

OIL POLLUTION RISK ASSESSMENT AND PREPAREDNESS IN THE EAST MEDITERRANEAN

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ABSTRACT

The East Mediterranean is an area of high oil traffic because it is an important transit centre between Middle Eastern/Russian oil and the western European countries/USA. Recent traffic developments show that the importance of this centre is expected to increase. ITOPF and REMPEC carried out a joint risk assessment study of the area. For the purpose of this paper the “East Mediterranean” includes the Adriatic Sea and the East Mediterranean Basin; this was necessary to carry out a comprehensive analysis of the issue, as the oil traffic in the Adriatic is strictly linked with the activities occurring in the East Mediterranean basin. The aim of this study is to test the hypothesis that the East Mediterranean is a high risk area for oil spills. For this analysis the ITOPF oil spill data set was used (1974 to 2003). Results show that the majority of spills involving a quantity of less than 7 tonnes are operational, whereas medium and major spills result from accidents. Crude oil spills appear to have the highest occurrence in each of the spill size categories, with the highest value for major spills; the accident occurrence appears to be closely related to the import flow. A risk analysis for the East Mediterranean has been overdue, as this area is characterised by a very heterogeneous level of preparedness and response, by several sensitive areas, and a lack of active bi/tri-lateral cooperation agreements. It is concluded that the Eastern Mediterranean is a high risk area for tanker spills, and the risk is likely to increase with the predicted increases in tanker traffic.

RISK ASSESSMENT

Import and export flows

In the Mediterranean Region the major importers are Spain (net oil import 1.5 million bbl/d, 2003), Italy (net oil import 1.71 million bbl/d, 2003) and Greece (net oil import 400,838 bbl/d in 2002) (IEA, 2004).

Greece has limited oil production, but imports most of its fuel source from Iran, Saudi Arabia, Russia, Libya and Egypt. Although the Middle East is the major source of oil, Russia, Bulgaria and Kazakhstan, along with the Caspian region, have become important oil suppliers. The finalisation of the new pipelines project, linking the Bulgarian Black Sea Port of Burgas with Alexandroupolis on the Greek Mediterranean Coast, will allow these countries to export oil whilst avoiding the use of the Turkish Straits. The proposed capacity for this pipeline ranges from 600,000 bbl/d to 800,000 bbl/d. Greece has an estimated crude oil refining capacity of 406,500 bbl/d (2003).

Oil import from Turkey in 2004 has been recorded at around 603,080 bbl/d, 90% of which was supplied by the Middle East (Saudi Arabia, Iran, Iraq and Syria) and Russia. Turkey’s port of Ceyhan is a major outlet for Iraqi oil exports, with a pipeline capacity from Iraq of about 1.5-1.6 million bbl/d, and potential for future export from the Caspian Sea.

Because of the high flow of Asian oil, Turkey has backed the pipelines proposal for oil and gas transport: the Caspian oil pipeline route from Baku to the Turkish Mediterranean port of Ceyhan, as well as the Trans-Caspian gas pipeline from Turkmenistan across Azerbaijan and Georgia to Turkey. Although these alternative means of transport could reduce the risk of shipping accidents in the area, a recent Russian-Kazakh deal to ship more oil to the Russian Black Sea port of Novorossiysk guarantees that more oil will continue to flow through the Turkish Straits in tankers.

In the East Mediterranean, other countries, such as Lebanon, Syria and Israel, serve as transit centres for oil arriving from the east and north. For instance, Lebanon imports most of its oil (by pipeline and tanker) and plays a gateway role for the Asian, European and African trade. Lebanon imports 101,000 bbl/d (2003). This was once a refinery centre for crude oil exported from Iraq and Saudi Arabia by pipelines to the coastal refinery of Tripoli and Zahrani, but it has been inactive since the 1980s. Currently, the Tripoli refinery is the subject of a potential rehabilitation programme with foreign investment. At present the Lebanese crude oil refining capacity is of 37,500 bbl/d (Oil & Gas Journal, 2004).

