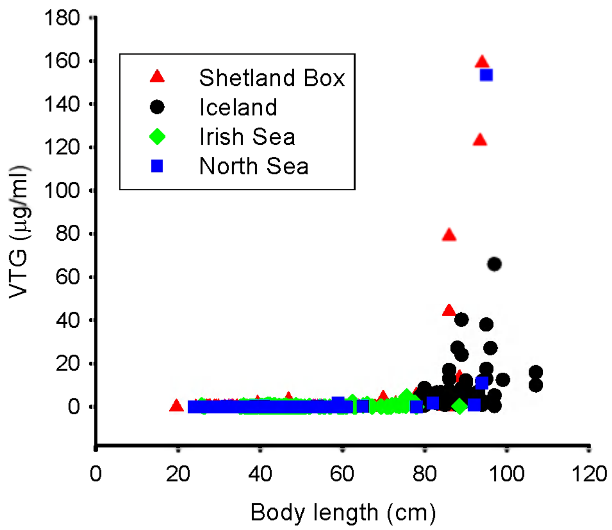

Fig. 2. Concentrations of vitellogenin in the plasma of male cod captured from the NE Altantic (reproduced with permission from Prof. A. Scott).

This was a surprising finding and led us to look at VTG in wild cod from the North and Irish Seas and from Iceland waters where we assumed any pollution levels would be low. The results showed that small fish had only low concentrations of VTG but larger ones had increased levels. The point at which the production of VTG seemed to increase dramatically (Fig. 2) coincides with a time in the life cycle when the fish are able to take larger prey items such as bottom-dwelling fish and crabs (Scott *et al.*, 2006). From this evidence it seems that the driver for the change in production in VTG may be due to uptake from prey items of more persistent and bioaccumulating compounds that are widespread in the environment at very low levels. Presently we have not yet identified the cause of the problem and the current programme at CEFAS is aimed at quantifying similar effects in prey species such as the dab that live in close association with sediments.

So is there a link of endocrine disruption to shipping such as by accidental spillages of oil and chemicals? For the example of TBT and whelks the link to shipping use of antifouling paints is clear but for endocrine disruption in fish it seems more likely that the cumulative and chronic effects of shipping, land-based and offshore-based industry, or even global distillation of persistent compounds might be to blame. The next challenge is to develop a strategy to identify the causes and trends in the effects. If this is something that is reducing over time we might be looking at a legacy of historical inputs. If the trend shows an increase, the risk assessment is different matter.

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TRICOLOR EXPERIENCE IN THE FRAMEWORK OF THE CONTINGENCY PLAN MANCHEPLAN

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Abstract

Due to a collision on 14 december 2002 the Tricolor, a Norwegian car carrier, sank close to Dunkirk, in the French Exclusive Economic Zone (EEZ) on the French continental shelf. We did not know that one of the most important counter pollution and wreck salvage operations was going to start, this for 22 months and ten days! You can easily imagine that it is hard for maritime authorities to handle such a long lasting operation even if you are dealing with a very cooperative ship owner. International cooperation is an absolute necessity particularly when the accident occurs close to the area of responsibility of two neighbouring countries. Before recalling all that has been done together with our British and Belgian colleagues in the framework of Mancheplan, I will focus on the Mancheplan to explain its organization and its characteristics.

What exactly is the Mancheplan?

The Mancheplan is the fruit of the work of an Anglo-French working group created in 1976 named Anglo-French Accident Technical Group (AFATG). It dates from July 1978, a few months after the Amoco Cadiz accident.

The Mancheplan is a contingency plan for maritime disasters, which means Search and Rescue and Counter Pollution operations. Its purpose is wider than international cooperation in the framework of the Bonn Agreement which concerns just pollution fighting and repression of MARPOL offences.
At the beginning it just concerned the UK and France, but gradually some other countries joined the Mancheplan as observers (Channel Islands, Belgium and Ireland).

I would like to emphasize some characteristics of the plan:

- First this plan is activated at the operational level and not at a political level (so it is quicker and more precise).
- Second, this plan is made to provide help and assistance at the request of the other country. It is clearly stated in the request and in the answer which country conducts the operation (ACA) and which provides assistance (ALA).
- Third the English Channel is divided in two responsibility zones, but if both countries agree, a country can lead the operations in the responsibility zone of the other if its own interests are concerned.
- Fourth, the proceedings and principles of the Mancheplan can be used even in case of a minor accident in day to day operation.

Most of all the Mancheplan is a pragmatic plan based on mutual confidence. Maritime authorities of the six countries meet twice a year during the AFATG meetings where they discuss the lessons to learn from the last accidents at sea. They inform their partners of the changes in their organization. They discuss about the new rules, new equipment. They organize a common exercise every year. As a result, when an accident happens, the partners know who to contact and who will rely on them.

The plan has an introduction, one chapter dedicated to SAR and another to counter pollution. The other 20 annexes deal with communication with the media, radio-frequencies, characteristics of the assets, grids, etc. Also standing orders for a common chartered Emergency Towing Vessel (ETV) in the Dover Strait are included.

Now let's talk about the Tricolor…

The saga of the Tricolor

The Tricolor sank on 14 December 2002, during the night, very quickly (20 minutes), in relatively shallow waters (30 meters depth). The side of the vessel was only a few meters below the sea surface at high tide and the wreck was laying in the middle of a Traffic Separation Scheme.
Thank God nobody died, nobody was injured or missing, even if the chief engineer got a real fright (he escaped through the funnel!).

