

CHAPTER-7
ANALYSIS ON SHIP SOURCE POLLUTION IN PORTS OF INDIA
AND ABROAD- CASE STUDIES

In the previous chapters, an overview of the technical measures and various operational control measures taken to prevent ship pollution was done. Detailed study was also done about the authorities who are exercising proper control over the ships when they are employed in the transportation industry. Subsequently, to what extent the various international conventions promulgated by IMO over the past years were implemented and complied with by the states and the liability and the compensation part of the pollution caused by ships were described in detail.

Having studied the various control measures taken at various levels to prevent the vessel source pollution caused by oil and other pollutants, it is felt appropriate to critically analyse through various angles and deduce necessary conclusions to ascertain as to what extent the various measures taken in the past were successful in actually preventing/reducing the pollution across the world. As the main focus of the study is on the pollution in ports and port areas, a case study has been done covering the reported pollution incidents in Indian ports and the ports of other countries. In addition to this, a comparative study is also made in this chapter on the fines and penalties imposed by the states for pollution offences. Finally, it is felt that the study will not be complete without the discussion on the criminal prosecutions done by the states against the ship owners whose ships had illegally discharged various pollutants in various ports across the world and as such the same is also included in this chapter.

Hence, the enquiry done in this chapter is indented to cover mainly the following four important areas related to ship born pollution. In order to study in depth, each of the four areas covered are taken up as independent case study. While trying to collect data for the various types of pollutions occurring from the ships, it was noticed that the past information available is mostly regarding the oil and chemical pollution from the ships. This is mainly due to the fact that only the annexes I and II of the MARPOL 73/78 are

made mandatory. Nevertheless, attempt has been made to study the following four areas in detail.

1. Study of the reported oil pollution incidents from ships around the world, during the period 1970-2006:
2. Study of the reported pollution incidents from the ports of India and the ports of other countries:
3. Comparative study of the fines and penalties imposed by different countries for violations of conventions:
4. Study of the criminal prosecutions done by different countries for the discharge of pollutants from ships:

7.1 Data Collection and Analysis:

Letters were sent to the Deputy Conservators of twelve major ports (six numbers each on east coast and west coast) requesting to provide the pollution incidents occurred in their respective ports and the penalties imposed on the ships which had violated the national and international rules. Personal visits were made to Cochin Port, New Mangalore Port, Mormugao Port, Mumbai Port, Visakhapatnam Port and Tuticorin Port. Details regarding pollution incidents of various ports in India and the reports of the Port State Control inspections and vessel detentions in India were collected from the office of the Director General of Shipping, Mumbai. Information /statistics of pollution incidents of various ports of different countries were collected from the relevant websites of the maritime authority offices of those countries, ITOPF, IMO etc. Various journals and books relevant to the subject were also referred to for the collection of different data. References made are detailed out under the heading “Bibliography” at the end of the thesis.

Data thus collected were separated, categorized, grouped, summarised and presented in the form of bar charts, pie charts and graphs, wherever possible, for the easy analysis, interpretation, and for comparison. While grouping, the pollution due to oil spills, chemical spills, and air pollution in Indian ports and at different parts of the world were detailed out separately for better clarity.

7.2 Oil Pollution Spills all over the world during the period 1970-2006(Part-1) – A

Case Study:

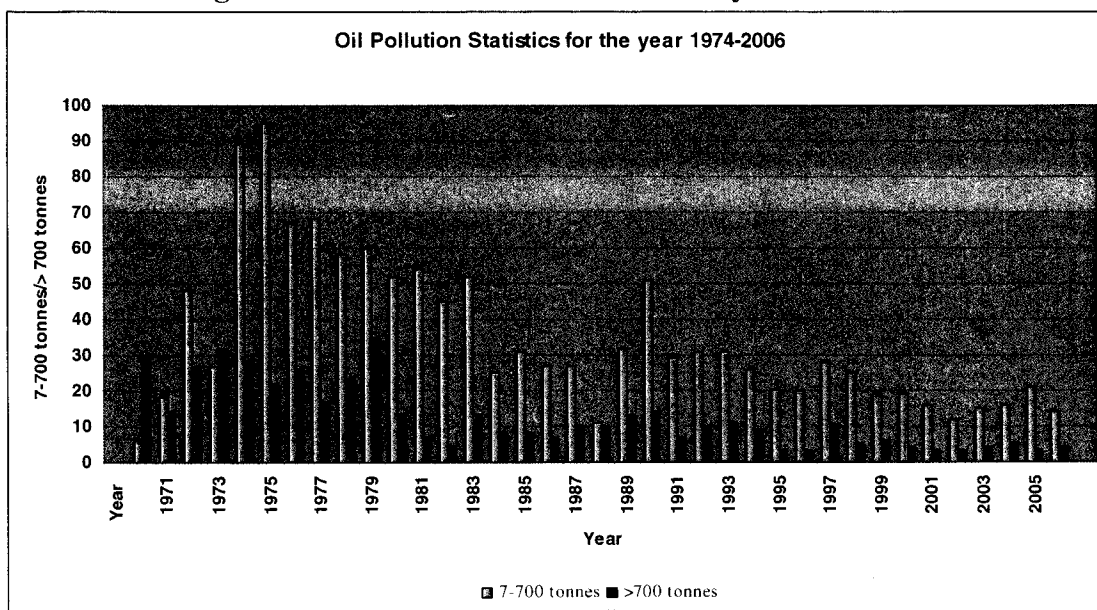
In order to have an overall view of the oil spills occurred, all over the world, during the period 1970 -2006, the following Table – 7.1 may be examined along with the bar chart followed by that.