Israel does not produce oil, and imports its oil (279,000 bbl/d, 2003) from Egypt, the North Sea, West Africa and Mexico. In most recent years, Israel obtained the majority of its oil from Russia and the Caspian Region. Israel would be in a strategic position for an alternative oil export route for the Persian Gulf oil, heading to Europe and the United States, nevertheless this oil is transported by ship through the Suez Canal and around the cape of Africa or alternatively by pipelines (Sumed, 2.5 million bbl/d; Iraq-Turkey 1.6 million bbl/d) (IPA, 2003). Syria produces 535,000 bbl/d of oil (2003), nonetheless Syrian oil production is in decline due to technological problems and depletion of oil reserves. In 2003, Syrian export was of 256,000 bbl/d (Oil & Gas Journal, 2004).

The countries of the Balkan region are major oil importers as they have a low level of oil production. These countries include Albania, Bosnia-Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia, and Serbia and Montenegro (ex-Yugoslavia). In 2002 they imported a total of 179,000 bbl/d. The Balkan region provides several port facilities in the Adriatic Sea, and is supplied by oil pipelines linked with Russia and Greece. Therefore this region is a potential strategic transit centre for Russian and the Caspian Sea oil export, bypassing increasingly

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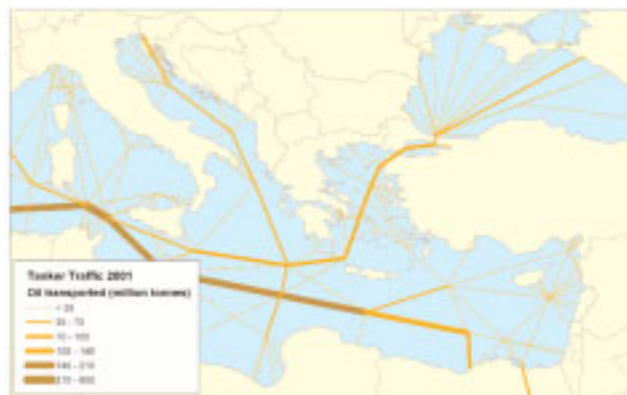
congested Turkish Straits. Currently there are several pipelines project proposals under review: the AMBO 570-mile pipeline project, connecting the Bulgarian Black Sea port of Burgas with the Albanian Adriatic port of Vlore; the Reversal of the Adria pipeline between Croatia's port of Omisalj on the Adriatic Sea and Hungary; the 760-mile line Constanta-Omisalj-Trieste pipeline connecting the Romanian Black Sea Port of Constanta with the Croatian port of Omisalj in the Adriatic, and later possibly to the Italian city of Trieste.

The major oil producers in the East Mediterranean Basin are Libya and Egypt. Libya is a major oil exporter to Europe. In 2003 the net oil export was 1.25 million bbl/d and 90% of Libyan oil net exports are sold to European countries such as Italy (485,000 bbl/d in 2002), Germany (188,000 bbl/d in 2002), France (47,000 bbl/d in 2002), Spain and Greece. Furthermore, Libya has three main refineries with a total capacity of 343,400 bbl/d.

Egypt is also an important oil producer; it produced 620,000 bbl/d of crude oil for 2003. Also, it plays a strategic role as a transit centre for the Persian Gulf oil export, through the Suez Canal and the Sumed Pipeline. Although the tanker traffic has slightly declined due to pipeline competition, the Suez Canal is still a major route for oil traffic as it can accept the world's largest bulk carriers and fully laden, very large crude carriers. The Sumed Pipeline is a 200 mile pipeline running from Ain Sukhna on the Gulf of Suez to Sidi Kerir on the Mediterranean, and has capacity of 2.5 million bbl/d. Egypt has several refineries widespread throughout the country with a total capacity of 725,000 bbl/d

Tanker traffic and routes

In the East Mediterranean three major tanker routes can be identified. (Map I) (2001, LMIU). These data referred to transported volumes of crude oil and dirty and clean products, and show that large quantities of oil are transported across the easternmost part of the Mediterranean. Although the flow is not unidirectional, most of it is the result of oil from the Middle East transiting through the Suez Canal and Sumed pipeline, and from the Russian export regions to the west and to the south. However, the data is for one year only and so does not reveal the changes in the trend of oil traffic from 1974 up to 2004. During this time period, the Russian production has increased, leading to a rise in tanker traffic from Novorossiysk in the Black Sea, through the Turkish Straits en route to the East Mediterranean. The Turkish Straits, which are only 0.5 miles wide at the narrowest point are amongst the world's most difficult waterways and also the busiest as 50,000 vessels navigate these waters each year, 5,500 of which are oil tankers. In 2003, 3.0 million bbl/d transited through the Turkish Straits, the majority of which was crude oil and only a small portion was oil products. Nearly all of this traffic was southbound.