The wreck caused an immediate threat to shipping in the major sea route in the North Sea. Another concern was the quantity of bunker oil remaining in the wreck which was estimated to 1990 tons of IFO 380 (same viscosity as the oil carried by the Prestige!).

Préfect maritime in Cherbourg, who is the French maritime authority for the Channel and North Sea, sent immediately a legal notice to the ship owner to oblige him to take relevant measures to put an end to the threats of pollution and danger for navigation. The ship owner acknowledged to our legal notice, and chartered immediately a guard vessel to put near the wreck.

At the same time the Mancheplan was activated to get assistance from the neighbouring countries, and of course we sent them information about the accident which was very close to their areas of responsibility.

Ensuring safety of navigation

The most immediate risk was the risk of another accident. So we had to prevent collision with the wreck.

Navigation warnings have been broadcasted by the local MRCC (Gris-Nez, Dover, Oostende). We decided to put a state ship in the vicinity of the wreck to reinforce information and to put a buoyage around the wreck.
The first ship doing this hard duty was the Belgium frigate Wandelaar. Afterwards some French ships from customs and Gendarmerie maritime came from Boulogne and Cherbourg. Two buoys have been settled the day after the collision by the French Buoyage service.

Despite these actions a German coaster collided with the wreck on 16 December. As a result, we decided to put a full buoyage around the wreck complying with the recommendation of the International Maritime Signalisation Organization, and to put two state ships in the vicinity. Two weeks later, the Vicky, a Turkish tanker, carrying 66,000 tons of kerosene also struck the submerged Tricolor and an oil spill occurred.

At this time, I want to focus on two things: 1) the Tricolor accident happened just a few weeks after the sinking of the Prestige, so the majority of the European counter pollution resources were in Spain, and 2) we were just a few weeks before the second Gulf War.

Therefore getting a Royal Navy ship was very difficult. First of all because our British colleagues of MCA had no power on Royal Navy and second the biggest ships which are seaworthy were all gone far. Fortunately our Belgium colleagues were still there and decided to share the burden with us.

So we organized a planning every month with two ships on duty for a week. I must say that without the Belgium help it would not have been possible for us to maintain two state ships at the same time here.
This situation has been going on for almost eleven months (when the remaining parts of the wreck collapsed giving more than 16 meters depth to navigate).

The figures are impressive: 25 state ships involved, 773 sailors, 325 days of surveillance, information provided to 7,076 merchant ships, 98 collisions avoided by ships whose master or officer of watch did not know the position of the wreck.

Monitoring pollution

I mentioned before that the ship owner was very cooperative. He immediately sent a guard vessel and also within two days after the collision a ship to remove the bunker oil.

We had to monitor the situation on the basis of three daily reports at the beginning.
So we organized an aerial surveillance plan with our British colleagues of CNIS, our Belgium colleagues of MUMM, and the French Customs and French Navy aircrafts (do not forget that most of the time the French remote sensing aircrafts were most of the time off the Spanish Coasts). This planning was established on a weekly basis and I tried to take the opportunity of every scheduled routine flight to avoid disturbance for services and to minimise the costs of the operation (because after all we have to try to be refunded by the ship owner's insurers). This planning was organized to avoid any aerial hazard.
The oil recovery has been completed at the middle of February 2003.

Aerial surveillance continued on a different schedule and resumed on a two flights per day during the cutting operations.
During the first year 310 hours of surveillance (175 France, 77 UK, 58 Belgium) have been dedicated to monitoring the possible oil spills of the wreck.

Counter pollution response

When it appeared that the only solution to remove the wreck from the seabed was to cut it in sections and then to lift them and bring them on the shore, it became obvious to the maritime authorities that oil release was a permanent risk (even if the pumping has been done very seriously, oil fractions still remain in a wreck). An invitation to tender has been published in February with a deadline in April.
The owner and P§I have contracted a consortium headed by Smit to cut the wreck in nine sections by means of a specially designed cutting wire system that was used in the lifting of the Russian submarine Kursk in the Barents Sea.
Each wreck section, including the cargo inside (luxury cars), was lifted by means of two sheerleg cranes barging of 3,000 ton lifting capacity.
France, in accordance with Belgium and UK, asked the contractor to have an oil spill contingency plan. In this plan it was stated that the first tier response was in charge of the

contractor with appropriate assets and trained crew. The second tier response (major oil release) was in charge of France and Belgium.

So we had to have a ready duty counter pollution ship available during all the cutting and lifting operation. During the last part of the operation on the working site (May to September 2004) when the giant crane was grabbing the collapsed parts of the ship, the same counter pollution system with two response tiers has been implemented.

It means that during the first year we had to plan aerial surveillance, to plan navigation control, and to plan oil spill response ships.

You cannot do that if you do not have goodwill men (or women) in front of you. Fortunately I knew all my opposite numbers.

Sharing information and decisions together

Leading such an important operation close to the borders of other countries is not possible if you do not share the information and take advice to take common decisions.

All the important working meetings we had with the ship owner's representatives were held in Dunkirk with the French shore authorities and the British and Belgian relevant authorities.

All the press releases and releases for French ministries have been sent to our foreign partners.

More than 12 meetings have been held in Dunkirk (even if it was a burden to organize meetings far from our office) to facilitate the participation of the Flemish Governor Paul Breyne and other relevant Belgium authorities and the MCA representatives of Dover. 87 official communiqués have been addressed to the UK and Belgium authorities.

Conclusion

The Tricolor case is one of the most important salvage operations ever been carried out in the world.

