

# Restrictions of Passage, Accidents and Oil Transportation Norms Impact on supply security

**Giacomo Luciani\***

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## Abstract

This paper looks at restrictions of passage, accidents and oil transportation norms as causes of interruption in oil supplies. The key 'chokepoints' are discussed in detail: the Straits of Hormuz, Malacca, Bab el-Mandeb, the Canals of Suez and Panama, the Turkish Straits and the entrance to the Baltic Sea. It is concluded that in most cases the danger of closure can only be temporary; nevertheless, investment in bypasses and alternatives is highly desirable, and in the case of the Turkish Straits, has not been forthcoming. The discussion then turns to threats to navigation outside the chokepoints, such as piracy and oil spills in enclosed seas, particularly the Mediterranean. The final section looks at changing international norms, especially the entry into force of the requirement of double hulls for oil tankers. The paper's main conclusion is that there is no scenario of interruption of maritime oil and gas transportation that may cause a severe physical shortage of oil, in general or specifically for Europe. In almost all cases potential tensions could be easily allayed if responsible governments took the necessary steps to create alternatives (notably pipeline bypasses) or to curb illegal activities. The main factor preventing the required investment in transportation alternatives is the lack of a well-functioning market mechanism for burden sharing. Where passage must be paid for, the resulting income stream supports investment to increase capacity and accommodate growing demand.

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# **Restrictions of Passage, Accidents and Oil Transportation Norms Impact on supply security**

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## **Introduction**

Security of oil supplies is a multifaceted issue: it relates to the availability of resources and production capacity, to the continuing willingness on the part of producers to supply importers, and to the availability and reliability of logistics. Enhancing security of supply entails adopting policies that tackle all the dimensions of the issue.

The logistical aspects are frequently mentioned as a source of uncertainty, generally as part of a long list of other potentially disturbing factors. In this paper we focus on seaborne transportation of oil and oil products, and consider how the logistics of oil maritime transportation may affect oil supply security.

There are several different dimensions to this question:

- 1) restrictions of passage, meaning wilful interference with the freedom of navigation on the part of riparian or other actors, including both state and non-state actors;
- 2) accidents involving one or more tankers and entailing environmental or other damages, which may lead to the temporary closure of international waterways; and
- 3) oil transportation norms, that is the rules governing navigation and passage through specific waterways.

These different aspects may affect oil maritime transit through important sea passages (straits, 'chokepoints') as well as in the open seas. We discuss key maritime chokepoints in detail, but it should be stressed at the outset that restrictions of passage and accidents may very well occur in the open seas and have equally significant implications, and the effects of norms other than those specifically directed at critical sea passages are felt everywhere.

A large proportion of global oil traffic is seaborne. Approximately 50% of globally produced oil and an even higher percentage of internationally traded oil is transported by sea. According to INTERTANKO, over a ten-year period (1999–2008) the total crude oil transported by sea increased 16.5%, passing from 7,980 to 9,300 million tonnes.<sup>1</sup>

International trade in crude oil and petroleum products is a very substantial share of global merchandise trade. The fact that oil is a liquid and it can easily and cheaply be transported in tanker ships is one of the essential qualities that have supported the 'success' of oil as a primary source of energy. Other fossil fuels – coal and gas – are much more difficult to transport, for different reasons. Gas especially can only be transported either by pipeline or,

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<sup>1</sup> INTERTANKO, "Tanker Facts 2009", INTERTANKO, London, 2009.

following liquefaction, as liquefied natural gas (LNG) in specially designed ships where it is kept at a very low temperature.

Furthermore, growth in oil maritime transport must be set in the context of the increasing importance of transport by sea in general.

Advances in maritime technology have brought about a revolution in maritime transport and a huge lowering of the cost of transporting goods over long as well as short distances. This is a key development that is supporting globalisation and making it possible.

With the spread of fast ferries (ships that normally operate at 25-30 knots of speed), maritime transport and especially that of the roll-on/roll-off kind – in which entire lorries or trailers board the ship without loading/unloading their cargos – is frequently faster than overland routes, especially in enclosed seas, such as the Mediterranean, the Red Sea or the Gulf. The EU has been speaking of ‘highways of the sea’ to complement major overland transport axes, meant to facilitate the intensification of trade.

There are at least two important implications of this trend:

- The first is that the principle of freedom of navigation in the high seas – the core principle of international maritime law – is today universally supported by all countries. This principle has not been challenged by any state in many years; while in the past it was primarily of interest to the main trading nations and the superpowers, today it is of crucial importance to almost all countries.
- The second is that the sea-lanes are becoming increasingly crowded, with bigger and faster ships crossing in different directions – pointing to the need for prudential policing of maritime traffic. The problem is that this requirement does not square easily with the principle of absolute freedom of navigation in the high seas and international straits.

The first section of this paper looks at major chokepoints and discusses the characteristics of each of them. The second section discusses hazards that are not specifically linked to chokepoints. The third section reviews major normative developments. The final section introduces scenarios of supply interruption that might be provoked by the threats discussed in the previous section and potential remedies.

## 1. Oil chokepoints

According to the US Energy Information Administration (EIA), “[c]hokepoints are narrow channels along widely used global sea routes. They are a critical part of global energy security due to the high volume of oil traded through their narrow straits.”<sup>2</sup>

The European Commission’s paper on energy network infrastructures<sup>3</sup> has the following definition:

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<sup>2</sup> Energy Information Administration (EIA), “World Oil Transit Chokepoints”, Country Analysis Brief, EIA, Washington, D.C., January 2008 ([http://www.eia.doe.gov/cabs/World\\_Oil\\_Transit\\_Chokepoints/Background.html](http://www.eia.doe.gov/cabs/World_Oil_Transit_Chokepoints/Background.html)).

<sup>3</sup> European Commission, *Network Oil Infrastructures – An assessment of the existing and planned oil infrastructures within and towards the EU*, Commission Staff Working Document accompanying the Green Paper “Towards a secure, sustainable and competitive European energy” (COM(2008) 737), SEC(2008) 2869, Brussels, 13 November 2008.

Chokepoints are narrow channels used for transit of large volumes of international sea trade including oil. The concerns related to chokepoints can be different: geopolitical in the case of transit through potentially unstable areas, environmental and in particular in relation to damage from an accident, economic if transit through a chokepoint requires long waiting times, security in connection to possible terrorist attack etc.

Chokepoints therefore represent critical bottlenecks in the energy transport network since they transit high volumes of crude and products and the impact of interruptions of transit through them would affect severely the global oil market.

The list of chokepoints considered by each institution differs somewhat: the International Energy Agency (IEA) focuses especially on passages in the Middle East (Hormuz, Bab el-Mandeb, Suez) and the Malacca Strait, while the EIA and the European Commission also include Panama and the Turkish Straits. The European Commission additionally includes the “Baltic Sea”, by which the Danish Straits giving access to the same are probably meant. Other notable passages – such as the Strait of Gibraltar – are not normally included in the list (see Table 1).

*Table 1. Chokepoints*

Lists of chokepoints	EIA	European Commission Green Paper	IEA
Hormuz	X	X	X
Malacca	X	X	X
Bab el-Mandeb	X	X	X
Panama Canal and pipeline	X	X	
Suez Canal and SUMED pipeline	X	X	X
Turkish Straits	X	X	
Baltic Sea		X	

*Source:* Author’s compilation.

