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MARITIME REGULATIONS CASE STUDY

TANKER ACCIDENTS AND THE AVOIDANCE OF POLLUTION

Sea Empress Tanker Accident, www.walesonline.co.uk.

STUDY: *Analysis of three major tanker ship accidents/incidents that had either occurred in the same sea area or had suffered similar effects in different periods of time.*

Athens, 2017

Tankers Grounding: “Sea Empress”, “Borga”, “Propontis”

Legal Regime, Accident Conditions/Reasons, Consequences, Lessons Taught

ABSTRACT

The European sea area of the Atlantic as well as the area of the Baltic Sea have been indicated as areas where marine incidents occurred in the past. Extreme weather conditions, human factor/error, non-compliance with safety regulations, age or bad maintenance of vessels, constructional defects/issues were among the reasons that led to a series of maritime accidents/incidents.

The aim of this assignment is to utilize 3 examples of such accidents that resulted to grounding and hull damage in the said broad geographic area and compare them. Similarities and differences shall be indicated. We will assess the legislative matrix and the connection of maritime regulations to these accidents as well as the lessons learned from them.

In the introduction, we will provide an introductory note and highlight questions that will be answered during the project.

The literature review will present what has been written or stated on the said subject including oil spill data, regulatory developments with a focus on the double hull requirement set out by MARPOL 73/78, and the effect of the human factor in tanker accidents.

In the methodology, we will mention the aims and limitations of the project while we shall be presenting the raw data of the accidents in a table whereas the data analysis will focus on three tanker accidents regarding vessels suffering hull damage by comparing them between one another, analysing the accidents, the conditions under which they occurred, what went wrong, whether pollution was avoided and the legislative initiatives they did (or did not) effectuate.

In the conclusion, we shall summarize the whole project by acknowledging the progress made thus far by IMO and the need for further close observance of the conditions of accidents as a guide for further legislative progress.

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1. INTRODUCTION

Marine oil pollution has been a side-effect of global industrialization. According to Etkin (2001), spills from oil tankers amount to a total of 13 percent of the total annual numbers of spills. Still, most legislative efforts globally were the direct result of these tanker accidents as they received increased media coverage and caused public outcry. Parties with vested interests in the above process and directly affected by the legislative efforts in the said area include port states, flag states, ship owners and environmental agencies.

Locations with heavy vessel traffic that are also exposed to heavy weather conditions could be more prone to accidents as experience has demonstrated.

We have decided to focus on 3 tanker accidents/incidents that occurred in the surroundings of the British and Baltic coastal areas. All 3 have similar characteristics (tankers grounding and suffering hull damage). All accidents contributed to safer, more environmental friendly shipping operations. The main points we shall examine are:

- the reasons behind the occurrence of hull damage;
- the resulting (or prevented) marine pollution;
- whether the legal regime at the time was sufficient for the prevention of the accidents;
- where appropriate how pollution was deterred in the event no pollution took place;
- finally, we shall evaluate the lessons learnt and the changes these accidents triggered or they should have triggered with a view to making shipping operations in the tanker subsector safer.