It is a unique example of cooperation with a ship owner taking his full responsibility, the fantastic know-how of Dutch and Belgian salvage companies and the quality of relationships between Mancheplan partners.

Even if the Tricolor spill turned into one of the most serious incidents in Europe for birds (but we had to face pollution coming up from Prestige), we can consider that we succeeded all together in dealing with the pollution threat and the navigation danger in this busy and sensitive area.

THE SUB-REGIONAL CONTINGENCY PLAN BETWEEN DENMARK, GERMANY AND THE NETHERLANDS (DENGERNETH)

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Abstract

BEING AWARE that the increasing maritime transportation and the growing size of ships are causing a potential threat of a pollution incident at sea,

BEING ALSO AWARE that spills of oil or other harmful substances can have long lasting negative impacts on the sensitive marine environment in the Southern North Sea and present a danger to coastal regions of Denmark, Germany and The Netherlands,

NOTING that he sub-regional approach is crucial to ensure timely and well organized response to pollution incidents and in that way to minimize environmental damage caused by an accident,

NOTING FURTHER that sub-regional cooperation is of crucial importance when effectively using the emergency and response resources.

Due to the above mentioned and of the continuous threat of pollution to their coasts bilateral Agreements have been concluded between the Netherlands and Germany (NETHGER, 1991) on the one hand and between Denmark and Germany (DENGER, 1993) on the other hand to establish close co-operation in response to pollution of the sea by such substances.

The competent Parties e.g., the Defence Command Denmark, the Ministry of Transport, Public Works and Water Management of the Netherlands and the Federal Ministry of Transport, Building and Housing of Germany, (referred to as the Parties) have agreed to extend their existing co-operation to include information exchange on the threat of marine pollution and aerial surveillance for the prevention and detection of pollution.

The Parties also agreed to establish one composite trilateral arrangement of co-operation instead of having separate bilateral instruments concerning co-operation in combating marine pollution and co-operation in aerial surveillance.

Parties also agreed to establish closer co-operation between the relevant authorities in the field of preventing and limiting the damage to the marine environment in cases of maritime accidents.

The trilateral arrangement of co-operation is named 'Joint Danish-German-Dutch Response Plan to maritime incidents involving Oil and other Harmful Substances and Co-operation in Aerial Surveillance (DENGERNETH Plan).

Bearing in mind the respective provisions of the Agreement for co-operation in dealing with pollution of the North Sea by oil and other harmful substances, 1983 (Bonn Agreement), and all endeavours of the three countries to control and minimize pollution and its effects, the Parties recognise the obligation to exchange information on casualties, the threat of pollution and to respond to pollution within the DENGERNETH Region, also in those cases where their own territory is not threatened by the pollution in question.

This co-operation includes also exchange of information on maritime accidents in its own region of responsibility that could constitute threats to the coasts or related interests of the three countries. In order

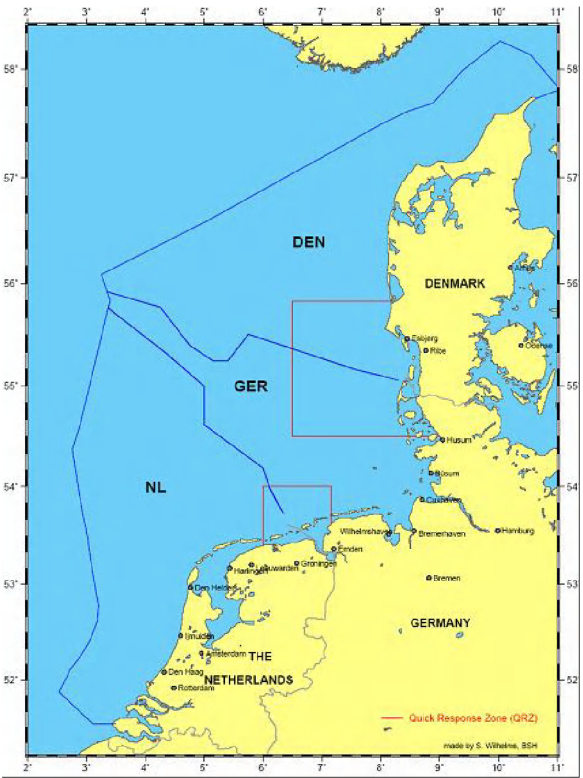
to increase the effectiveness of the measures taken, the Danish, German and Dutch authorities agreed to act in accordance with the principles contained in the Plan.

For the purpose of this Plan joint operations include all operations involving co-operation, of whatever nature, between Denmark, Germany and The Netherlands pursuant to the objective of the Plan.

This Plan applies as necessary and appropriate to any marine pollution or threat of pollution within the DENGERNETH Response Region, which is or could become of sufficient severity to initiate joint action. Even when an incident provides for no imminent threat of pollution the Plan will initiate an information exchange. The exchange of information must not necessarily mean an activation of the DENGERNETH Plan.

The Response Region

The southern part of the North Sea is considered as the Response Region.



The Response Region is divided into the national response zones of Denmark, Germany and the Netherlands in accordance with Art. 6 of the Bonn Agreement. The lines of demarcation coincide with the National Response Zones.