These passages are deemed especially important for global oil traffic. The IEA has estimated that the share of global oil consumption that transits through Hormuz might increase from 21% in 2004 to 28% in 2030, while the importance of the Strait of Malacca might only be marginally less (close to 24% in 2030).

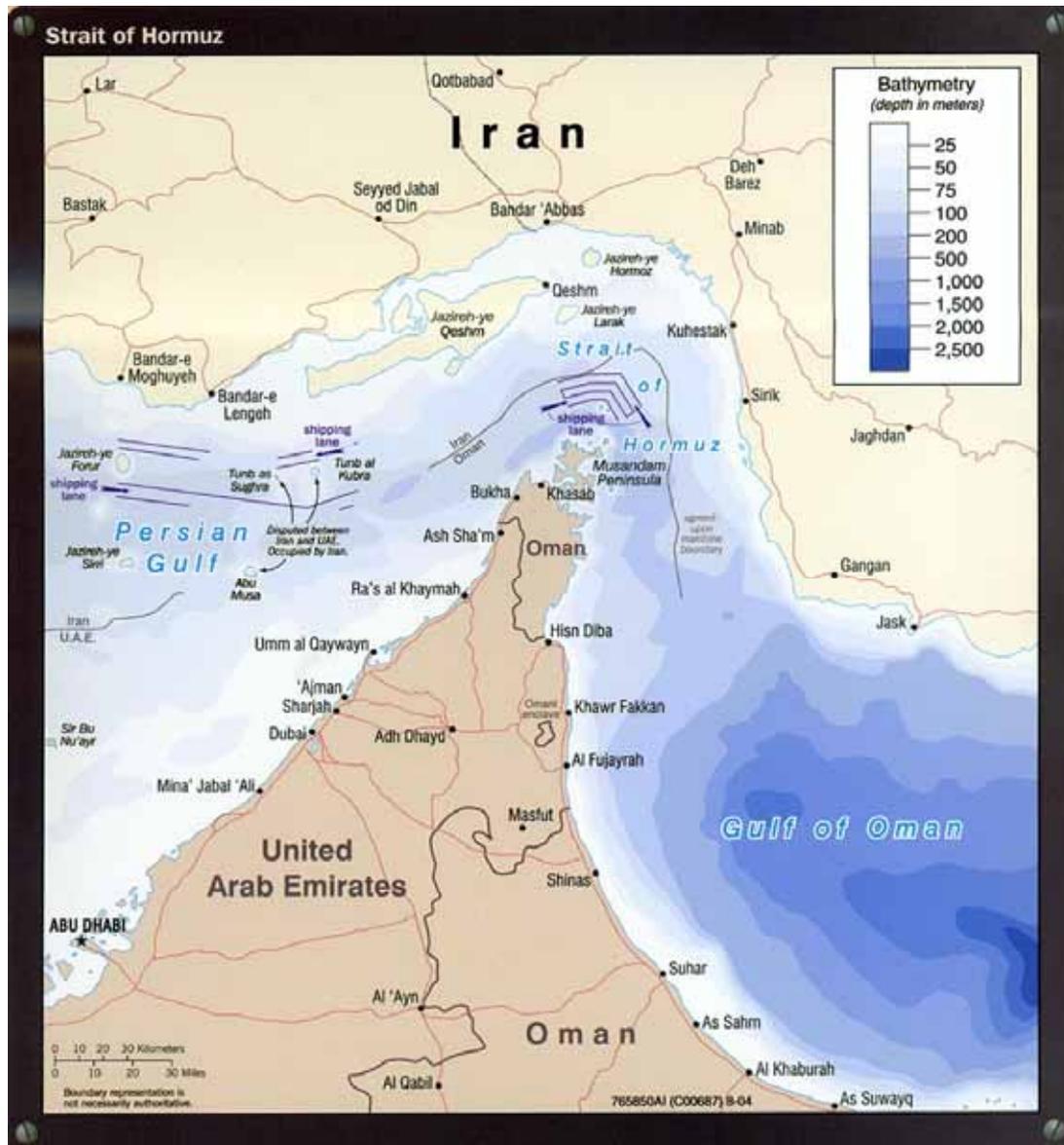
## 1.1 The Gulf countries and the Strait of Hormuz

The concentration of oil reserves and production in Gulf riparian countries inevitably inflates the volume of internationally traded oil that originates in the Gulf and must transit through the Strait of Hormuz.

The Strait of Hormuz is 21 nautical miles (nm) wide at its narrowest point, measured from Larak Island (Iran) to Great Quoin (Oman). Sovereignty over the strait is divided between Iran and Oman, with the latter possessing the Musandam peninsula, which defines the strait. The current navigation channels lie just north of the two Omani islets of Great and Little Quoin, entirely in Omani territorial waters, and are 2 nm wide in each direction with a 2 nm dividing lane. These are represented in Figure 1.

It should be noted, however, that in the past (until 1979) two narrower shipping lanes were in use between Little Quoin (where the main lighthouse is located) and the tip of the Musandam Peninsula, entirely in Omani territorial waters. In fact, the waters are deeper there and farther from the Iranian coast.

Figure 1. The Strait of Hormuz



The obvious threat to freedom of passage through the strait comes from Iran – no one seriously considers the possibility that Oman might wish to impede passage. The potential threat of closure from Iran has been evaluated in detail by Caitlin Talmadge.<sup>4</sup> The author argues that it is not in the interest of Iran to close the strait as an offensive first move, as this

<sup>4</sup> Caitlin Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz", *International Security*, Vol. 33, No. 1, Summer 2008, pp. 82–117.

would damage Iran itself and would certainly provoke retribution from the international community. Nevertheless,

[i]f the United States or Israel attacked Iran, the restraint that previously characterized Iranian behaviour in the strait might evaporate. Indeed, in 2006 Iran's supreme leader, Ayatollah Ali Khamenei, cautioned that although Iran would not be 'the initiator of war', if the US punished or attacked Iran, then 'definitely the shipment of energy from this region will be seriously jeopardized'. The Iranian oil minister made similar comments, hinting that 'if the country's interests are attacked, we will use all our capabilities, and oil is one of them'. One can imagine other events that could bring Iran to the same point of desperation – for example, if it were losing a conventional war with any of its neighbours and wanted to open another front as a punitive measure or distraction. Short of the extreme case in which the United States pre-emptively destroys much of Iran's military, there is an intermediate range of scenarios in which Iran is deeply threatened yet parts of its military are still intact and functioning. It is in this context that threats to block the strait could become reality.<sup>5</sup>

The main conclusion of Talmadge's very detailed analysis is that

the notion that Iran could truly blockade the strait is wrong – but so too is the notion that U.S. operations in response to any Iranian action in the area would be short and simple. The key question is not whether Iran can sink dozens of oil tankers, which would be difficult. Tankers are resilient targets. Their immense size, internal compartmentalization, and thick hull plates allow them to survive hits by mines and missiles that would sink warships. Their crude oil absorbs the impact of an explosion and is difficult to ignite. Historically, their captains have proven receptive to the strong financial incentives to sustain shipping.

The question is whether Iran can harass shipping enough to prompt U.S. intervention in defence of the sea-lanes. Given that the United States has staked its credibility on promises to do just that, this is a threshold that Iran's significant and growing littoral warfare capabilities can cross, even with fairly conservative assumptions about Iranian capabilities.<sup>6</sup>

Therefore, a threat of closure of the strait, even if partial or limited in time to a period of several weeks is possible. "It does not take much imagination to suggest that the traffic in the Strait of Hormuz could be impeded for weeks or longer, with major air and naval operations required to restore the full flow of traffic."<sup>7</sup>

In 2007 the Joint Economic Committee of the US Congress published a study on *The Strait of Hormuz and the Threat of an Oil Shock*.<sup>8</sup> Rather than discussing the potential for closure of the strait subsequent to military action on the part of Iran, the study assumes that this is possible and investigates the potential economic impact of such a closure. It draws the following key conclusions: "A closure of the Strait of Hormuz has the potential to reduce the flow of oil by far more than any previous disruption, both in absolute and percentage terms.