MAP I: TANKER TRAFFIC IN THE EAST MEDITERRANEAN (2001, LMIU)

Oil Spill Accidents

Thirty years of oil spill data from tankers, barges and combined carriers have been recorded in the ITOPIF database, which contains oil spill data from 1974 up to 2003. For this analysis the Eastern Mediterranean components have been extracted. Three main categories have been considered: incidents of spills of less than 7 tonnes, between 7-700 tonnes and more than 700 tonnes (Map II).



MAP II: OIL SPILLS FROM TANKERS 1974-2003

Spills result from operations, groundings, collisions, hull failure, fire & explosion, equipment failure as well as other causes. These causes have been clustered into two main categories: operational and accidental. The majority of operational spills involve

Table I: Oil spills from tankers and their causes

%	Operations	Collisions	Groundings	Hull Failures	Fire & Explosions	Equip. Failure	Other
<7 tonnes	26.5	0.5	1.6	5.1	0.3	39.6	26.4
7-700 tonnes	17.4	17.3	17.3	6.7	5.3	24	12
> 700 tonnes	14.3	28.6	42.8	3.6	7.1	3.6	

quantities of less than 7 tonnes (66 %), whereas the larger spills result from accidents, respectively 58.7% (7-700 tonnes) and 82.2% (over 700 tonnes).

Oil spill data for the three main categories have also been analysed according to the oil type (Table II). Crude oil spills appear to have the highest occurrence in each of the spill size categories, with the highest value for spills > 700 tonnes (67.8%). Refinery product spills have the second highest occurrence (7-700 tonnes, 34.7% and > 700 tonnes, 25%) of oil pollution events, whereas bunker spills have the second highest occurrence for spills <7 tonnes (22 %).

Table II: Oil spills from tankers and oil type

%	Bunkers	Crude Oil	Refinery products	Other
<7 tonnes	22	51	15.7	11.3
7-700 tonnes	8	44	34.7	13.3
> 700 tonnes	3.6	67.8	25	3.6

When undertaking a risk assessment of an area, other factors such as navigational hazards and the prevalence of adverse weather conditions also need to be considered. The Eastern Mediterranean suffers winter and summer storms as well as periods of seasonal winds and bad weather, particularly during the winter months around the Turkish Straits. The combination of historical spills (particularly high numbers in Italy and Greece), shipping traffic density, proximity of shipping routes to coastlines and the likely considerable increase in oil transportation through the region confirm that the area remains a high risk area for oil spills.

Special areas and traffic regulations

ANNEXES I, II, and V of the International Convention for the Prevention of Oil Pollution from Ships 73-78 (MARPOL 73-78) introduces the concept of “special areas”. In “special areas”, characterised by certain ecological, oceanographic and traffic conditions, the adoption of mandatory instruments to prevent sea pollution is envisaged; guidelines for the designation of Special Areas are provided in Assembly resolution A.720(17). The Mediterranean Sea has been identified within “special areas” for strict control on discharge of oil, noxious liquid substances and garbage; this is achieved with predetermined protective measures, such as discharges restrictions. Annex II of IMO Assembly resolution A.927(22) provides guidelines for the identification and designation of Particular Sensitive Sea Areas (PSSAs). PSSAs provide the IMO an instrument to protect environmentally sensitive or, otherwise significant marine areas, from the risk that can be possibly caused by shipping activities. To meet this aim, more stringent and more effective tailor-made Associated Protective Measures (APMs) can be used for PSSAs (i.e. mandatory reporting; traffic separation schemes; compulsory pilotage). Currently, environmental NGOs have identified few sea areas that could be proposed for international protection measures as PSSA's and for satellite monitoring. The criteria used for their identification is data matching between layers of biodiversity levels, oil spill frequency and ship traffic (WWF, 2004). The East Adriatic Sea, the Aegean Sea (with the Turkish Straits, Iskenderun Bay and the Cilician coast of Turkey), and the Cyrenaica coast of Libya have been singled out within the East Mediterranean Basin.