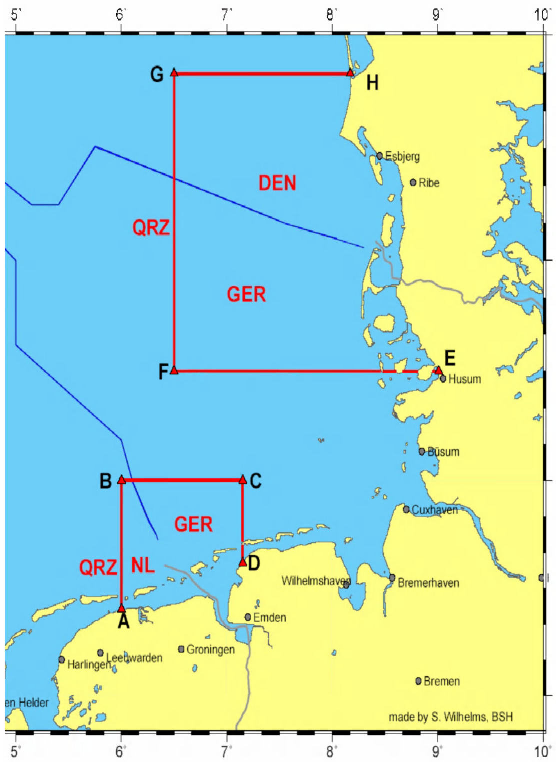
According to Art. 6 of the Bonn Agreement the Party within whose zone the incident occurs, shall make the necessary assessments of the nature and inform the national contact points of the other Parties of its assessments and any action taken.

Fig. 1. Map of Responsibility in the North Sea (DENGERNETH).

Quick Response Zones

Within the Response Region there are two areas of joint responsibility (Quick Response Zones):
bilateral area 'Denmark – Germany'
bilateral area 'Germany – The Netherlands'

In a Quick Response Zone, immediate actions must take place in maritime accidents and each Party has the right to start response actions immediately regardless in whose National Response Zone the pollution has occurred.



On the landward side of the baseline (internal waters) joint combating actions only take place, if explicitly requested by the concerned Party.

The two Quick Response Zones link the agreed points of the EEZ boundaries to the coast.

Fig. 2. Map of Quick Response Zones in the North Sea (DENGERNETH).

Special arrangements

The DENGERNETH Plan also applies to the Wadden Sea and the Eems-Dollard region. Regional sub-plans for Wadden Sea areas may be concluded within the framework of this DENGERNETH Plan. The agreement between the Federal Republic of Germany and the Kingdom of the Netherlands concerning the arrangement of co-operation in the Eems Estuary of 8 April 1960 is not affected by this plan.

Activation of the plan

The DENGERNETH Plan is activated if one country asks the other Parties for assistance (call for assistance) in response to pollution of the sea by oil or other harmful substances. The other Parties are to acknowledge the activation of the Plan.

The DENGERNETH Plan is also activated if one Party takes response measures in another Party's National Response Zone.

The DENGERNETH Plan may further be activated in case of pollution or serious threat of pollution outside the Response Region, if the situation calls for an urgent activation of the Plan in a case where the pollution or the threat of pollution could affect the Response Region. In this case the National Responsible Authorities of the Parties should in due course decide whether or not joint response actions are required.

Co-ordination and responsibility

In the Response Region the responsibility for initiating joint operations normally rests with that country in whose National Response Zone the incident has occurred. This country normally will be the Lead Country. The Lead Country will assume responsibility and co-ordinate any required assistance.

Governmental owned or operated equipment, vessels, operational forces and surveillance capacity of the three countries shall be made available for joint combating activities. The Lead Country shall be assisted by the other Parties to arrange contacts with private companies, which have the appropriate equipment and/or operational forces available.

When the oil or other harmful substances enter into the National Response Zone of another Party to the DENGERNETH Plan the responsibility of joint actions normally should be transferred to that Party.

In case of a pollution incident of which the source is known, the Lead Country will also co-ordinate legal and financial matters (claims) on behalf of the Parties.

There may be cases in which, as a result of a joint evaluation by the authorities of the three Parties, the responsibility is left with the original Lead Country.

There may also be cases where the three Parties operate independently in their National Response Zone, but continuously inform each other about their operations. This may occur for instance if pollution impacts more than one National Response Zone at the same time.

Response actions

All response actions under this Plan should be agreed between the Parties, unless the situation requires quick response activities. In a case where quick response activities are required, the operational forces of one Party may operate within the territorial waters of the neighbouring country, if these operational forces are first to arrive at the site of the pollution. Notification of the authorities of the Party affected should be made as soon as possible.

Especially in the case of pollution by harmful substances others than oil or loss of packaged dangerous goods, the assistance requesting Party shall specify the circumstances of the incident and the kind of assistance needed. The other Parties shall use their best endeavors to bring such assistance as is within their power taking into account the technological means available.

Aerial surveillance

For the purpose of detecting spills of oil or other hazardous substances which may be illegal according to international law, and for the purpose of registering spills of oil and other harmful substances likely to affect coastal regions or the environment of the North Sea, the parties agree, with reference to the Bonn Agreement, 1983 to intensify and to regulate co-operation regarding airborne surveillance between the respective competent authorities, according to the Bonn Agreement procedures, by:

- the establishment of surveillance areas of mutual interest;
- the co-ordination of flight schedules;
- standardisation of reporting and communication procedures;
- standardisation of observation methods and registration formats;
- the development and the effective use of airborne surveillance equipment;
- the improvement of marine pollution combating actions especially in the implementation of the DENGERNETH Plan;
- providing mutual assistance in case of failure of aircraft or if the own air surveillance system cannot be operated.