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<sup>5</sup> Ibid., p. 88.

<sup>6</sup> Ibid., pp. 84-85.

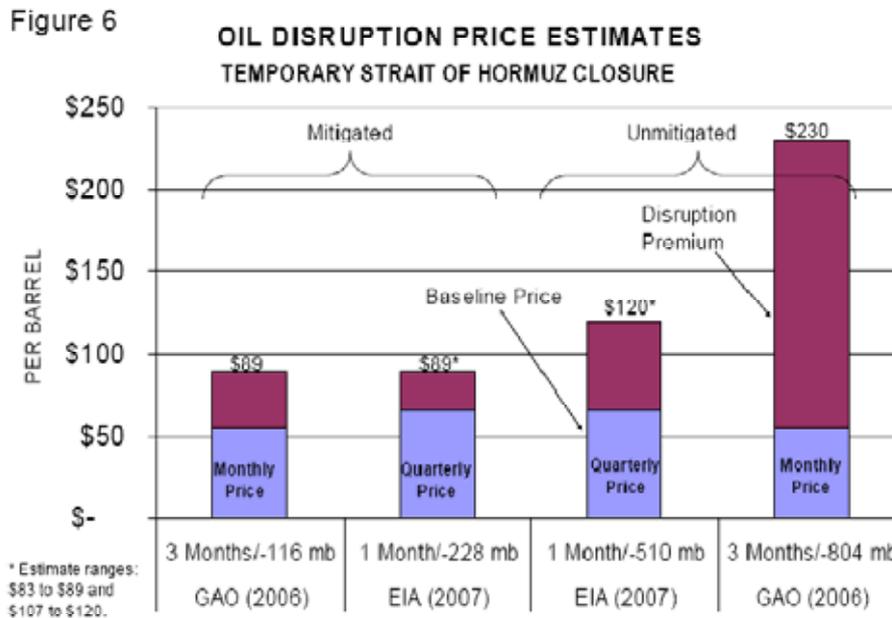
<sup>7</sup> Ibid., p. 116.

<sup>8</sup> US Congress, Joint Economic Committee, *The Strait of Hormuz and the Threat of an Oil Shock*, Washington, D.C., July 2007 (<http://www.house.gov/jec/studies/2007/Straight%20of%20Hormuz%20Study.pdf>).

...Nevertheless, the OECD countries have enough oil in primary inventory to last them more than eight months, should Persian Gulf oil cease to flow.”<sup>9</sup>

The study also refers to various estimates of the potential impact of a closure of the Strait of Hormuz on the price of oil. These are summarised in Figure 2.

Figure 2. Oil disruption price estimates



Source: US Congress, Joint Economic Committee (2007).

The first two estimates refer to a scenario in which the closure of the strait is mitigated through fuel switching, the rerouting of some shipments and the release of oil from strategic storage. The remaining two estimates, to the right in the chart, refer to scenarios of unmitigated loss of supplies – for one month in the estimate of the EIA and for three months in the estimate of the GAO (Government Accountability Office). These calculations are interesting not so much for the absolute level of the price forecast – which obviously is contingent on market conditions at the time the disruption occurs – as for the difference in outcomes, which points to the importance of emergency preparedness and the availability of mitigation measures.

In this context, it is crucial to underline the potential role of pipelines allowing Gulf oil to be exported from terminals that are outside the Gulf and do not require transit through Hormuz.

Of the five major Gulf oil exporters, three (Iran, Saudi Arabia and the UAE) have ports outside the Gulf: Iran and the UAE on the Indian Ocean, outside Hormuz; and Saudi Arabia on the Red Sea. Indeed, Saudi Arabia has a pipeline (known as the ‘Petroline’) with a capacity of 5 million barrels per day (b/d) running from the Eastern Province, where the oil

<sup>9</sup> Ibid., p. 5.

is produced, to the Red Sea port of Yanbu, and it has been exporting crude oil and products from there for more than 20 years.<sup>10</sup>

Iraq does not have a maritime outlet outside the Gulf, and indeed even its outlet on the Gulf is insufficient and cannot accommodate very large crude carriers. For this reason, over the years it has developed several notable alternatives:

- a pipeline running from the fields in northern Iraq across Turkey to the Mediterranean port of Ceyhan;
- a pipeline running from the fields in northern Iraq across Syria to the Mediterranean port of Baniyas; and
- a pipeline from the fields in southern Iraq across Saudi Arabia to the Red Sea port of Yanbu (known as 'IPSA').

The operations of all of the above have been disrupted by political or military interference at various times. Currently, only the pipeline to Ceyhan through Turkey is normally in operation, albeit at a low level. The pipeline had an original design capacity of 1.6 million b/d, but was repeatedly attacked during the Iraq–Iran war and more recently during the phase of insurgency in Iraq; it is estimated to have a maximum capacity of 900,000 b/d at the moment.

The Kirkuk–Baniyas pipeline has been inoperative since 1982, but there has been talk of reactivating the pipeline, and Iraq has signed a protocol with Russia's Sroytransgaz to this effect. Still, this pipeline remains hostage to the vagaries of relations between Syria and Iraq, which are far from having been fully normalised.

Finally, the IPSA pipeline to Yanbu has been inoperative since Iraq's invasion of Kuwait in 1990. A segment of the pipeline across Saudi Arabia has been converted to carry natural gas – the pipeline in Saudi territory was paid for and belongs to Saudi Arabia. The utilisation for gas transmission is less than optimal, because an oil pipeline is not built to withstand the normal operating pressure of gas pipelines, and thus its capacity is very low. The possibility of restoring this pipeline to transport oil to the Red Sea (be it Iraqi or Saudi or even Kuwaiti) should not be excluded.

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<sup>10</sup> The pipeline has been operating at much less than its rated maximum capacity because most customers of Saudi Aramco prefer to lift from Ras Tanura in the Gulf rather than from Yanbu. Nevertheless, a study conducted for the Baker Institute of Public Policy (M. Webster Ewell, Dagobert Brito and John Noer, *An Alternative Pipeline Strategy in the Persian Gulf*, James A. Baker III Institute for Public Policy, Rice University, Houston, TX, 2000, [http://www.rice.edu/energy/publications/docs/TrendsInMiddleEast\\_AlternativePipelineStrategy.pdf](http://www.rice.edu/energy/publications/docs/TrendsInMiddleEast_AlternativePipelineStrategy.pdf)) concluded that

the throughput of the existing pipeline system can be significantly increased with the use of drag reduction technology. As many as 11 MBD could be moved through the combined Petroline-IPSA system for an investment of \$600 million. Alternatively, a noticeable increase in Petroline throughput can be obtained for as little as \$100 million. All options require an additional annual cost of roughly \$50 million to hold DRA (drag reduction agent) inventory, or additional investment to build DRA production capacity in Saudi Arabia. The additional cost of moving oil during a crisis by this route is less than \$1 per barrel. This is clearly economically feasible in the event of a SoH (Strait of Hormuz) closure; the price of oil will rise more than \$1 per barrel in this case, covering the additional costs. It is just as clearly not economically viable as a routine peacetime alternative: Yanbu exports are already economically unattractive (compared to Ras Tanura) for most Saudi customers, and adding DRAs would increase costs of oil at Yanbu even further.

