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Oil Spill Risks and the State of Preparedness in the Regional Seas

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Abstract

The International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (OPRC Convention) defines the basic elements for co-operation between government and industry in marine pollution response. Emphasis is given in the Convention to developing contingency plans, equipment stocks, research and development initiatives, training and exercise programmes, and appropriate spill notification procedures for shipping. This paper reviews the current status of the partnership between government and industry for dealing with spills arising from the transportation of oil by sea. Three areas are explored: the risk of spills, environmental sensitivity issues, and the capabilities for dealing with oil spills in different regions of the world. The format for the study is based on the Regional Seas and Partner Seas Programme initiated by the United Nations Environment Programme (UNEP), and supported by the International Maritime Organization (IMO).

For each region, the main factors contributing to the risk of oil spills are identified, analysed and discussed in relation to the current pattern of oil transportation by sea. Comparisons are made with data on major oil pollution incidents drawn from ITOPF's oil spill database. Priorities and activities in the different regions are considered and the implications for oil spill response are discussed. Finally, the commitment and capabilities for mounting effective spill response measures in the different regions are gauged, with particular reference to the tenets of the OPRC Convention.

Introduction

The primary role of the International Tanker Owners Pollution Federation (ITOPF) is to provide advice on effective oil spill clean-up and on economic and ecological effects of oil pollution in the marine environment. Over the course of 30 years ITOPF staff have attended some 470 pollution incidents in 85 countries. A database of accidental oil spills from tankers was started in 1974 and gradually other forms of information on oil spill risks and impact in different countries have been gathered as the pool of experience within the organisation has expanded. Summaries of information on spill response arrangements have been organised by country and posted on the ITOPF website under the heading 'Country Profiles'.

In parallel with these developments the International Maritime Organization (IMO) and the United Nations Environment Programme (UNEP) have encouraged co-operation between countries under the Regional Seas Programme, started in 1974. The spirit of international collaboration was formalised and codified through the adoption of the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) in 1990. Since then particular emphasis has been placed on fostering an integrated approach by governments and industry for development towards OPRC goals. To this end, IMO and the international oil and shipping industries have joined in a partnership, the Global Initiative, to promote progress in oil spill preparedness.

In a wide-ranging review of land-based activities and pollution sources affecting the quality and uses of the marine environment, the United Nations Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) identified two avenues for improving the control of accidental oil spills: risk reduction and developing spill response capabilities. In particular, it was concluded that significant gains can be made by implementing existing technologies and procedures more widely, especially in developing countries (GESAMP, 2001a).

Against this background it was natural for ITOPF to collate available information on oil spill risks and oil spill preparedness to serve as a tool for the response community. Gaps in current spill response arrangements will indicate which potential projects and activities may be most appropriate to the particular needs of a country or region. A report was issued, and updated in 1996, entitled *"An Assessment of the Risk of Oil Spills and the State of Preparedness in 13 UNEP Regional Seas Areas"*. A fresh review ('the Review') was conducted in 2002 expanding the earlier study, and the purpose of this paper is to describe the review process, present the main results, and outline future plans for the initiative.

Aims and means of conducting the Review

The main aim of the Review is to provide a summary of oil pollution issues relevant to specific regions of the world, and to set such issues in a wider context, recognising that there are many other forms of pollution or stress on the marine environment. Some of the main issues of global concern identified by leading marine scientists regarding deterioration of the marine environment were compiled by GESAMP (2001a). The issues can be loosely grouped into three categories of impact: Marine Pollution, Ecological Balance & Habitat Change.

Marine pollution
Sewage, eutrophication, harmful algal blooms and human health implications
Classic pollution (metals, oils, persistent organic pollutants, radionuclides)
Endocrine-disrupting chemicals
Man-made debris (litter)

Ecological balance
Overfishing and destructive fishing practices
Reduced biodiversity
Transfer of alien species

Habitat change
Climate change, sea-level rise and coastal flooding from other man-made causes
Marine habitat destruction (e.g. coral reefs, mangroves, wetlands, seagrass beds)
Effects of deforestation and changes in hydrology, turbidity and sedimentation
Mineral, sand & gravel extraction

Given this wide variety of potential impacts on the marine environment, it is clear that the implications of oil spills for both risk perception and formulating policy for preparedness can be difficult to balance amongst other conflicting requirements. As a generalisation, oil spills and other 'classical' pollutants including heavy metals, persistent organic substances and radionuclides are perceived by GESAMP as less significant compared with other agents of environmental deterioration, and create few long-term problems. Instead, the focus of concern is centred more on the threat of climate change and the greater effects of sewage, eutrophication, declining fish stocks, and habitat destruction (GESAMP, 2001b).