The National Responsible Authorities shall carry out the above-mentioned provisions in direct contact with each other. Each Party of the DENGERNETH Plan shall make available aircraft especially equipped for airborne surveillance in order to:

- carry out regular surveillance flights in accordance with the jointly established flight Plan;
- provide assistance on request during pollution combating operations and during overhaul of an other Parties aircraft.

Exercises

In order to establish a high degree of readiness, annual exercises shall be carried out between the three countries. Instead of these trilateral exercises or in addition, combined exercises in accordance with relevant regulations of the Bonn Agreement may be conducted.

The annual exercise programme shall be decided upon in January after trilateral consultations.

Within the framework of the DENGERNETH Plan two exercises have already been carried out.
Denmark, May 2005. The Netherlands, June 2006.

THE NATIONAL CONTINGENCY PLAN FOR THE NORTH SEA 'RAMPENPLAN NOORDZEE': PRESENT STATE AND CRITICAL EVALUATION – ORGANIZATION

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Introduction

As the study 'Risk Analysis of Marine Activities in the Belgian part of the North Sea (RAMA)' shows, the Belgian part of the North Sea is a busy sea area. It contains one of the busiest sea routes of the world. As we have learned from past experience, this implies a number of risks at severe shipping disasters.
For contingency planning in Belgium and on the North Sea, the Herald of Free Enterprise catastrophe off the coast of Zeebrugge on 6 March 1987 became a turning point.
After this disaster, in which 193 lives were lost, the National Contingency Plan for the North Sea was drawn up.
This contingency plan existed by mutual tacit agreement between all concerned parties, however, without officially having been endorsed. This endorsement only came later by Ministerial Decree of 19 April 2005 (BS 25 May 2005).

Objective of the contingency plan for the North Sea

This contingency plan applies to disasters in which:
- ships and their cargo could get lost and passengers and crew could become victims;
- shipping and sea access to harbours could be seriously hampered;
- environmental problems could occur.

The aim is to:
- immediately deploy the available means on the scene through a chain of alert, which implies being permanently operational;
- set up a co-ordination between the authorities involved, which requires a unity of command.

The North Sea contingency plan describes the organization of the assistance and the co-ordination of the operations in case of a disaster or severe accidents on the North Sea.
It has an operational character and is used without prejudice to the legal or regulatory authority of concerned parties, which are amongst others:
- the shipping police (scheepvaartpolitie): which is responsible for the supervision of the general and specific surveillance of the sea;
- the Flemish Government (Vlaamse gewest), in particular the Agency for Maritime Services, (Agentschap voor Maritieme Dienstverlening) which is amongst others responsible for the rescue operations at sea;
- the Navy (Marine), which is responsible for the execution of antipollution measures and the co-ordination at sea;
- the Federal Government, in particular the General Directorate of the Environment (directoraat-generaal Leefmilieu) of the Department of Health (FOD Volksgezondheid), which is responsible for the control of marine pollution and the availability of resources, and the technical and operational expertise in the deployment and use of these resources;

- the Management Unit of the North Sea Mathematical Models (MUMM) (Beheerseenheid Mathematisch Model), which is responsible for the scientific supervision of the marine environment and co-ordinates the scientific activities at sea.

The Governor of the province of West Flanders has been appointed General Co-ordinator of the North Sea contingency plan by the Council of Ministers on 11 March 1988.

Area of application

The North Sea contingency plan applies to the territorial sea, the Exclusive Economical Zone, the Responsibility Zone as stipulated in the Bonn Agreement with reference to sea water pollution control and the rescue zone as determined by FIR with regard to aid and assistance at sea.
Moreover, the North Sea contingency plan is also applicable in a number of zones as stipulated in international treaties and which impose on coastal states specific obligations for the open sea, for instance with regard to the rescue of people and marine environmental protection (cf. law of 20 January 1999 for the protection of the marine environment in the sea areas under Belgian jurisdiction).

Phasing

The contingency plan for the North Sea provides four phases:

Phase 1: fore alert by the Nautical Director and assistance through own resources

The fore alert is launched as soon as, because of certain circumstances or facts, the risk of a 'threatening event' occurring, has considerably increased. The chain of alerts is initiated by the person in charge at the Maritime Rescue and Coordination Centre (MRCC).

Phase 2: alert by the Nautical Director and immediate precautions

As soon as a threatening event occurs or is on the verge of occurring and when there is serious indication to suspect that the own assistance resources will be insufficient to control the disaster, the person in charge at the Maritime Rescue and Co-ordination Centre (MRCC) proclaims the alert. Here, a chain of alert is followed in order to notify all concerning parties that the plan has been activated.

It is important that, if there is any indication of possible victims, the 100 service in Brugge is alerted and the general provincial emergency plan (in particular the medical intervention plan) is activated.

Which actions should be taken by the alerted services?
In anticipation of co-ordinated assistance, the ships involved must confront the 'problem' with their proper resources.
The MRCC establishes a reinforced 24 hour permanent service and activates the crisis centre. As soon as possible, the Navy (COMOPSNAV) takes on the task of 'on scene-co-ordinator' and leads the interventions at sea. The second phase ends as soon as the co-ordination committee is operational.

Phase 3: co-ordinated interventions led by the Governor

The Governor of West Flanders has been appointed by the federal government as general co-ordinator of the contingency plan for the North Sea.
He can call upon the help of four staffs: a Search and Rescue Staff (SAR) for emergency interventions at sea led by the nautical director. A Pollution Staff (POL) led by the navy with regard to pollution control at sea.
Concerning incidents which could affect the harbours, the involved harbour captain is co-ordinator of the Harbour Staff (HAV).
The governor co-ordinates the Land Staff in case of incidents with an onshore impact.