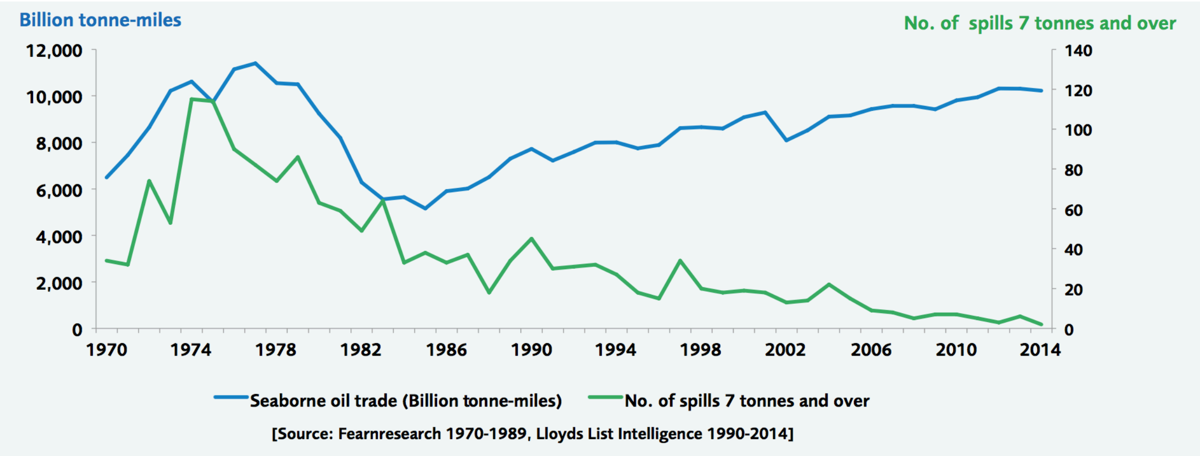
2. LITERATURE REVIEW

2.1 Volume Increase of Seaborne Oil Trade vs Oil Spills

Seaborne oil trade reached its peak in 1976 and declined until 1985 (Figure 1.1).

Since 1986 seaborne oil trade has steadily increased.

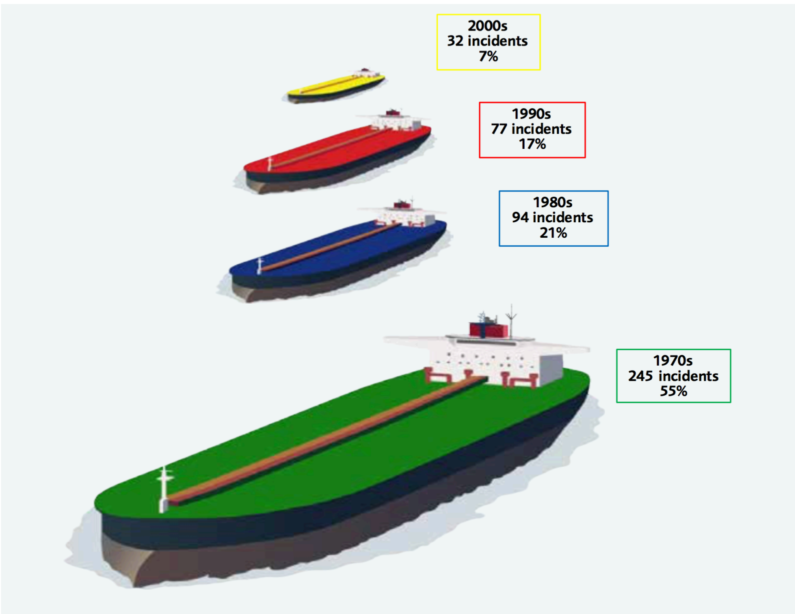
Figure 1.1. Seaborne oil trade vs Oil Spills 1970-2004



Source: ITOPF, http://www.itopf.com/knowledge-resources/data-statistics/statistics/

Although seaborne oil trade has been steadily growing since 1985, oil spills have been drastically reduced in recent times especially after the 2000s.

Figure 1.2 Large Spills (>700 tonnes) as a percentage of those recorded from 1970 to 2009 per decade.



Source: ITOPF, http://www.itopf.com/knowledge-resources/data-statistics/statistics/

The International Maritime Organization (IMO) had a central role in this documented decline in oil spills.