Irrespective of the relative severity of the issues identified, it is crucial that measures to protect and restore coastal and marine resources are properly targeted, and that duplication of effort is avoided. Access to an objective analysis of the situation prevailing in different parts of the world should help policy makers and spill responders, as well as major funding institutions (e.g. World Bank, regional development banks, European Union), to assess priorities and tackle problems in a co-ordinated and systematic manner.

There are also differences in the perception of oil pollution which determine how oil spills are viewed and what importance is accorded to contingency planning. Ideally, good preparation paves the way for an effective response and both preparation and response aspects are given equal weight. In reality, however, preparedness activity is often compromised in countries with more pressing demands on scarse financial, human and institutional resources, (Moller & Santner, 1997).

Furthermore, there are considerable geographical differences in the range of threats and impact of marine pollutants, ecological balance and habitat change in different regions of the world. Only by concerted action by partners facing common problems and threats can there be any real prospect of improvement. Recognition of this fact lies at the heart of the Regional Seas Programme instituted by UNEP and supported by IMO, and also forms the framework for our Review. There are now 14 recognised Regional Seas (UNEP 2002), as well as five so-called Partner Seas:

Regional Seas

North-east Pacific (NEP)
South-east Pacific (SE/PCF)
Upper South-west Atlantic (SWAT)
Wider Caribbean (WCR)
West & Central Africa (WACAF)
Eastern Africa (EAF)
Red Sea & Gulf of Aden (PERSGA)
Gulf Area (ROPME)
Mediterranean (MED)
Black Sea (BLACK)
South Asian Seas (SACEP)
East Asian Seas (EAS)
South Pacific (SPREP)
North-west Pacific (NOWPAP)

Partner Seas

Baltic (HELCOM)
North-east Atlantic (OSPAR)
Caspian
Arctic (PAME)
Antarctic

For the purpose of the Review the Arctic and Antarctic regions are given less attention since relevant information on these areas is limited.

Two main databases are used to generate information on oil spill risks from tanker operations. Data on historical tanker spills of over 100 tonnes (700 bbl) was extracted from the ITOPF database of oil spills. With a few exceptions, the spill data used for the risk assessment spans the period 1974 to 2002. Data on oil tanker shipments on specific routes for the year 2001 has been obtained from Lloyds Marine Intelligence Unit (LMIU). In order to determine the correct distance and locations of shipping routes, reference has been made to computerised marine distance tables developed by BP Shipping Marine, and experienced mariners have been consulted regarding details such as seasonal routes. The data on historical spills and tanker routes are then processed for graphical display by region. Considerable attention has been devoted to presenting the data in a format compatible with Geographic Information Systems (GIS) using ArcView. An example of the GIS output for the Gulf Area (ROPME Sea Area) is given in Figure 1.

The rate of accidental spills from the bulk transportation of oil varies widely between different locations, depending both on the amount of oil transported and the combined effect of local factors which are chiefly related to navigational hazards. These local factors include traffic density, weather and sea conditions, visibility, water depth and the nature of the sea bed. In addition, the operation in progress such as entering or leaving port or loading or discharging of cargo or bunkers is relevant. It is not possible to quantify the individual effect of each of these factors and the approach taken in our evaluation has been to deduce the relative risk of spills in different locations by comparing the historical occurrence of spills with the amount of oil transported.

When evaluating risk perception in relation to the degree of preparedness in each area, the intention is to highlight regions and issues deserving particular attention. An oil spill risk profile has therefore been prepared with textual information for each region summarising the main points, including tanker routes, navigational hazards, offshore oil exploration & production activity and historical oil spills. The end-point is an overall assessment of the risk of spills (High, Medium or Low Risk). An attempt is also made to

identify key issues relevant to the management of the marine environment in the respective regions in order to place oil spills in a wider context.