Phase 4: after care led by the Governor

If there are no more urgent decisions to be made, the general co-ordinator proclaims the after care phase.

Evaluation

The main objective of this contingency plan is to establish a consultative structure in which various authorities with their specific competences come together under the leadership of the general co-ordinator.
In the past, this plan has worked well because of the good understanding between all on-scene parties.
However, taking into account various new developments in emergency planning in Belgium, as well as in cooperation between different parties with jurisdiction at sea; this contingency plan for the North Sea needs to be revised.

The North Sea contingency plan goes back to a time when emergency planning in Belgium was not efficiently organized.
It speaks of four phases, but these phases do not correspond to those which were used in the onshore emergency planning.
The Royal Decree of 16 February 2006 on emergency and intervention plans now provides that the policy and the operational intervention co-ordination happens on three levels, which are called phases.
There is a municipal phase, a provincial phase and a federal phase.
This phasing cannot automatically be applied to the contingency plan for the North Sea, because it is situated outside the municipal and provincial level, but the logic of this threefold phasing could be. Then there would be a first phase in which co-ordination takes place between the different on-scene parties. In the second phase the Governor of West Flanders co-ordinates the activities, such as actually is the case.
And if the incident at sea should have national effects, the federal phase could be activated.
In this manner, there would be coherence with the onshore emergency planning.
The organization of this first phase co-ordination, however, still requires some brainwork.

The onshore emergency planning has five 'disciplines'. The North Sea contingency plan distinguishes four staffs. A better coherence between on and offshore emergency planning is desirable here also.

Discipline 1 - on shore refers to assistance and is the task of the fire department and the civil protection service operational units.

The SAR staff in the North Sea contingency plan actually corresponds with this first discipline. It relates to everything with regard to immediate assistance at sea and the actual rescues.

Discipline 2 refers to the medical, sanitary and psychosocial assistance and is provided by the services which give urgent medical aid.
The North Sea contingency plan stipulates nothing on this matter. It is therefore desirable to at least refer to the medical intervention plan, and in that plan pay specific attention to victim relief of sea incident victims.

Discipline 3 concerns the policing of the emergency site. This task is fulfilled by the federal and/or local police.
Again, the contingency plan for the North Sea does not provide anything on that subject. Nonetheless, the federal police, which is in this case the shipping police has important assignments in this respect. Therefore, further elaboration of this discipline is a must.

Discipline 4 concerns logistic support and is provided by the operational units of the civil protection service, the fire department and the public and private services specialised in this matter. At sea, we have the Pollution Staff in charge of sea pollution control. This Staff could resort under discipline 4, together with all other services which offer logistic support and are indispensable to efficiently tackle sea incidents.

Finally, discipline 5 is about information. In the provincial phase, this is the task of the Governor. The North Sea contingency plan stipulates that the Governor is at all times in charge of all press contacts. In this matter, the onshore emergency planning organization can again be of use in organizing this aspect of the offshore incident control.

The importance of an onshore-offshore emergency planning synergy also lies in the drafting of the various contingency plans.
Onshore, there should be a multidisciplinary emergency and intervention plan and each discipline needs to have its own monodisciplinary intervention plan.
The North Sea contingency plan then will become the multidisciplinary North Sea emergency and intervention plan. Each discipline will then draw up its own monodisciplinary plan.
This was already mentioned in the North Sea contingency plan, but rather as a recommendation.
It read that each authority involved at interventions at sea was expected to intervene according to its own, previously drafted intervention plan. This is currently being finalised. The MRCC has an operational plan named SAR and there already exists an operational anti pollution intervention plan.

A second evolution which the contingency plan for the North Sea should take advantage of, is the putting in place of the Coastguard structure. On 8 July 2005 a cooperation treaty was made between the federal and the Flemish government on the subject of founding and cooperating in a Coastguard structure.
The Flemish government has endorsed it by decree of March 17th 2006, the federal government by law of 4 April 2006. Article 26 of this cooperation treaty stipulates that the Governor of West Flanders is the co-ordinator of the contingency plan for the North Sea.
This includes the drafting, up-date and co-ordination of the ‘contingency plan for the North Sea’, which deals with all aspects related to disasters at sea and in coastal waters and which are part of the responsibility of all parties involved in this treaty.
With this knowledge, the new to be established structures, especially those of the Coastguard centre, the collaboration between the MRCC and the Maritime Information Point (MIK), will have to be taken into account.
This yet to be established Coastguard centre, will play an important role in supporting the co-ordinator and the crisis committee on the subject of gathering of and spreading of information to all parties concerned.

A third focal point is the definition of the application area of the North Sea contingency plan.
As it is now, it is rather limited. It is a definition in which a number of possible incidents are enumerated (for instance shipping accidents with loss of passengers and/or cargo, environmental incidents). A broader definition seems more appropriate, in which is referred to the definition of an emergency situation as mentioned in the Royal Decree on Emergency and Intervention Plans.
Under emergency situation the Royal Decree's legislator reads 'any event that has or can have damaging effects on social life, such as a severe disruption of public safety, a serious threat to people's lives or health and/or to important material interests and which requires the co-ordination of the disciplines to eliminate the threat or restrict damaging effects'. A similar definition might be used in the contingency plan for the North Sea. This broadened definition covers both safety and security incidents, whereas the current definition is limited to safety issues.
Safety and security each have their own finality, but in case of a crisis, they are closely linked and can have a big impact on one another. A contingency plan in which both aspects are integrated, which is also reflected in the composition of its crisis committee, should stimulate uniformity of all actions. There will still have to go a lot of thought into this matter and its interpretation during the contingency plan's revision.