2.2 IMO's Legal Regime for Vessel Design and the Prevention of Pollution

The regulation of vessels' design for safety and prevention of pollution is regulated mainly by the following legal instruments of the IMO:

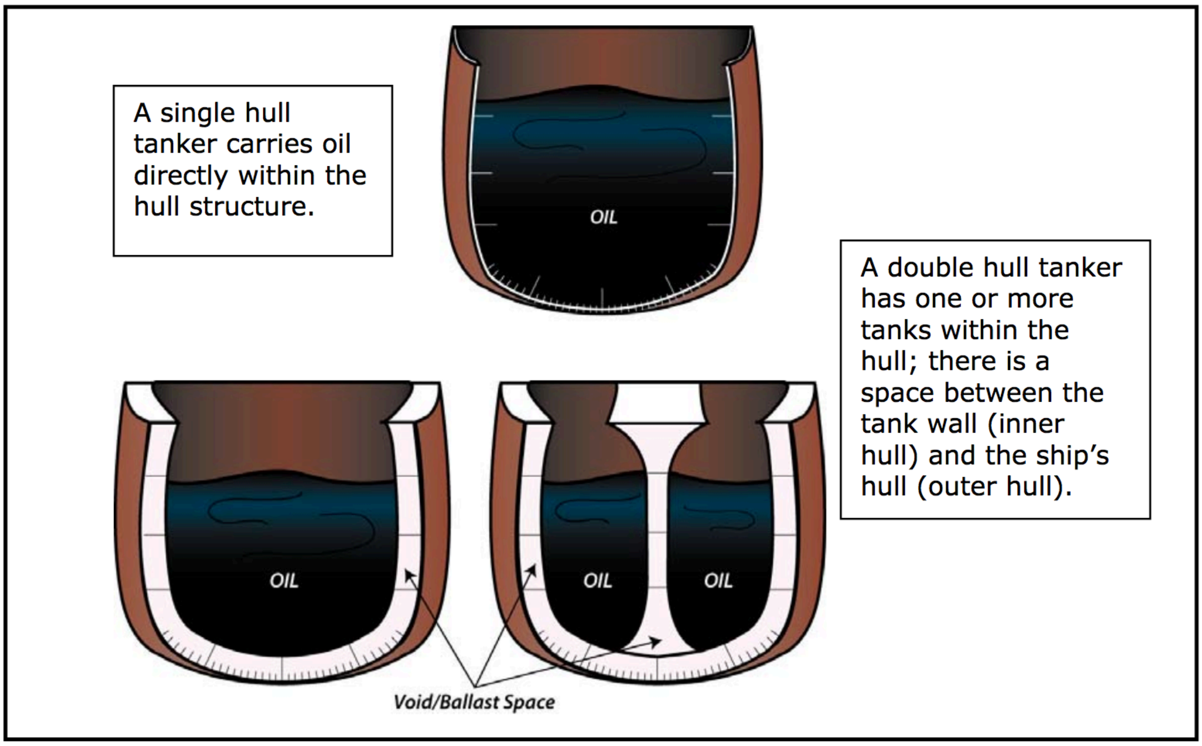
1. The International Convention on Load lines (ICLL 1966)
2. The International Convention for the Safety of Life at Sea (SOLAS 1974) and its 1978 Protocol
3. The Management Code for the Safe Operations of Ships and for Pollution Prevention (ISM Code 1993) which forms Chapter IX of the SOLAS Convention
4. The International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and its 1978 Protocol which followed a series of tanker accidents setting out regulations for tanker designs.

2.3 Double Hull & Double Bottom Requirements

The oil spills in the 1970s, mandated major structural improvements to single hull oil tankers as the oil spill incidents were very high and presented a threat to the ecosystems and economies affected. Especially at the aftermath of the Exxon Valdez incident in 1989, governments and the IMO speeded the process of mandating structural modifications to the existing fleet until the phase out of single hull tankers in 2015.

Double hull tankers meant that the double hull would help preventing oil from spilling in the marine environment or at least mitigate the severity of a spill (Figure 1.3).

Figure 1.3 Typical Single Hull and Double Hull Configurations



Source:

http://www.pwsrcac.org/wp-content/uploads/filebase/programs/oil_spill_prevention_planning/double_hull_tanker_review.pdf

MARPOL has been the main international legal instrument related to tanker designs. Since the 1970s we can distinguish tankers into 5 main design categories.