Under the Barcelona Convention, the Special Protected Area and Biodiversity Protocol provides for the establishment of a list of Specially Protected Areas of Mediterranean Interest (SPAMI's). Currently there are 54 protected areas, 22 of which are in the Eastern Mediterranean: five in Italy (east coast only), five in

Croatia, nine in Turkey, and one each in Cyprus, Greece and Lebanon. These are characterised by high biodiversity values either at genetic or at ecosystem level (Badalamenti et al, 2000).

For the East Mediterranean no PSSA's have been officially proposed up till now. However there have been few unilateral attempts to regulate shipping activities for the purpose of environmental protection. Commercial shipping through the Turkish Straits is regulated by the Montreux Convention of 1936, which identified the Straits as international waters. Nonetheless, under this Convention, the Turkish Straits has been explicitly pronounced “innocent passage”, which empowered the coastal states to adopt laws to regulate maritime traffic, under the customary principle of safe navigation; this initiative was also approved by IMO Resolution A/857 (1994). Turkey has enforced traffic separation schemes and restrictions for navigation within the Straits on night transit for ships longer than 200 metres, including tankers. These regulations are design to safeguard passage and navigation and to protect the environment.

PREPAREDNESS AND RESPONSE

International Agreements and Conventions

An important instrument in the region is the “International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990” (OPRC 90) (Table III). Signatory Parties undertake to designate the relevant competent authorities and establish a national contingency plan, which includes the public and private bodies involved. This implies the establishment of a minimum resource of oil spill combating equipment, training and exercise programme, a continuous communication system and procedures for coordinating the mobilisation and deployment of oil spill combating resources. The Convention provisions enhance the movement of spill response personnel and resources into, through, and out of its territory. This is intended to facilitate the creation of bilateral and multilateral agreements with neighbouring states for oil pollution preparedness and response.

Intergovernmental support for response to spills throughout the Mediterranean Sea exists through the Barcelona Convention with technical assistance provided by the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC); parallel support from the oil industry is foreseen through the auspices of the recently inaugurated Mediterranean Oil Industry Group (MOIG). The European Union support international oil pollution response and cooperation through the new-born European Maritime and Safety Agency (EMSA), the Civil Protection Unit of the Directorate General of the Environment and the MEDA programme, designed to promote economic development in the region with joint investments.

The 1976 Emergency Protocol of the Barcelona Convention was expanded in scope and eventually substituted by a new Prevention and Emergency Protocol. The first Protocol focused on cooperation for preparedness and response, whilst the new protocol expands its scope into the prevention of pollution incidents, illegal discharges and widens international cooperation; new actions will be promoted, such as the development of port reception facilities, surveillance strategies and emergency towing. Moreover Contracting Parties to the Barcelona Convention entrusted REMPEC to prepare a regional strategy to facilitate the implementation process of the new Prevention Emergency Protocol '02. This will be proposed for adoption at 14th Ordinary Meeting of the Contracting Parties in November 2005. Reducing the risk of marine pollution from maritime transport and related activities is its key aim. The strategy will tackle technical issues, taking into consideration the social and economic aspects. This sustainable approach to the technical issue could greatly strengthen this regional strategy and enhance cooperation.