A complementary profile on preparedness contains information on significant measures taken to meet the threat of oil spills in the region concerned. Such measures include the designation of a competent national authority to deal with marine emergencies, the preparation and adoption of national contingency plans, participation in regional or multilateral spill response arrangements, the provision of spill response equipment and materials, and the ratification of certain relevant international conventions. The profile ends with an overall assessment of the level of preparedness (High, Medium, Low). The assessment is a measure of the extent to which the oil spill risks in the region have been met.

Main findings

Major spills (greater than 1,000 tonnes) are usually associated with serious casualties such as groundings, collisions, structural failures, fires and explosions, and typically occur offshore or outside ports. The volume of oil transported within a given area is not of itself an indication of spill risk from casualties but if this is combined with other factors such as high vessel traffic densities, or hazards such as bad weather and narrow, congested straits, there is a good correlation with previous major spill incidents. Many countries at risk from major oil spills are not large oil importers and the threat is therefore often from tankers in transit to other destinations.

Intermediate spills (between 100 and 1,000 tonnes) usually occur in ports or their approaches, either during routine oil transfer operations such as loading, discharging and bunkering or as a result of less severe casualties such as low-energy collisions, groundings and berthing accidents. The large differences in risk for intermediate spills appear to be strongly related to the amounts of oil imported and exported by individual countries, rather than to the region as a whole. Countries which import large quantities of oil appear to be at greater risk than those which are major exporters. The reasons for this are not clear, but may be related to factors such as the comparatively more severe weather and seas conditions in the importing countries and crew fatigue at the end of laden tanker voyages.

There is considerable variation in the risks of major spills from tankers between and within the various regional sea areas. The regions facing the greatest risk from major spills are the Mediterranean, Black Sea, North-east Atlantic, East Asian Seas and North-west Pacific, where there is a moderate-to-high overall likelihood of spills combined with specific areas of very high risk (e.g. Bosporus, English Channel, Singapore Strait). Several other areas, notably Wider Caribbean and Eastern Africa, also contain individual areas of high risk although the remainder of these Regions are relatively low risk.

The main conclusions reached in the Review are summarised in Table 1. The overall risk and levels of Preparedness are assigned to either of three categories. The table also

contains a final column with a combined score: if the levels of Risk and Preparedness are equal, the score is zero; a positive score signifies that the Risk exceeds Preparedness by one or two levels; a negative score signifies a high degree of Preparedness in relation to Risk.

Table 1. Assessments of Risk and Levels of Preparedness for 19 Regional Sea Areas

Regional Sea	***Risk Category***	***Level of Preparedness***	***Priority ranking***
North-east Pacific (NEP)	*Low 1*	*Low -1*	*0*
South-east Pacific (SE/PCF)	*Low 1*	*Low -1*	*0*
Upper South-west Atlantic (SWAT)	*Medium 2*	*Medium -2*	*0*
Wider Caribbean (WCR)	*Medium 2*	*Low -1*	*+1*
West & Central Africa (WACAF)	*Medium 2*	*Low -1*	*+1*
Eastern Africa (EAF)	*Medium 2*	*Low -1*	*+1*
Red Sea & Gulf of Aden (PERSGA)	*Medium 2*	*Low -1*	*+1*
Gulf Area (ROPME)	*Medium 2*	*Low -1*	*+1*
Mediterranean (MED)	*High 3*	*Medium -2*	*+1*
Black Sea (BLACK)	*High 3*	*Low -1*	*+2*
Caspian	*Medium 2*	*Low -1*	*+1*
Baltic (HELCOM)	*Medium 2*	*High -3*	*-1*
North-east Atlantic (OSPAR)	*High 3*	*High -3*	*0*
South Asian Seas (SACEP)	*Medium 2*	*Low -1*	*+1*
East Asian Seas (EAS)	*High 3*	*Medium -2*	*+1*
South Pacific (SPREP)	*Low 1*	*Low -1*	*0*
North-west Pacific (NOWPAP)	*High 3*	*Medium -2*	*+1*
Arctic (PAME)	*Low 1*	*Medium -2*	*-1*
Antarctic	*Low 1*	*Low -1*	*0*

To distil the complexities of a region to a single number inevitably represents a gross simplification and the underlying assessment is undeniably a subjective one. Nevertheless, the results are meaningful in the context of formulating and updating a global policy for promoting advances in oil spill response capabilities. The justification for the exercise lies in the need for a framework within which to allocate the limited government and industry resources available for maximum benefit. ITOPF invite comments and observations from other parties, perhaps with a different perspective on regional variations.