1. Pre-MARPOL single hull tankers
2. MARPOL 1973/1978 single hull tankers with segregated ballast tanks
3. Double Bottom tankers
4. Double sided tankers
5. Double Hull tankers which are now the industry standard.

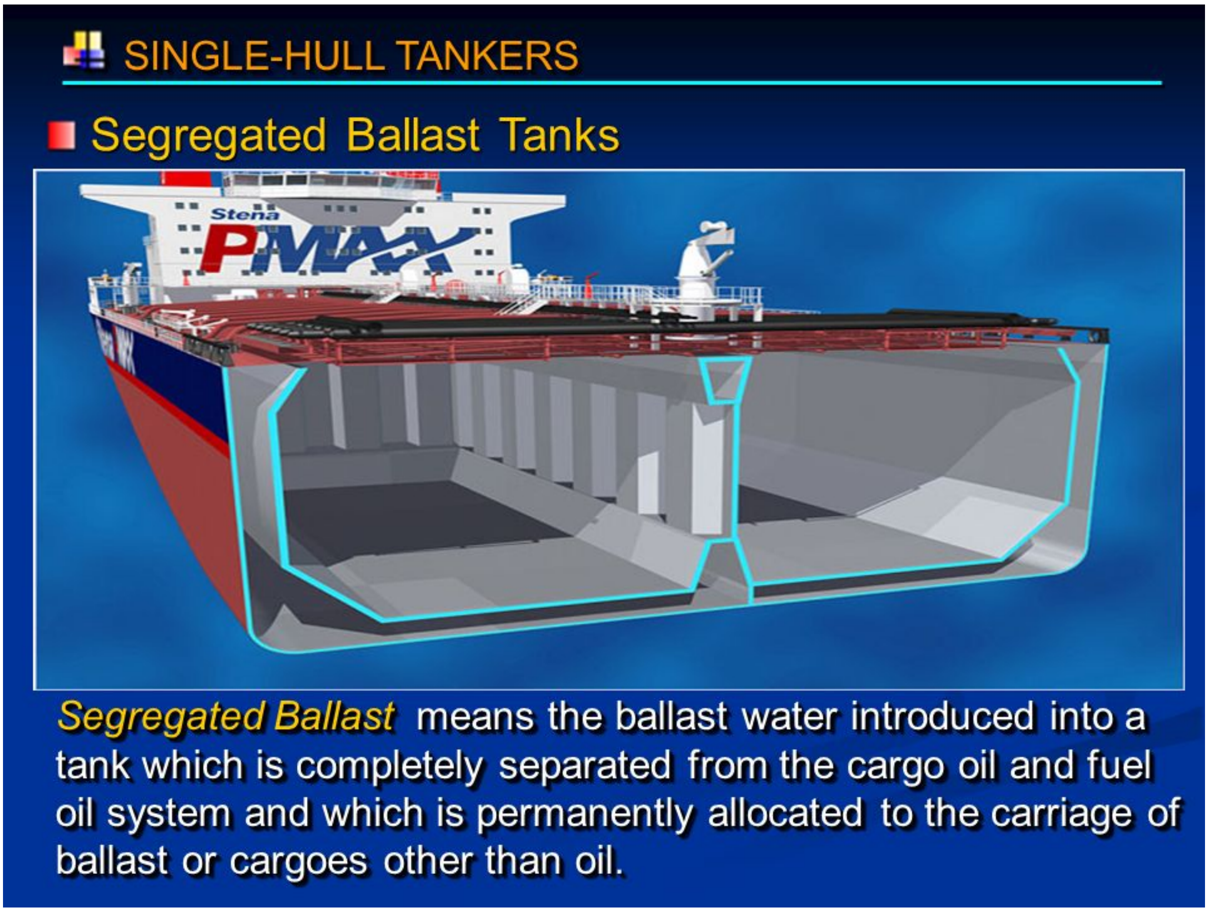
The Oil Pollution Act of 1990 in the U.S.A. following the Exxon Valdez incident followed by MARPOL Regulations 13F and 13G, mandated the phase out of single hull tankers.