Table III: International Conventions and Agreements for the East Mediterranean

	Barcelona Convention	Emergency Protocol '76	Prevention & Emergency Protocol '02	MARPOL	OPRC '90	East Basin Sub-regional Agreements	LLMC '76	CLC '69 CLC '92	FUND '92
Croatia	Yes	Yes	Yes	Yes	Yes	Draft	Yes	'92	'92
Cyprus	Yes	Yes		Yes		Draft		'92	'92
Egypt	Yes	Yes		Yes	Yes	Draft	Yes	'92	
Greece	Yes	Yes		Yes	Yes	Draft	Yes	'92	'92
Israel	Yes	Yes		Yes	Yes	Draft			
Italy	Yes	Yes		Yes	Yes	Draft		92	92
Lebanon	Yes	Yes		Yes				69	
Libya	Yes	Yes			Yes				
Malta	Yes	Yes	Yes	Yes	Yes			'92	'92
Slovenia	Yes	Yes	Yes	Yes	Yes	Draft		'92	'92
Syria	Yes	Yes		Yes	Yes			'69	'71
Turkey	Yes	Yes	Yes	Yes				'92	'92

Preparedness and response

This analysis will be carried out on a basin scale since the overall area is actually characterised by the Adriatic Sea and the East Mediterranean basin.

In the Adriatic Sea, Italy, Croatia and Slovenia are parties to the OPRC 90 (Table IV). No other country from the Balkan region is a party to this convention (Albania, Bosnia-Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia, Serbia and Montenegro). For instance only, Italy, Croatia and Slovenia have a designated authority with the ultimate responsibility to deal with preparedness and response for oil spills (Table IV). In Italy and Croatia, the organizational responsibility for the response to an emergency is shared between government and private sectors; however each country has a different approach. In Italy, the response is centralised and the government charter most of the response equipment and vessels through an agreement with a private company; moreover if a national emergency is declared the Civil Protection Unit and the Navy would be in charge of the overall operations. In Croatia the operational phase is less centralised as the government owns two basic stocks of equipment and materials and also relies on the services of several contractors based within the main ports. In Slovenia the government does not possess equipment and resources. Should a national emergency occur, the ports and industrial facilities would use their own resources.

In the East Mediterranean basin, Egypt, Greece, Israel, Libya, Malta, Syria and Turkey are parties to the OPRC 90, whereas Cyprus and Lebanon are not (Table IV). Within the OPRC countries, the operational responsibility for preparedness and response is shared between government and private sectors; however each country has a different approach to national emergencies. In Greece, preparedness the operational responsibility is decentralised because, although the national competent authority possess equipment and resources, it shares the responsibility with a private contractor. Moreover there are expectations for the ship owner to have an active role in the response.

In Egypt, the EEAA has the sole strategic and operational responsibility; nevertheless the procedures for national response rely on a coordinated action from both the public and the private sector (oil industry). Syria also combats oil pollution emergencies at a national level, both with port authorities and oil terminals'

resources and equipment. Israel is the exception, as although local contractors could be employed, the operational responsibility is centralised within the MECD, which owns several stockpiles and specialised resources (Haifa, Ashkelon, and Eliat). Industry infrastructures have their own equipment and resources for local response emergencies in Israel.

Some of these OPRC countries are still in the process of developing the necessary infrastructures to implement this Convention. For instance, the Turkish Ministry of the Environment has developed a centralised operational response through the creation of a NCP Executive Committee; however the small amount of government owned equipment has led to sharing the operational task both with oil industry resources and private contractors. In

Libya, on the other hand, the lack of a NCP and government owned equipment has led to operational responsibility by the oil industry. Another unusual case is Malta, where the government possesses very limited EC funded equipment, and does not have specialised personnel. Therefore a national response would require the help of neighbouring countries. In non-OPRC countries, the preparedness and operational responsibility is also heterogeneous. In Cyprus, the government possesses significant stockpiles and means, but two local private contractors are often involved in the operations. In Lebanon, where the government owns only a small amount of equipment (only dispersant) allocated in the major ports, a national response is mainly dealt with using equipment and resources from oil terminals. The overall status of response and preparedness is summarised in Table V.

CONCLUSION

The East Mediterranean comprises a diverse range of countries with varying political, social and economic conditions. Italy and Greece have been part of the EU for a long time; Slovenia, Malta and Cyprus have recently joined the EU; Croatia and Turkey are candidate countries. Egypt, Israel, Lebanon, Libya and Syria are parties to the Barcelona Convention only. These factors have not been conducive to the co-operation and coordination processes which are so necessary for pollution prevention and to combat oil pollution emergencies.