In the end, Kuwait is the only major Gulf oil exporter that at present has absolutely no alternative but to ship oil through Hormuz – yet its position is not that much different from Iraq's, and it too could find an alternative (most likely, to the Red Sea across Saudi Arabia). Therefore, the probability that the world will increasingly rely on Gulf producers to satisfy its thirst for oil does not necessarily imply that shipments through Hormuz will be rapidly increasing.

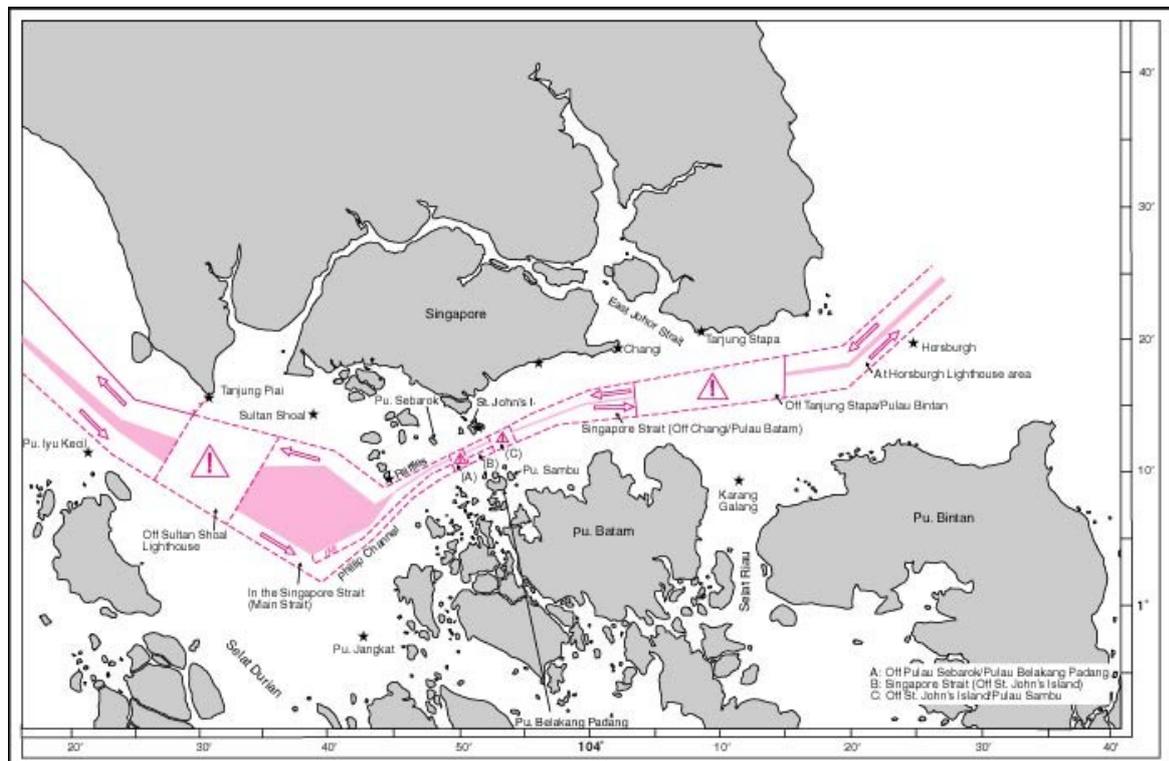
In conclusion, a threat to freedom of navigation through the Strait of Hormuz is a scenario that cannot entirely be discarded, but should be nuanced. There is universal consensus on the conclusion that as long as a credible commitment on the part of the US to keep the strait open exists, its closure can only be temporary. In all likelihood, it would also be partial. In any case, mitigation measures are of the utmost importance – to react to a possible emergency and even more to prevent an emergency by reducing the expected benefit of closing the strait. Mitigation measures may be of a general kind, such as strategic stocks, or specific; among the latter we should in particular mention oil pipelines to loading terminals outside the Gulf, the use and expansion of which should be encouraged.

## 1.2 The Malacca Strait

Essentially *all* traffic between the Far East and points west of Singapore passes through Malacca. According to the International Maritime Organisation (IMO), at least 50,000 ships sail through this strait every year – many, many more than just tankers. Far from being a reason for comfort, this consideration should all the more encourage finding a solution that may take tankers out of the strait, as in the end they are the one component of traffic that is most easily substituted.

At its narrowest point in the Phillips Channel of the Singapore Strait, Malacca is only 1.7 miles wide, and thus entails a natural bottleneck as well as the potential for collisions, grounding or oil spills (Figure 3).

Figure 3. The Malacca Strait



Source: IMO.

Sovereignty over the waters of the Malacca Strait is divided among Singapore, Malaysia and Indonesia. The literature does not consider the hypothesis that any of these three states might wilfully attempt to close the strait or attack vessels transiting through them, but the possibility of attacks on the part of non-state actors – as well as of accidents with environmental consequences that would require at least the temporary closure of the strait to navigation – must be considered. The Malacca Strait is frequently associated with endemic acts of piracy, but here we shall not differentiate between banditry (piracy) and terrorism or politically motivated action; we shall speak of non-state actors as a potential source of threat.

Although international statistics report very large numbers of both vessels entering the strait and violent attacks, it is necessary to distinguish among the types of vessels and between local and long-distance traffic.<sup>11</sup> When this distinction is made, it is clear that crude oil tankers (and LNG tankers) are among the least vulnerable categories of ships transiting the strait.

In Bateman et al. (2007), the authors recognise that “[a] successful terrorist attack on a crude oil tanker could cause massive economic and environmental damage”, but they believe that this is unlikely. Experience in the ‘tanker war’ (during the Iran–Iraq war) demonstrated that tankers are more resilient targets than normally recognised. Furthermore, “[t]hese vessels are also less vulnerable to piracy or sea robberies when underway due to their size and speed. It is virtually impossible, and certainly highly dangerous, for a small craft to attempt to get alongside such a large vessel travelling at its normal operational speed.” We should note, however, that the successful hijacking of the Saudi tanker *Sirius Star* off the coast of Kenya in November 2008 appears to contradict this conclusion.

Interestingly enough, Malacca also sees considerable traffic of oil product tankers, LPG tankers and petrochemical product tankers. The authors recognise that these vessels – typically much smaller than large crude oil carriers, and in some cases not adequately maintained – could become more significant targets or ‘tools’ of terrorist activity, also in light of the higher flammability and explosive potential of their cargo.

The Institute of Defence and Strategic Studies (IDSS) in Singapore conducted a comprehensive analysis of piracy and armed robbery attacks in the Malacca and Singapore Straits over a period of ten years.<sup>12</sup> The IDSS analysis revealed that the larger tankers, container ships, and LNG and car carriers on international voyages are not attacked unless they slow down or stop for some reason.

These analyses are only partially reassuring. If on the one hand they tend to dismiss the danger that large vessels carrying substantial volumes of oil and LNG may be attacked, they seem to point to the considerable vulnerability of smaller vessels, which in turn may lead to catastrophic accidents and the temporary closure of the strait.

While this issue is of concern primarily to the countries in the Far East (a closure of Malacca would not entail a global loss of crude supply, just a shortage of crude available to the Far Eastern countries), it is nevertheless worth considering also from a European point of view.