Conclusion

A contingency plan is not a rigid document in which once and for all is put down how to react in case of an emergency. It is, as such, an evolving matter, which entails that the plan should constantly be adjusted to changing circumstances. This is surely the case for the North Sea contingency plan. Sometimes there is a need for small but necessary adjustments, but in due course one should dare to question the totality of it all and submit it to major changes. The contingency plan for the North Sea is currently at that point in time.
This revision will still require a lot more energy, deliberation and effort of all parties concerned. Nonetheless, it is an important assignment. Belgium may only count 65 kilometres of coast and have the authority on only a very small part of the North Sea, but the potential risks and dangers are substantial and realistic.
Therefore, risk analysis is an important tool to assess these potential risks. It is the task of the appointed authorities to take them into consideration and take the necessary precautions.
It is in this view that the Governor of West Flanders wishes to observe his role as co-ordinator of the contingency plan for the North Sea and desires to permanently evaluate, question and revise this emergency plan.

THE NATIONAL CONTINGENCY PLAN FOR THE NORTH SEA: THE SHAPING OF OPERATIONAL ARRANGEMENTS

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Abstract

As all small countries, Belgium lacks the resources to respond to a major accidental pollution at sea. Over the years, the awareness of the risk has grown and practical arrangements have been adopted to deal with emergencies. These arrangements now rest on recent legislation that confers considerable powers to the federal authorities. They are also characterized by a will to co-operate and pool whatever intervention capabilities are available. Operational plans now exist and are in the process of being tested. Conformity with internationally accepted doctrine remains uncertain in some respects.

Introduction

Specificities of the problem faced by Belgium

Belgium has a coastline of only about 65 km. Yet, Belgium borders the North Sea in one of the busiest shipping areas of the world. More than 500 ship movements are registered each day in the nearby Strait of Dover. All vessels bound to Antwerp, Ghent and Flushing pass in the vicinity of the Belgian coast, and the seaports of Zeebrugge and Ostend are expanding.

Interest for marine affairs in Belgium has long been more commensurate with the length of its shores than with the potential of its harbours, however: the country is not a typical seafaring nation. If many of us have developed a deep passion for the sea, many more suffer from a total lack of familiarity with it. Politically, this has for long resulted in an absence of commitment and a tragic lack of financial resources in the public sector. Fifteen years ago, for example, no dedicated means and no budget existed for dealing with accidental marine pollution. It seemed not obvious that the economic risk would justify the investment.

UNCLOS and international law

Public awareness arose in the eighties with the growing international concern for the quality of the marine environment and the spectacular impact of oil spills. As international law began to deal more specifically with marine pollution, various groups in the academic world, the administration and the industry became increasingly active and called for a new strategy.

The United Nations Convention on the Law of the Sea (UNCLOS, Montego Bay, 1984) established a global legal regime for the territorial sea, the continental shelf and the exclusive economic zone. The convention granted the coastal state sovereign rights on the natural resources of its exclusive economic zone and jurisdiction with regard to the protection and preservation of the marine environment in the zone. This resulted in Europe in a concerted effort to implement those provisions of the convention and come to practical arrangements. The change was particularly welcome in Belgium.

Legal foundations of our response strategy

On the initiative of the Belgian government, treaties were signed with France (law of 1993), the United Kingdom (law of 1993) and the Netherlands (law of 1998) to delimit the territorial seas and continental shelves. By law of 18 June 1998, Belgium ratified UNCLOS, which made it possible to establish an exclusive economic zone. The zone was created by law of 22 April 1999. Almost simultaneously, the Federal Government passed through Parliament the law of 20 January 1999 on the protection of the marine environment. That law set the frame of an integrated marine management strategy, including an entire body of principles with regard to the responsibilities of the polluter and the powers of the public authorities in maritime accidents. Meanwhile, many provisions of international law were confirmed and further developed in European legislation. Following directive 2002/59/EC, all Federal ministers responsible for operational aspects of counter-pollution response pursuant to the law of 20 January 1999 signed the decree of 19 April 2005 granting official status to the North Sea Emergency Plan placed under the coordination of the Governor of West-Flanders. On 8 July 2005, an Agreement setting up a joint cooperative Coast Guard Structure was signed by the Federal Government and the Flemish Region. With a joint communication system, a common secretariat and two levels of coordination, that Agreement set the stage for operational plans covering all aspects of the intervention of the coastal state at sea.

Peculiarities of the response strategy in Belgium

In the above legislation a number of features deserve to be pointed out as particularly interesting or unconventional. In line with the most recent directives, the polluter is expected to take initial measures to contain pollution, recover the pollutant, prevent damage and restore the affected resources. This being said, however:

- the authorities may intervene on a vessel ex officio, if they think it necessary; the polluter pays; the master of a polluting vessel is required to co-operate with the authorities;
- any of five different government services with authority at sea may do so; their actions and interactions are in principle governed by an operational plan;
- some decisions bearing a risk for nature conservation can only be made by a government scientist: the incident manager or the on-scene commander must obtain his authorization before using chemical treatment agents or before abandoning gear or intervention materials in the environment at sea;
- the criterion for such decisions is set down in the law: the chosen treatment should produce 'a global reduction of the adverse effects of the pollution in the marine environment' compared with other combating options or with the natural processes.