MARPOL 73/78 was amended on the following dates (Intertanko, 2006):

1. with effect 07/1993 (it provided new tanker buildings to be double hull tankers),
2. 09/2002 (Category 1 should be phased out by 2007 & Category 2-3 would be phased out by 2015),

3. 04/2005 (in conjunction with EU Regulation 1726/2003, following the Prestige accident), where Category 1 should be phased out by 2005 and Categories 2-3 between 2010 and 2015.

Figure 1.4 Configuration of segregated ballast tanks



Source: http://slideplayer.com/slide/6812637/

It would not have been economically viable for the phasing out to occur earlier as:

a. The tanker sector could collapse as cost would be prohibiting;
b. the balance of demand and supply would be disturbed with extreme shortages of supply.

All three vessels examined here present 3 different variants of designs.

2.3.1 Disadvantages of Double Hull tankers

Although double hull tankers are obviously safer (especially in relation to groundings or low speed collisions) and even though oil spills have been radically reduced since they were introduced, there are disadvantages noted also.

DeCola (2009) notes that among the disadvantages of double hull tankers are the higher cost of steel (as more is used in the construction), longer construction times, higher costs of maintenance, the need for continuous monitoring of ballast tank coatings, difficult access to ballast spaces.

2.4 Human Factor in Oil Spills and Accidents & Regulations

Most oil spills and marine accidents (80%) have been attributed to human factors such as individual errors or organisation failures (Hee et al., 1999). This means that whereas a double hull vessel shall provide better protection and spills may be reduced, incidents shall also be reduced if humans take the appropriate steps on the individual and organisational level so that they break the chain of events that led to the accident in the first place (DeCola E., 2009).

IMO has thus taken some steps to the end of regulating the human factor. The ISM Code (in the form of an amendment to the SOLAS Convention) and the STCW Code are two such examples.

3. METHODOLOGY

The purpose of this assignment is to make a comparative analysis of 3 tanker accidents/incidents that took place in the broader area of the North Sea and the sea area adjacent to the British coast. All accidents share a common feature: All three tankers grounded and hull damage resulted. In one case oil was spilled, whereas in the 2 others none was.

There are certain actions to be taken when dealing with hull damage. Competence of the crew, sufficient training, effective communications between parties involved, utilization of technologies assisting navigation, speed of response are among the determining factors that may help avoiding or resulting in a tragedy.

The incidents examined are the Sea Empress, Borga and Propontis by utilizing IMO's Conventions and international Regulations to identify what went wrong, improvements over the years and suggestions for the future. Similarities and differences shall also be pointed out and analysed.

Data from sources is somewhat limited especially in regards to Borga and Propontis as they never gained the publicity of the Sea Empress tragedy. Hence conclusions may be limited as a result of the above shortcomings.

We have decided to provide the data of the three incidents in one table (Figure 1.5)

Figure 1.5 Comparison of Sea Empress, Borga, Propontis

Vessel	**Sea Empress**	**Borga**	**Propontis**
POL	North Sea Oil Fields	Draugen Oil Field, Norway	Primorsk, Russia
POD	Milford Heaven	Milford Heaven	britain
Location	Milford Heaven	Milford Heaven	Gulf of Finland
Date of Accident	15/02/1996	29/10/1995	09/02/2007
Conditions	Normal then Heavy weather conditions during salvage	Normal	
Loading Status	Loaded	Loaded	Loaded
Owner	Alegrete Shipping Co Inc	A/S J Ludwig Mowinckels Rederi Bergen, Morway	Triton Triumph S.A.
IMO	8906999	8912405	9305623
Type	Oil Tanker	Oil Tanker	Oil Tanker
Flag	Liberia	Norway	Greece
Class Society	Det Norske Veritas (DNV)	Det Norske Veritas (DNV)	Bureau Veritas
Shipyard	Astilleros Cadix	Astilleros, Espanoles, Bilbao, Spain	Hyundai H.I. 1652, Ulsan, S. Korea
Type of Cargo	Light Crude Oil	Crude Oil	
Loaded Cargo (DWT)	130,824 (tonnes)	112,180 (tonnes)	110,000 (tonnes)
Year of Built	1993	1992	2006
DH/DB	Single Hull	Segregated Ballast, Double Bottom	Double Hull
Insurance		-	-
Years of Service	3	3	1
Type of incident	Grounding resulting in Spill	Grounding – no spill	Grounding – no spill