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<sup>11</sup> This discussion is based on Sam Bateman, Joshua Ho and Mathew Mathai, “Shipping Patterns in the Malacca and Singapore Straits: An Assessment of the Risks to Different Types of Vessel”, *Contemporary Southeast Asia*, Vol. 29, No. 2, 2007, pp. 309–32.

<sup>12</sup> Sam Bateman, Catherine Zara Raymond and Joshua Ho, *Safety and Security in the Malacca and Singapore Straits — An Agenda for Action*, IDSS, Singapore, 2006.

It is to be noted that already today larger tankers exceeding the dimensions and draft permitted in the Malacca Strait utilise the Lombok Strait between the islands of Bali and Lombok in Indonesia to access the South China Sea. This passage is longer and requires navigating through several other straits in Indonesian and Philippine waters before actually getting to the South China Sea, but it constitutes a valid alternative.

It should also be noted that over the years several projects for creating a bypass pipeline across the Malay Peninsula, either through Malaysian and Thai territory or exclusively through Malaysian territory, have been proposed. So far, none of these appears to have made significant progress towards implementation. The key cause for that, as for many other proposals for a bypass around sensitive straits, is the lack of a clear economic incentive to justify the investment. We discuss this issue in broader terms in the remedies section of this paper.

The latest version of the bypass project is promoted by Trans-Peninsula Petroleum of Malaysia and envisages laying a pipeline some 300 km across the Malaysian states of Kedah, Perak and Kelantan: from Yan in Kedah to Tumpat in Kelantan. The project entails the construction of large storage facilities and refineries at both ends of the pipeline, and a first phase should be operational by 2014.

### 1.3 Bab el-Mandeb

The Bab el-Mandeb – meaning Gate of Tears in Arabic – is a strait located between Yemen on the Arabian Peninsula and Djibouti, north of Somalia in the Horn of Africa, and connecting the Red Sea to the Gulf of Aden. It is of importance to all tanker traffic from the Gulf to the Mediterranean, which normally includes tankers heading to north-west Europe and the US. Alternatively, this traffic can also circumnavigate Africa and thus very large crude carriers, which cannot pass through Suez, routinely follow this alternative route.

The distance across is about 20 miles. The island of Perim divides the strait into two channels, of which the eastern is 2 miles wide and 30 metres deep, while the western has a width of about 16 miles and a depth of 310 metres.

In past years, South Yemen was under the political influence of the Soviet Union and the possibility that the strait might be closed in the event of war was considered. Djibouti houses the most important French foreign military base, and also hosts a significant US contingent.

The domestic security situation in Yemen justifies some consideration. Not only has the country become a haven and redeployment base for elements linked to the al-Qaeda galaxy, but also the danger of state failure and decline comparable to neighbouring Somalia is real. This may well create conditions whereby non-state actors may engage in violent action against oil targets in the strait.

That being stated, piracy has become endemic not just in the strait, but also across the entire offshore area of Yemen and Somalia, reaching out to offshore Oman on one side and offshore Kenya on the other. Therefore, the issue is not specifically Bab el-Mandeb, but more generally security of navigation at sea in the Gulf of Aden and Indian Ocean, as discussed in the section 2.

### 1.4 Panama

Panama is not vital for Europe and has limited importance for oil traffic globally. Approximately 0.5 million b/d of crude oil and products transit through the canal. Large oil carriers cannot pass through the canal.

## 1.5 Suez

The Suez Canal, like the Panama Canal, is not an international waterway, but a transit facility entirely controlled by Egypt (Figures 4 and 5).

The canal was closed between July 1956 and April 1957, and then again between the Six Day War in June 1967 and June 1975. Although there is at present no reason to expect that the government of Egypt might consider closing the canal again, and a peace treaty has been signed between Egypt and Israel eliminating the closest potential cause of conflict and closure, historical experience shows that it can happen.

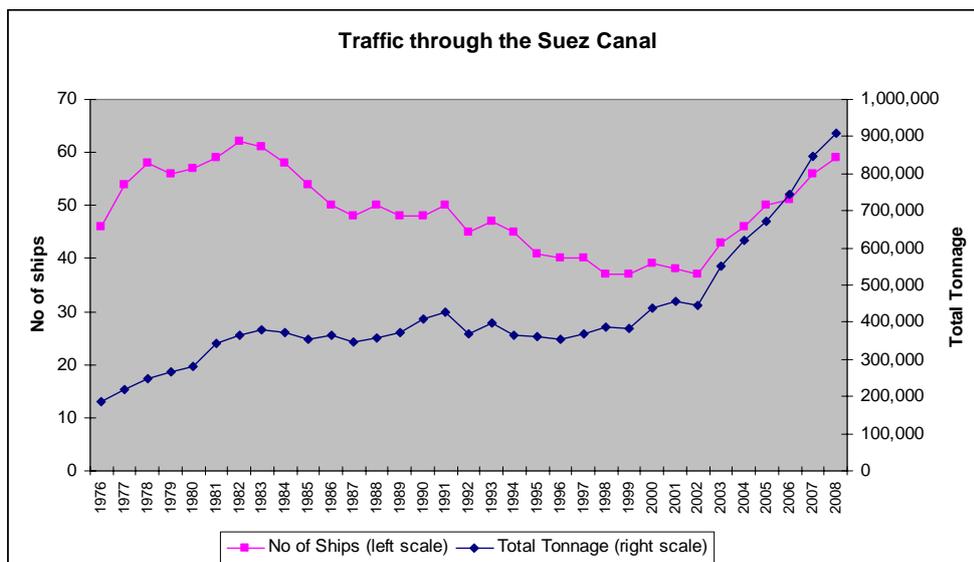
As the canal is fully under Egyptian control, acts of piracy or terrorism against ships in transit would indicate a severe lapse of security conditions in the country.

Figure 4. The Suez Canal



Source: "The Suez Canal" (<http://geography.howstuffworks.com/africa/the-suez-canal.htm>).

Figure 5. Traffic through the Suez Canal



Source: Suez Canal Authority (2008).

In 2008, 146.7 million metric tonnes of crude oil and products transited through the Suez, equal to 3 million b/d (Table 2). Since the canal has no locks, the only serious limiting factors for the passage of tankers are draft and height due to the Suez Canal Bridge. The current channel depth of the canal allows for a maximum of 16 metres of draft, meaning many fully laden supertankers are too deep to fit and either have to unload part of their cargo onto other ships ('transshipment') or to the SUMED pipeline terminal before passing through the canal. Tankers capable of passing through the canal fully laden are called 'Suezmax'.

Table 2. Passage of energy products through the Suez Canal

	No. of vessels		Tonnage	
	2007	2008	2007	2008
Tankers	3,470	3,795	145,934	146,658
LNG	358	429	32,776	38,987

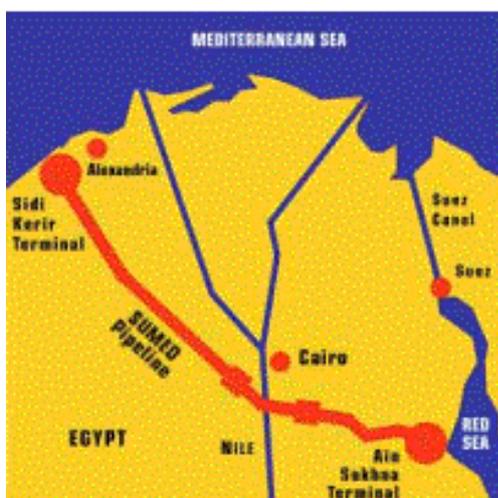
Source: Suez Canal Authority.