Table -7.1 Oil Pollution Spill statistics- For the period 1970-2006:

Year	No.of Spills (7-700 tonnes range)	No.of spills (>700 tonnes range)
1970	6	29
1971	18	14
1972	48	27
1973	27	32
1974	89	28
1975	95	22
1976	67	26
1977	68	17
1978	58	23
1979	60	34
1980	52	13
1981	54	7
1982	45	4
1983	52	13
1984	25	8
1985	31	8
1986	27	7
1987	27	10
1988	11	10
1989	32	13
1990	51	14
1991	29	7
1992	31	10
1993	31	11
1994	26	9
1995	20	3
1996	20	3
1997	28	10
1998	25	5
1999	19	6
2000	19	4
2001	16	3
2002	12	3
2003	15	4
2004	16	5
2005	21	3
2006	14	4

Source: Data base provided by ITOPF

Figure 7.1 Oil Pollution Statistics for the year 1970-2006



Source: From the website of ITOPF.

ITOPF had generally categorized the spillages by size (<7tonnes, 7-700 tonnes and >700 tonnes). From the database of nearly 10000 incidents held by ITOPF, the vast majority (84 percentage) fall into the smallest category of <7 tonnes¹. As per ITOPF, the information gathered by them is from both published sources, such as shipping press and other specialised publications, and also from vessel owners and their insurers. Information from published sources generally relates to large spills, often resulting from collisions, groundings, structural damages, fires and explosions, where as the majority of individual reports relate to small operational spillages.

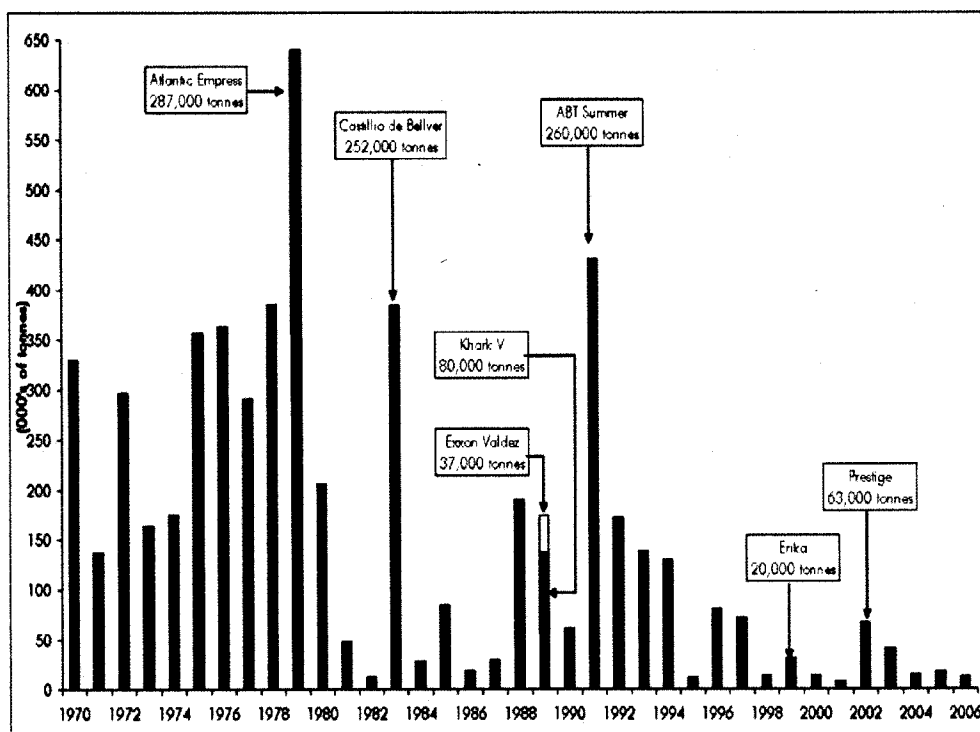
It may be seen from the Table-7.1 that the number of large spills (>700 tonnes) has decreased significantly during the last thirty years. The average number of large spills per year during the 1990s was less than one third of that witnessed during the 1970s. It is also seen that a few very large spills were responsible for a high percentage of the oil spilt. For example, in the ten-year period 1990-1999 there were 358 spills over 7 tonnes, totalling 1,138 thousand tonnes, but 830 thousand tonnes (73 percentage) were spilt in