Sources: Borga: www.gov.uk http://www.shipspotting.com/gallery/photo.php?lid=46558
Sea Empress: www.cedre.fr http://www.parliament.uk/documents/post/pn075.pdf
Proportis: http://www.shipspotting.com/gallery/photo.php?lid=1564782
http://www.merikotka.fi/safgof/Oil%20spills_luoma_2009.pdf

4. DATA ANALYSIS

4.1 Sea Empress

On February 15th 1996 at 20:00, the Liberian registered single hull (with some side ballast tanks but no double bottom tanks) tanker Sea Empress struck a rock at the entrance to Milford Haven. There was a pilot on board who joined the vessel at 19:30. Four cargo tanks and several ballast tanks suffered damage from this grounding and significant amounts of oil started spilling (CEDRE, 2011).

During the next days the vessel was refloated and ran aground several times, causing further damage to more cargo and ballast tanks.

Oil continued to be spilled even after she was refloated and towed to a berth in Milford Haven.

58,000 tones were discharged from the vessel and 73,000 were estimated to be spilled.

It has been estimated that up to 600 people worked during the clean up operations and costs reached a total of 8 million GBP by mid-March.

100 kilometres of coastline were affected by the spill.

According to the Royal Society for the Protection of Cruelty to Animals (RSPCA) 4,000 birds died and a further 3,600 were taken into care (IOPC Fund, 1996).

Figure 1.6 Duck rescued from the oil spill

Source: http://www.bbc.com/news/uk-wales-politics-35563031

Fishing activities were banned in the surrounding area.

Young's report (Young, 1997) made for the Marine Accident Investigation Branch (MAIB) of the British government, indicated that the cause of the initial grounding was due to pilot error. It was further noted that a lack of tugs of the appropriate power and manoeuvrability combined with bad weather conditions and lack of understanding of the area's tidal currents led to delay and further spilling during the salvage operation. It is noteworthy to mention that the initial grounding led to 2,500 tonnes of oil spilled whereas 69,300 were spilled during the salvage operation!

Since the accident the Milford Haven Pilotage Authority (MHPA) amended the pilotage rules so that two pilots are taken by vessels over 65,000 GT and above.

An expenditure for a new radar system was also approved for the harbour of Milford Haven although the lack of this system cannot be proved to be connected with the incident (Young, 1997).

Sea Empress was an Annex I Marpol 73/78 compliant vessel (came into force 1983). It was argued that pollution could have been avoided or eliminated had she been a double hull tanker although arguments are based on speculations. Also had she had a double bottom fitted to the tank room salvage operations would be easier thus avoiding further pollution (Young, 1997).

Furthermore, it was found that certification for the vessel and crew was in accordance with the requirements of IMO's STCW and SOLAS (IOPC Fund, 1996).

No legislative reforms were made in the EU or internationally in response to the Sea Empress incident (Krämer, 2007). Most changes were mandated by the Erika and Prestige incidents (port state control in EU ports, speeding of phase out times for single hull tankers, establishment of EMSA etc.).

One may argue though, that the Sea Empress did raise public awareness at the international level as the pollution was of a considerable extent.

Finally, it has been pointed out that a GPS/ECDIS system would have possibly helped (had it been present) since the accident was due to a a guidance (pilot) error (Devanney, 2006). ECDIS is mandatory as of 01/01/2011 under SOLAS Resolution MSC.282(86).