The typical deadweight of a Suezmax ship is about 150,000 metric tonnes and the beam 46 metres. Also of note is the maximum headroom ('air draft') limitation of 68 metres, which is the height above water of the Suez Canal Bridge. There is additionally a width limitation of 70.1 metres, but only a handful of tankers exceed this size and they are excluded from Suez by their draft in any case.

Improvements are underway that will increase the maximum draft to 22 metres, in order to allow supertankers. Until then, supertankers must discharge part of their cargo at the entry of the channel and reload it at the other end, transported along the way by the SUMED pipeline.

The SUMED pipeline, with a capacity of about 2.5 million b/d, links the Ain Sukhna terminal on the Gulf of Suez with Sidi Kerir on the Mediterranean (Figure 6). SUMED consists of two parallel 42-inch lines, and is owned by the Arab Petroleum Pipeline Co., a joint venture of EGPC (50%), Saudi Aramco (15%), Abu Dhabi's ADNOC (15%), three Kuwaiti companies (15% total) and Qatar's QGPC (5%). The pipeline has been in operation since January 1977.

Figure 6. The SUMED pipeline



Source: EIA, Department of Energy.

Overall, the Suez Canal/SUMED system, notwithstanding past interruptions, strikes the observer as being very reliable and unlikely to face interruptions. This is primarily because the system is controlled by a single jurisdiction, is not an international waterway that can be used free of charge, and is in fact a major source of revenue for the Egyptian government. This creates a strong incentive to maintain the confidence of the international community in the availability of the system, and to invest in improving quality and operational capabilities.

## 1.6 Turkish Straits

The prospect of greatly increased tanker traffic across the Turkish Straits – in particular the Bosphorus – has been a cause of concern for the Turkish government and international observers for longer than a decade. The concern is stirred by a combination of natural, institutional and environmental factors.

Natural factors include the shape of the straits, with the narrowest point in the Bosphorus no more than 700 metres across, numerous bends and significant currents (Figure 7).

*Figure 7. The Bosphorus*



*Source:* MapQuest.

Institutional factors include the fact that according to the Montreux Convention of 1936, passage through the straits is free, to the extent that even pilotage is not obligatory and no tolls are imposed (which of course discourages the installation of costly traffic regulation and control equipment).

Environmental factors include primarily the consideration that the Bosphorus is today entirely encapsulated in the Istanbul urban area, and any accident would have an immediate impact on a very large number of people.

The number of tankers transiting the strait reached an average of 28 per day in 2007, in excess of 10,000 per year during the past three years (Table 3).

Tankers have had to wait for permission to transit in the southbound direction (i.e. from the Black Sea) from time to time, but no systematic statistics on waiting times are available. Delays are longer in winter, when weather conditions are less favourable. In short, traffic congestion in the Bosphorus adds to the cost of shipping but has not reached crisis proportions.

The Turkish Straits are the sole outlet for oil exported from Russia, the Caucasus and Central Asia through terminals located on the Black Sea. Russia exports oil by pipeline to Central Europe and by sea through terminals located either on the Black Sea or on the Baltic Sea or to the Far East. Azerbaijan can now export oil directly to the Mediterranean through the Baku–Tbilisi–Ceyhan pipeline. Kazakhstan exports oil through the Caspian Pipeline Consortium (CPC) pipeline, leading to the terminal near Novorossiysk, on the Black Sea. Therefore, the volumes of crude oil that will need to transit through the Turkish Straits is a function of the evolution in the logistics of Russian and Kazakh oil exports, plus to some extent oil consumption in the Black Sea region itself (possibly satisfied by supplies originating outside the Black Sea).

*Table 3. Tanker passages through the Turkish Straits, 1996-2007*

Year	Bosphorus			Canakkale		
	Total no. of tankers	Monthly average	Daily average	Total no. of tankers	Monthly average	Daily average
1996	4,248	354	12	5,658	472	16
1997	4,303	359	12	6,043	504	17
1998	5,142	429	14	6,546	546	18
1999	5,504	459	15	7,266	606	20
2000	6,093	508	17	7,529	627	21
2001	6,516	543	18	7,064	589	19
2002	7,427	619	20	7,637	636	21
2003	8,107	676	22	8,114	676	22
2004	9,399	783	26	9,016	751	25
2005	10,027	836	27	8,813	734	24
2006	10,153	846	28	9,567	797	26
2007	10,054	838	28	9,271	773	25

*Source:* Turkish Undersecretariat of Maritime Affairs, Straits Statistics, 2007.

Investing in bypass pipelines that may drastically reduce the number of tanker passages (considering that tankers are not the only vessels passing the straits) would appear to be a wise policy. The key difficulty is that so long as there is no toll for passage through the Turkish Straits, no alternative commercial route can compete. The only cost for utilising the straits is the waiting time at the entrance, which has not become a major issue except during specific periods (generally in conjunction with bad weather in the Black Sea).

International maritime law not only provides that freedom of passage cannot be impeded, but also requires that passage be at no cost. In the extreme case of the Turkish Straits (which are considered international waterways as per the Montreux Convention, notwithstanding the fact that they are so narrow and densely inhabited, with Turkey controlling both shores), not even the use of a pilot can be imposed.

Clearly such rules were conceived in a now distant past, in which the intensity of traffic was incomparably less, and the danger of accidents not a significant consideration. International law gave absolute priority to the interests of maritime nations requesting freedom of passage – or as in the case of the Turkish Straits, to the interests of countries that would otherwise be

almost landlocked, such as the Soviet Union in the winter months when the country's northern ports are closed by ice.

In cases where major waterways are not international – for instance for the Suez and Panama Canals – passage is regulated and must be paid for, thus laying the commercial basis for the establishment of alternatives and competition.

Suez and Panama clearly demonstrate that it is not difficult to establish alternatives to congested navigation channels, provided that the cost of congestion is properly assessed and charged to the user. At Suez, there is both a physical limitation to the draft of vessels that can transit and a fee for transiting vessels. Yet neither limitation applies to the Turkish Straits. This explains why discussions about several potential pipeline schemes to bypass the straits have been going on for two decades, but none has yet taken off. It is a classic free-rider situation: as progress in any bypass scheme would reduce congestion in the straits, and passage through the latter would remain for free, each party concerned has an interest in waiting for the others to take the initiative.

There are three main pipeline projects currently on the table to create alternatives to shipping oil out of the Black Sea through the Turkish Straits: the Samsun–Ceyhan project (aka TAPCO, the Trans-Anatolian Pipeline Company), the Burgas–Alexandroupolis project and the Constanta–Trieste project (aka PEO, the Pan-European Oil Pipeline).

The first project is being promoted by Calik Enerji and Eni, and has reportedly reached the commercial stage – that is the sponsors are looking for shippers ready to commit to using the pipeline. At the beginning of 2011 it was announced that two Russian companies, Rosneft and Tatneft, would join the original sponsors in the implementation of this project.<sup>13</sup> It is not clear, however, whether Russia intends to abandon the Burgas–Alexandroupolis project.

The Burgas–Alexandroupolis oil pipeline is the solution preferred by Transneft, which has sought an engagement on the part of users of the CPC pipeline bringing oil from Kazakhstan to Novorossiysk to use this bypass. The pipeline is supported by Greece, but the Bulgarian government has shown much less enthusiasm, and at the time of writing it is not clear whether the project will go ahead.