The levels of government preparedness to combat oil pollution (national) emergencies are extremely varied. The need for inter-

Table IV: Government authorises for oil spill response at sea in the East Mediterranean

Country	Government authorities with ultimate responsibility	Operational responsibility
Italy	Ministry of the Environment, Department of Sea Defence	Castalia Ecolmar (private contractor for the Government)
Croatia	Ministry of Foreign Affairs, Civil Protection Unit (national emergency only)	
Slovenia	Ministry of the Interior	Harbour Master's Offices (six offices) Several private contractors (i.e. Dezinsekcija)
Greece	Administration for Civil Protection and Disaster Relief	Industrial facilities equipment; H idroKoper, private contractor
Turkey	Marine Environmental Protection Division within the Ministry of Mercantile Marine (MECD)	Hellenic Coast Guard EPE (private contractor, often instructed by HCGS)
Cyprus	Ministry of the Environment	
Syria	Ministry of Agriculture, Department of Fisheries & Marine Research	Ministry of Agriculture, Department of Fisheries & Marine Research Brasal-Marine (private contractor)
Lebanon	Ministry of the Environment	Directorate General for Ports, Ministry of Transport Port Authorities and oil terminal resources
Israel	Marine Research Centre, National Research Council	Ministry of transport Industrial facilities equipment
Egypt	Ministry of the Environment, Marine and Coastal Environmental Division (MECD)	MECD equipment and resources industry infrastructure equipment and resources
Libya	Egyptian Environment Affairs Agency (EEAA)	EEAA equipment and resources Oil industry equipment and resources
Malta	Technical Centre for Environmental Protection	Oil industry equipment and resources
	Pollution Control Unit within the Ministry of Tourism	Police force vessels Very few industry infrastructure equipment and resources

national cooperation in the area has already been acknowledged by the international community, with the creation of the REMPEC (IMO/UNEP), the MEDA programme (EC), and more recently MOIG. Also, the newly formed European Maritime and Safety Agency (EMSA) could play an important role within the framework of the regional convention (Barcelona Convention). Nevertheless, due to the complexity of the overall Mediterranean region, a sub regional strategy seems the most appropriate approach to tackle spill response cooperation.

Currently, the East Mediterranean is an area of considerable oil traffic, as it is an important transit centre between Middle Eastern/Russian oil and western European countries and the USA. The importance held by this transit centre is expected to increase shortly because of forthcoming oil traffic developments. This could lead to an increase in oil spills in the area as historically, accidents appear to be closely related to the traffic density and flow. All of these characteristics, together with the numerous

sensitive areas and the seasonal bad weather conditions make the East Mediterranean a high risk area for oil spills. This confirms and reinforces the importance for the region of the current system of liability and compensation laid down by the 92' Civil Liability and Fund Conventions.

The East Mediterranean is characterised by a very heterogeneous level of preparedness and response. In this context, it is of fundamental importance for individual governments to improve their degree of organisation and preparedness for spill response. Whilst improvements to the amounts of available response resources, possibly including a regional response centre would help, such measures would not in themselves improve preparedness. Moreover, in this area, there is a lack of active bi/tri-lateral cooperation agreements. Such agreements could greatly enhance and facilitate the sharing of experience and resources between neighbouring governments, promote the practices of oil spill exercises, and as a consequence, greatly improve the effectiveness of

Table V: Preparedness and response in the East Mediterranean

	Competent National Authority	National Plan	Clean-up Resources	
			Tier 1	Tier 2
Croatia	Yes	Yes	Yes	Yes
Cyprus	Yes	Yes	Yes	Yes
Egypt	Yes	Yes	Yes	Yes
Greece	Yes	Yes	Yes	Yes
Israel	Yes	Yes	Yes	Yes
Lebanon	Yes	No	Yes	Some
Libya	Yes	No	Yes	No
Malta	Yes	Draft	Yes	Some
Slovenia	Yes	Yes	Yes	No
Italy	Yes	Yes	Yes	Yes
Syria	Yes	Draft	Yes	No
Turkey	Yes	Draft	Yes	No

prevention and of the response. The forthcoming REMPEC strategy for the implementation of a new Prevention and Emergency Protocol could be a key instrument for achieving this goal.

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