The Black Sea emerges as an area deserving particular attention, due to the substantial increase in Caspian oil transported through the region to foreign markets. A similar trend of increasing oil transportation and attendant risk can be discerned for the Baltic, Arctic, Upper South-west Atlantic and West & Central Africa regions. A continuation of this trend could lead to a change in the balance between risk and preparedness in the next few years.

A total of ten regions show a score of +1 for Risk vs Preparedness, implying that effort expended on improving oil spill response capabilities should be worthwhile. Most of

these regions have been the target for training activity for some time (Mediterranean, Gulf) whilst for others such activity is more recent or just beginning (Eastern Africa, North-west Pacific, Caspian).

Discussion

Looking at the importance given to individual issues in a series of Regional Programmes for Action compiled by UNEP administrators (c.f. GESAMP, 2001) for the various regions it is interesting to note that oil pollution is ranked high in the ROPME Sea Area, Black Sea and, to a lesser extent, WACAF and SWAT (see Table 1. for abbreviations). Presumably their assessments reflect the prominence of oil and shipping industry activity in all or parts of these regions. In the case of the Black Sea, as well as the Caspian, this is a recent and rapid development.

Whilst it is true that in many developing countries there are more pressing requirements than oil spill contingency planning, there are persuasive arguments for devoting attention to developing a well-focused programme on oil spill preparedness, particularly in high risk areas. Firstly, and as is self-evident, an effective response capability will confer a quicker recovery from pollution incidents in high risk areas. From the global perspective adopted by intergovernmental organisations, the international funding institutions as well as the international oil and shipping industry, it makes sense to concentrate training activity on areas of high risk and low preparedness. Such investment should maximise the return on effort expended.

Secondly, where environmental degradation is significant, there is a long-term economic dividend to be gained from adopting improved environmental standards and promoting sustainable development. To assume that an enlightened policy on conservation and pollution control issues is the preserve of the industrialised world and a luxury beyond the reach of developing nations is misguided. Oman provides a good example of what can be achieved with sound, integrated and far-sighted environmental management by a country outside the main block of industrialised nations.

Thirdly, the problem of oil spills is largely one of perception since the accumulated evidence of countless oil spills worldwide confirm there is little scientific basis for concern, whether in terms of human health or environmental damage (GESAMP 2001, a,b). The chief impact of oil pollution is of an economic nature, in the form of property damage, business interruption and consequential loss. An effective response capability will greatly help to defuse public concern in the event of an oil spill, and maximise the return on effort expended.

Conversely, as long as there is a mismatch between public perception and scientific reality regarding pollution there is a risk of political interference in decision-making. Common sense suggests that activities posing the greatest risk to the environment should attract the most attention. The media, governments, special interest groups and scientific organisations have a responsibility, as well as an opportunity, to provide reliable public

information and education about marine and other environmental issues, thereby enabling the public to assess the relative significance of problems and threats. GESAMP (2001) calls for attention to be focused on issues of substantive concern in preference to preoccupation with issues of relatively minor consequence for the marine environment.

Future plans

This review has mainly drawn on information gathered by ITOPF staff in the course of their normal oil spill response work. The product has been prepared in a GIS format for ease of reference and will in future be used routinely as a spill response and contingency planning tool. It is intended that the Review be available both as a publication and in an electronic version on the ITOPF web site.

At a later stage, it is anticipated that there will be opportunities for collaboration with other organisations holding complementary data, thereby further improving the value of the initiative. In particular, there is scope for incorporating more detailed information on oil exploration & production activity and on environmental sensitivities. With the expected introduction of the 1996 HNS Convention and the HNS Protocol to the OPRC Convention there is also merit in considering the risks and preparedness issues related to the carriage of hazardous and noxious substances by sea.

References

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Figure 1. Oil transportation routes and oil spill incidence data for the Gulf Region in GIS format.