Finally, the Constanta–Trieste pipeline would have the advantage of taking Caspian oil to a destination where it could be transferred to pipelines serving refineries in Central Europe and northern Italy, instead of being again loaded onto ships. In April 2007 EU Energy Commissioner Andris Piebalgs and ministers from Romania, Serbia, Croatia, Slovenia and Italy signed an intergovernmental agreement designed to create the Pan-European Oil Pipeline, but since then no visible progress has been made and a credible industrial sponsor is still lacking.

The persistent stalemate in promoting one or the other of these conflicting projects creates an avoidable threat to oil supplies, which the EU should address with the highest priority.

## 1.7 Baltic Sea

The European Commission (2008) staff working document on energy network infrastructures mentions the Baltic Sea as a potential chokepoint.

The Baltic Sea is an enclosed body of water, and an accident may have serious environmental consequences. In this way, the Baltic Sea is similar to the Mediterranean, only smaller and

<sup>13</sup> *Middle East Economic Survey*, Vol. 54, Nos.1-2, 3–10 January 2011.

thus possibly even more vulnerable. Nevertheless, it is not appropriate to consider the entire sea a chokepoint. Rather, the difficulty may be defined as the passage through the Danish Straits, which is very narrow.

The Oresund, separating Copenhagen from Malmö, is indeed narrow, partially encumbered by the Oresund Bridge, the central span of which is 490 metres, with a vertical clearance of 57 metres (lower than the clearance of the Suez Canal). Most of the maritime traffic uses the Drogden Strait to the west, under which a tunnel runs to the Peberholm artificial island where the bridge starts.

The Drogden at its narrowest point is 250 metres wide. Large ships can enter the harbours of Copenhagen and Malmö from the north, but the depth south of this line is insufficient for modern shipping. In the 2.7 nautical mile-wide water between Copenhagen (Amager) and Saltholm, the depth is 5 metres or less, except for a 1 nm zone at the ship channel from Copenhagen, the Drogden, where it approaches 10 metres. The official depth at medium water listed for the Drogden is 7.7 metres.<sup>14</sup>

The potential for a major increase of Russian exports through the Baltic is therefore likely to raise issues for navigation through the 'Baltic Straits'. According to Seppo Liukkonen,<sup>15</sup>

From the shipping point of view an essential fact of the Baltic Sea traffic is the draft limitation. The shallowness of the Danish Straits does not allow ships with draft deeper than 15.4 m to sail to the Baltic Sea. This limits the tankers useful at the Baltic Sea to the so-called 'Aframax' size, i.e. to the size of less than 150,000 tonnes in dead weight.

From the environmental point of view the IMO has named the Baltic Sea as a special sea area with several restrictions for the discharge of oil, oily water, oily waste and garbage into the sea as well for the emissions into the air. Additionally, the Helcom (Baltic Marine Environment Protection Commission) has issued several recommendations for safe shipping and protection of the marine environment at the Baltic Sea.

In addition to the features above the presence of ice is one of the most typical features characterising the shipping in the Baltic Sea. Even though the Baltic Sea is ice-free for the biggest part of the year, at least the northernmost parts of it, namely the Bay of Bothnia and the Gulf of Finland freeze every year. In a harsh winter all coastal waters of the whole Baltic Sea can be frozen leaving a small open water area only in the middle of the Southern Baltic Sea. Thus, the vessels intended for the year-round traffic at the Baltic Sea must be designed and built for sailing in ice.

The positive aspect of the Baltic situation is the high level of cooperation among riparian countries, institutionalised in the Helsinki Commission (HELCOM), which constantly monitors traffic and accidents especially in view of avoiding or containing pollution. HELCOM represents an example of regional cooperation that should be fostered in other areas of the world presenting similar problems.

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<sup>14</sup> Gunnar Alexandersson, *The Baltic Straits*, Leiden: Martinus Nijhoff Publishers, 1982.

<sup>15</sup> Seppo Liukkonen, "Technical Requirements for Year-round Baltic Sea Tanker Traffic" (not dated) (<http://www.google.ch/search?client=opera&rls=en&q=tanker+navigation+baltic+straits&sourceid=opera&ie=utf-8&oe=utf-8>).

## 2. Threats to navigation outside chokepoints

The discussion of chokepoints has evidenced that in several cases the threat to navigation is not limited to the chokepoint itself, but is extended to the high seas in its proximity. Indeed, an analysis of accidents and piracy attacks to oil tankers in particular shows that the largest number of significant events took place at a considerable distance from the chokepoints, inviting the consideration of shipping conditions in a much broader spectrum of situations.

We discuss two specific categories of threats that have attracted considerable attention in recent times: piracy attacks and pollution from accidents. Obviously, there might be military threats to shipping originating from state actors in the riparian countries, but discussing all potential threats of this kind would lead us too far. Suffice to repeat what we stated at the beginning: that freedom of navigation is increasingly of interest to all countries, not just the maritime powers, and we see no episodes of interfering with maritime traffic on the part of state actors other than for legitimate and accepted purposes anywhere in the world.

### 2.1 Global piracy

Surprising as it might be, piracy has been increasing in recent times (Table 4). According to the International Maritime Bureau, attacks on ships increased a further 10% in 2010, mostly by pirates based in Somalia.

*Table 4. Attacks on ships by type*

	2006	2007	2008	2009
Chemical and product tankers	35	52	55	69
Crude tankers	9	25	30	41
LNG tankers	0	1	0	1
LPG tankers	4	5	6	5
Total	239	263	293	410

*Source:* International Maritime Bureau (2010).

A Chatham House briefing paper published in October 2008<sup>16</sup> proposes a systematic analysis of the problem and notes that it has been growing for ten years at least. The report observes that the increased piracy threat translates into increased transportation costs – for much more costly insurance, for premiums to be paid to crew members, for time lost, for ransoms to be paid...

The One Earth Future (OEF) Foundation has established a task force and monitoring initiative (oceansbeyondpiracy.org), which published a report estimating the cost of piracy.<sup>17</sup> The report points to the fact that there has been a very significant increase in ransoms paid to rescue hijacked ships. In 2010 the average ransom paid was \$5.4 million, up from an average of \$150,000 in 2005. The report estimates that a total of \$238 million was paid in ransom in

<sup>16</sup> Roger Middleton, *Piracy in Somalia: Threatening Global Trade, Feeding Local Wars*, Chatham House Briefing Paper, Chatham House, London, October 2008.

<sup>17</sup> Anna Bowden (ed.), Kaija Hurlburt, Eamon Aloyo, Charles Marts and Andrew Lee, *The Economic Cost of Maritime Piracy*, OEF Working Paper, OEF, Louisville, CO, December 2010 (<http://oceansbeyondpiracy.org/obp/cost-of-piracy-home>).

2010, up from \$177 million in 2009. But this is just the tip of the iceberg, as a multiplicity of indirect costs should be added, including the cost of maintaining a naval presence whose effectiveness has proven to be limited – pushing the total to an estimated \$7 billion per year or more.

Thus piracy has become a significant economic burden, and one that has no easy solution at hand, short of recreating an effective government structure in Somalia and enforcing law and order. That being stated, piracy is not in any sense subtracting significant volumes of oil from global supplies – it is simply adding to the cost and time of transportation (ships must circumnavigate Africa to avoid pirate-infested waters; hijacked ships are delayed, but eventually ransoms are paid and they resume their journeys).