Obviously, the intention of the legislator was to maximize the enforcement capabilities of a small coastal state by granting powers to many authorities at sea, and to coordinate those many in a single structure, making sure that this structure also associates the regional (local) authorities. The emphasis is on sound practice and the preservation of the marine environment. The intention is also to make up for the lack of means by pooling resources for intervention at sea and on the shore; and to make up for the dispersion of legal responsibilities of the various departments involved by adopting good sense, voluntary co-ordination schemes. For example, the control of shipping is essentially centralized at the regional Flemish Marine Rescue Co-ordination Centre in Ostend. The national level General response Coordinator of all actions at sea and ashore is the Governor of West-Flanders. The On-Scene commander afloat is a Navy officer representing the Admiral commanding the Belgian fleet.

The operational arrangements

Budgetary provisions for oil combating at sea were not made in the State budget until 1994. When they were made, they remained exceedingly modest (75.000 euros per year working credit for nearly 10 years). A 2.5 million euros investment credit was first voted only in 2000. At the present time, no dedicated combating vessel is available yet to the authorities for operations at sea.

Three operational plans have been adopted as subsidiaries of the national North Sea Emergency Plan: a plan for oiled birds, on 21 June 2005; a plan for cleanup operations along the shore, on 25 January 2006; and a plan for counter-pollution operations at sea, on 10 August 2006. All three plans recognize the authority of the Governor as General Co-ordinator.

The operational plan for counter-pollution interventions at sea implements the principles of the general response strategy. The plan is placed under the coordination of the Federal Department of the Environment. After the evaluation of the situation and the initial counter-measures on-scene, a choice is made of the most appropriate combating method. Pursuant to the law on the protection of the marine environment, the decision rests on a Net Environmental Benefit Analysis (NEBA) for which MUMM, a department of the Royal Belgian Institute of Natural Sciences, is responsible. The intervention develops along seven phases: (1) alarm, (2) assessment, (3) initial counter-measures, (4) choice of the combating strategy, (5) combating operations, (6) follow-up, and (7) debriefing. All components of these seven phases are structured in a flowchart that also serves as an index: for each component, reference is made to an explanatory fiche that expands the information.

The plan places an emphasis on the need to search for and collate all the relevant information in one location in order to permit a valid NEBA assessment. Computer models used to simulate the natural processes and the behaviour of the pollutant are an essential tool for the assessment. The classical strategic choices (mechanical recovery, chemical dispersion, mechanical dispersion, do nothing) are explained in a flow chart and the emphasis is placed on the need for monitoring the operations (particularly if the do nothing option is selected!) and for providing aerial guidance to the intervening vessels. Basic provisions are made for temporary storage of recovered wastes and for disposal.

The oiled birds plan deserves an analysis of its own and will not be commented on any further here. The operational plan for cleanup along the shore has also been prepared under the coordination of the Federal Department of the Environment. It recognizes the need to reconcile the arrangements for dealing with marine pollution with the Provincial Emergency Plan. As long as the shore pollution is limited to the coastline of a single municipality, the operational coordination is done by the local mayor. He can call on the assistance of the Civil Protection, a service of the Minister of the Interior. If the cleanup overlaps on the territory of two or several municipalities, the Governor is in charge of the co-ordination. A Province Policy Group brings together the Coordinator, the mayors and the Civil Protection.

Critical evaluation of the current state of affairs

As the dates show, the operational plans are very recent and they will require the trial of time and contingencies to show their adequacy. A priori, however, the plans appear sound and well organized, and they constitute a huge step forward from the situation that existed only two years ago. They are professional instruments and it should be no great problem, when needed, to further build on them.

One cannot escape the impression, on the other hand, that these plans are well suited for medium-size spills (up to 1.000 tons of oil?) but that they would fail for large oil spills. The way in which the arrangements of the three operational plans integrate within the general arrangements of the North Sea Emergency Plan remains unclear. In particular, one misses here the traditional three-tier approach that has proven so useful in contingency planning world-wide. Structures appear rather dispersed and the responsibility for coordination shifts from one to the other, not only with scenarios, but also with the location and the phasing of the operations. In most cases, one gets the impression that the person in charge of the coordination is not an expert of counter-pollution but rather a high official endowed with administrative responsibilities. How this person will be assisted technically is unclear. The shore cleanup plan does not address the problem of organizing volunteers in a large-scale incident. Finally, logistics and finance do not seem to be centralized unless the Federal Department of the Environment takes the initiative. Rules enabling it – or another level of government – to do so and clear mechanisms for funding joint operations are most needed. There is an obvious need to reconcile the plans with the internationally recognized doctrine of contingency planning developed by the International Maritime Organization (IMO) and the Oil Pollution Response Convention (OPRC).

Conclusion

The current arrangements for dealing with emergencies at sea in Belgium rest on a sound, comprehensive body of legislation that evolved in less than a decade and shows a number of interesting, original features. There is an obvious attempt to reconcile a chronic lack of resources with the will of the coastal state to be present at sea and to be in control. The environmental concern is central to the contingency plans, and a resolute effort is made to found strategic choices on an expert assessment of impacts and a scientific approach of environmental benefits. The latest operational plans contribute decisively to the preparedness of the organization. They will need to be further aligned on the accepted international doctrine and scaled up to face major pollution disasters. Budgetary provisions, expert advice and dedicated sea-going platforms will most certainly be required.

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