4.2 Borga

On the 29th October 1995, the Norwegian tanker Borga ran aground in Milford Haven harbour whilst under pilotage loaded with 112,180 tonnes of crude oil (MARS, 2012).

The weather conditions were clear and good. There was damage to the hull but the vessel, unlike Sea Empress had double bottom tanks (she was not a double hull though).

Two unsuccessful attempts by tugs were made to pull her off without success. She was lightened by 8,500 tonnes of cargo and she refloated on the third attempt.

The incident was caused by a failure to compensate fast enough for the vessel's turn rate to port by applying sufficient starboard helm following an alternation of her course (MAIB Report, 1996).

Although the helmsman's port helm application may have been reasonable in the circumstances it was Borga's manoeuvring characteristics that did not allow the shortest delay in removing the port helm. It was noted that this characteristic was not noted on the Pilot card (MAIB Report, 1996).

Grounding damage was restricted to the front end of the tanker (Figure 1.)

Figure 1.7 General view of the ruder and propeller of Borga from the starboard side

Source: https://assets.publishing.service.gov.uk/media/54c1137340f0b6158d00001d/MAIBReport_Borga-1995.pdf

Two points are of particular interest in relation to maritime regulations in the light of the Borga incident.

1. The vessel's design (segregated ballast and double bottom) was possibly a contributing factor to the avoidance of pollution in the area were the Sea Empress tragedy resulted in 73,000 tonnes of oil spilled.
2. The MAIB Report suggested an amendment to SOLAS 1974 Convention and the 1978 Protocol, Chapter II-I, Part C, Regulation 29, Paragraph 8, Section 8.4 that it should include a low hydraulic pressure alarm sensor alarm in addition to the requirement for an electrical power supply failure alarm already in set in the Convention. This suggestion was not adopted by IMO though although it has

recently amended Regualtion 29 in respect to steering gear and rudder stock as well as auxiliary steering gear (Paragraphs 3 and 4) with Resolution MSC.365(93) adopted on 22nd of May 2014.