## 2.2 The danger of oil spills in enclosed seas

Oil spills from accidents involving tankers are a major source of concern and motivation for the international regulation of tanker traffic. Also in response to such concerns and to the rules that have been adopted in international fora to prevent damage to the environment, the number of spills has very much decreased over time, notwithstanding the significant increase in the quantities of oil transported by sea.

According to ITOPF (International Tanker Owners Pollution Federation),<sup>18</sup> the number of large and medium-sized spills has greatly declined over the years. With the fall in numbers there has also been a reduction in the total volume of oil spilt, although data show very clearly that a few very large accidents are responsible for most of the damage – therefore even a single large accident in the future may change the picture quite radically.

Statistics also show that spills (fortunately) do not occur primarily in enclosed seas or at chokepoints, but frequently in oceans and large bodies of water.

Nevertheless, it is logical that worries about environmental damage become more acute when tankers ply the waters of enclosed seas, where the damage is potentially much greater.

Limitations to the freedom of navigation imposed because of environmental concerns may affect European energy supply in the future, especially with respect to the Mediterranean Sea. The Baltic is a problem as well, but much less oil transits through there. The Gulf, the Red Sea and the Black Sea are also potentially highly problematic, but the ‘political equilibrium’ between oil and environmental interests in those areas is very much more in favour of oil interests and action to limit tankers’ freedom of navigation accordingly less likely.

## 2.3 Tanker traffic in the Mediterranean

A *Study of Maritime Traffic Flows in the Mediterranean Sea* was recently conducted by Lloyd’s Marine Intelligence Unit on behalf of REMPEC (Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea) in the context of the SAFEMED project sponsored by the European Commission.<sup>19</sup>

The study asserts that the most significant change in overall traffic patterns in the Mediterranean in the coming years will be the development of export routes for crude oil from the Caspian region, which is currently shipped predominantly via Black Sea ports

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<sup>18</sup> See the ITOPF website (<http://www.itopf.com/>).

<sup>19</sup> Lloyd’s Marine Intelligence Unit, *Study of Maritime Traffic Flows in the Mediterranean Sea*, REMPEC, Valletta, Malta, July 2008.

through the Bosphorus. Northern European demand for energy is likely to see an increase in LNG transits via the Mediterranean from gas fields in the Persian Gulf and the Far East. If planned LNG terminal developments actually take place, the density of LNG tanker deployment around the Italian coastline will increase significantly.

The study therefore supported concerns that were already evident at the political and diplomatic levels in previous years.

The Euro-Mediterranean conference of energy ministers in Athens (May 2003) recognised the broader nature of the problem:

Ministers confirm that, in view of recent accidents involving the maritime transportation of hydrocarbons and the particular vulnerability and sensitivity [of the] Mediterranean sea for this type of transport, it is important to consider the advisability of reducing the maritime transportation of hydrocarbons in the Mediterranean by the development of oil pipelines if these are shown to be technically, economically and environmentally feasible.<sup>20</sup>

### 3. Major normative developments

International navigation is a highly institutionalised area of international relations. Maritime law has been one of the earliest branches of international law to be developed, to regulate encounters at sea of ships of different nationalities.

In this section, we focus exclusively on recent norms affecting tanker traffic and potentially bearing consequences for security of supply in Europe. Generally speaking, international maritime law protects freedom of navigation, and individual riparian countries or regional groups of countries cannot restrict freedom of navigation even through territorial waters, if these are deemed to be relevant for international traffic.

In this context, the most important international instrument affecting oil transportation at sea is the International Convention for the Prevention of Pollution from Ships ('MARPOL').

The MARPOL Convention is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It is a combination of two treaties adopted in 1973 and 1978 respectively and updated by amendments through the years.<sup>21</sup>

In 1992 MARPOL was amended to make it mandatory for tankers of 5,000 deadweight tonnes and more ordered after 6 July 1993 to be fitted with double hulls, or an alternative

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<sup>20</sup> Ministerial Declaration by the Euro-Mediterranean energy forum adopted by participants at the conference in Athens on 21 May 2003.

<sup>21</sup> The 1973 MARPOL Convention was adopted on 2 November 1973 at the IMO and covered pollution by oil, chemicals, harmful substances in packaged form, sewage and garbage. The Protocol of 1978 relating to the 1973 International Convention for the Prevention of Pollution from Ships ('1978 MARPOL Protocol') was adopted at the IMO "Conference on Tanker Safety and Pollution Prevention" in February 1978, held in response to a spate of tanker accidents in 1976-77. As the 1973 MARPOL Convention had not yet entered into force, the 1978 MARPOL Protocol absorbed the parent Convention. The combined instrument is referred to as the International Convention for the Prevention of Marine Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), and it entered into force on 2 October 1983 (Annexes I and II).

design approved by the IMO (Regulation 13F in Annex I of MARPOL 73/78 (Regulation 19 in the revised Annex I, which entered into force on 1 January 2007)).

In subsequent years, further amendments were adopted to accelerate the phasing-out of single hull tankers. The final deadline for phasing out single hull tankers was 2010. Tankers that have double bottoms or double sides but not properly speaking double hulls may be kept in service for a few more years, but will also need to be retired soon.

This new norm has caused the retirement of a large number of ageing tankers. Yet an even larger number of new tankers are on order and there is no shortage of capacity in sight.

#### **4. Scenarios of supply interruption and potential remedies**

This paper has reviewed several potential causes of restrictions to passage, ranging from hostile acts on the part of states, to actions by non-state actors such as terrorists or pirates, and limitations to navigation linked to environmental protection.

The general conclusion that can be drawn from this discussion is that there is no scenario of interruption to maritime oil and gas transportation that may cause a severe physical shortage of oil, in general or specifically for Europe. Even the most problematic of cases – the attempted closure of the Strait of Hormuz – could not have the catastrophic consequences sometimes discussed: a good share of Gulf production could be evacuated from ports outside Hormuz, and the strait is unlikely to be totally closed. Whatever disruption occurred to passage, it would not last for more than two or a maximum of three months. The shortage of crude oil stemming from such circumstances could be dealt with through the drawdown of strategic stocks held by governments under the IEA programme.

A further conclusion is that in almost all cases potential tensions could be easily allayed if responsible governments took the necessary steps to create alternatives, notably pipeline bypasses, or to curb illegal activities.

It has been argued that the main obstacle preventing the required investment in transportation alternatives is the lack of a well-functioning market mechanism for burden sharing. Although excessive reliance on congested straits may result in losses to individual shippers because of longer waiting times, higher insurance rates or acts of piracy, this does not translate into the willingness to participate in investment, which should be carried out by third parties. In most cases the temptation of free riding prevails, and no one underwrites the required investment. Where passage must be paid for, the resulting income stream supports investment to increase capacity and accommodate growing demand.

Supply interruptions consequent to the closure of major sea lines may be addressed by the EU directly and indirectly. Directly, the Union can more forcefully pursue projects intended to reduce vulnerabilities, such as excessive passage of tankers through the Turkish Straits. Eventually, 'congestion charges' may need to be imposed, not differently from what is done for private cars in central London and several other major cities. Freedom of navigation and the right to free passage cannot be sacrosanct principles to be applied in all circumstances, even where resources are objectively scarce. Indirectly, the Union can pursue these goals through agreements with partner countries aimed at facilitating investment in infrastructure that may reduce vulnerabilities and the danger of accidents, and through the promotion of international compacts to enforce ever more stringent standards for oil, oil products and chemical tankers.

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