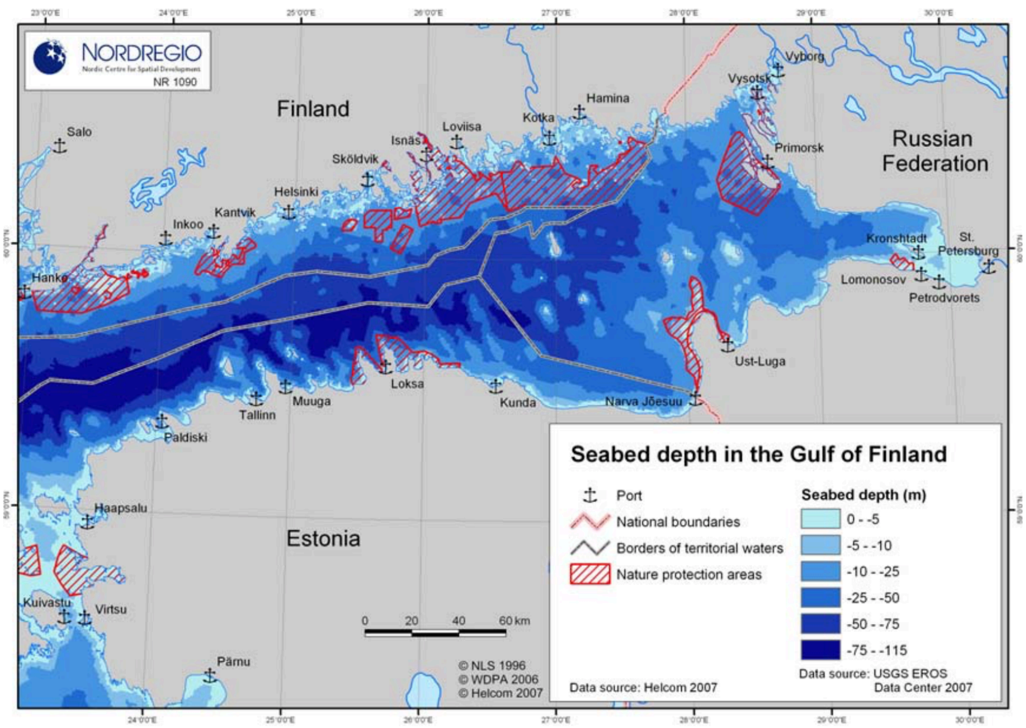
4.3 Propontis

On the morning of 9th February 2007, Propontis, a Greek registered tanker, grounded in the eastern Gulf of Finland. The ship was bound from Primorsk, Russia to the UK. Propontis was carrying 110,000 tons of crude oil. The vessel suffered some ruptures in the ballast tanks but the cargo space remained intact. No oil spills were observed. Propontis is a modern double-hull tanker built in 2006 and it is still in operation today.(SYKE, 2007)

The vessel was sailing in an area where the deepness of water is less than the deepness of the vessel hence the grounding was inevitable. A combination of the fact that the rock was not high enough to damage the upper part of the double bottom and the fact that the vessel was double hull helped avoid the spill (Luoma, 2009).

It should be noted that the area of the Baltic Sea is shallow and natural cleaning processes are rather slow (Luoma, 2009). An oil spill would thus have devastating effects.

Figure 1.8 Seabed depth in the Gulf of Finland



Source: www.nordregio.se

One of the arguments of the cause of the spill was the lack of the crew's experience of winter navigation (Nikulla & Tynkkynen, 2007) and increasing pressure has been exerted to this end especially in the light of increasing demand for oil transportation by tankers in the area.

Also increasing arguments have been raised in relation to good preventive systems being established (already in place through the Vessel Traffic Service) as well as the establishment of further oil combatting capacity from Finland and Russia (Luoma, E., 2009).

Another development since the accident is the mandatory ECDIS system (amendments to SOLAS as adopted by IMO Resolution MSC.282(86)) as it has been argued the incident could have been avoided had one been in place (Korhonen, 2007).

A combination of human factors resulted to the groundings of each one of the three vessels whereas it was the design characteristics and human responses that again resulted to the marine pollution in the case of Sea Empress and avoidance of it in the two latter instances of Borga and Propontis.

The ITOPF oil spill trends seen above (Figure 1.1) demonstrate a clear reduction in overall oil spills during the last couple of decades. This by no means eliminates the dangers for further spills but it appears IMO and the shipping industry have made considerable progress.

5. CONCLUSIONS

The incidents we examined may lead to a series of conclusions.

Two important regulations i.e. a. the MARPOL double hull requirement and b. the SOLAS mandatory ECDIS system have led to two distinct conclusions, one being that the slow pace of response from the shipping industry has led to incidents and on the other end of the spectrum that the industry has - although late - responded ensuring a safer environment for tanker operations.

Also, it has been demonstrated that the human factor is of a high significance in relation to oil spills and that IMO is moving to the direction of successfully regulating the human factor.

The decrease of oil spills seen above is living testimony of a successful legislative matrix with a view to eliminating oil spills.

Borga and Propontis were two examples where a combination of good fortune and good regulations did not result to oil pollution yet left scope for improvement i.e. by giving us lessons on avoiding the incidents in the first place.

The parties involved should continue to regulate with a view to protecting the environment, safety of vessels and their crews as well as the local economies affected by the disastrous effects of oil spills.

Close observance of incidents and the associated causes will help IMO and all parties involved in oil spill prevention regulations, to come up with a safer legislative matrix in the years to come.

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Appendix I

Pictures of the study's vessels can be found below:

Sea Empress

Source: www.walesonline.co.uk

Borga

Source: http://www.shipspotting.com/gallery/photo.php?lid=56480

Propontis

Source: http://www.shipspotting.com/gallery/photo.php?lid=1564782