1. From the official website of ITOPF, Historical data.

just 10 incidents (just under 3 percentage). The figures for a particular year may, therefore, be severely distorted by a single large incident. This is clearly illustrated by 1979 (Atlantic Empress - 287,000 tonnes), 1983 (Castillo de Bellver - 252,000 tonnes) and 1991 (ABT Summer - 260,000 tonnes). Please refer to the Figure- 7.2 shown below which clearly illustrates the above said facts.

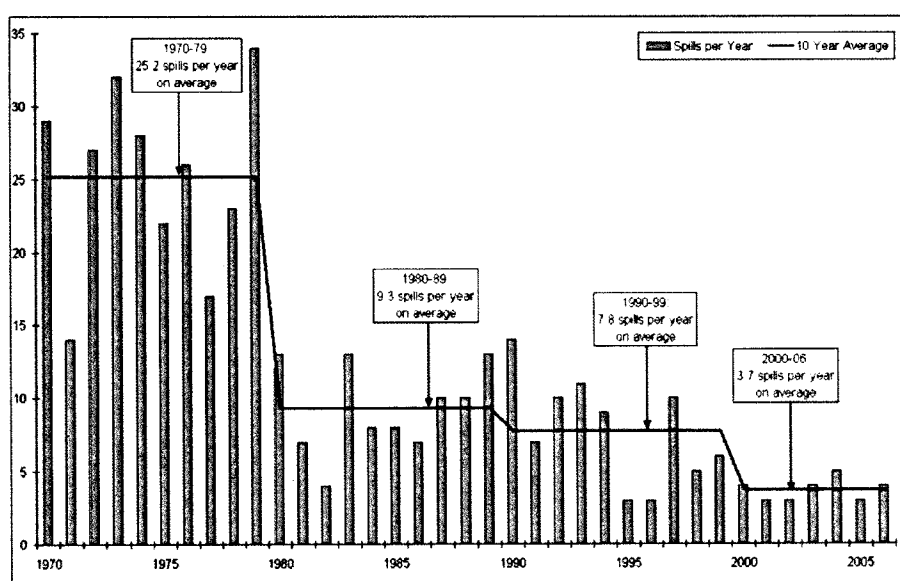
From the table, it can also be seen that for the period 1970-79, there were 25.2 spills per year on an average. However, for the period 1980-89, the average fell down to 9.3 spills per year on an average. The average value of spills per year fell further down to 7.8 per year for the period 1990-1999 and for the period 2000-2006, the average became 3.7 (please refer to the Figure- 7.3). This study generally confirms the fact that the changes made in the CDEM standards and/or the strict control measures taken during the operational stage of ships have reduced the average quantity of oil spilt during the said period. Although the pollution incidents referred above are not restricted to ports only, the final conclusion arrived at generally shows the reduction in pollution from ships.

Figure -7.2 Oil spills for the period 1970-2006 showing the major spills



Source: From database of ITOPF

Figure -7.3 Oil spills for the period 1970-2006 showing the averages



Source: From database of ITOPF

The Annual quantity of oil spilled in tonnes for the period 1970-2006 is given below in Table -7.2

Table 7.2 - Annual Quantity of Oil Spilt

Year	Quantity(Tonnes)	Year	Quantity (tonnes)
1970	330,000	1990	61,000
1971	138,000	1991	430,000
1972	297,000	1992	172,000
1973	164,000	1993	139,000
1974	175,000	1994	130,000
1975	357,000	1995	12,000
1976	364,000	1996	80,000
1977	291,000	1997	72,000
1978	386,000	1998	13,000
1979	640,000	1999	29,000
1970s	Total 3,142,000	1990s	Total 1,138,000
1980	206,000	2000	14,000
1981	48,000	2001	8000
1982	12,000	2002	67,000
1983	384,000	2003	42,000
1984	28,000	2004	15,000
1985	85,000	2005	17,000
1986	19,000	2006	13,000
1987	30,000		
1988	190,000		
1989	174,000		
1980s	Total 1,176,000		

Source: Data base provided by ITOPF

Figure -7.4 Annual quantity of oil spilt for the period 1970-1990

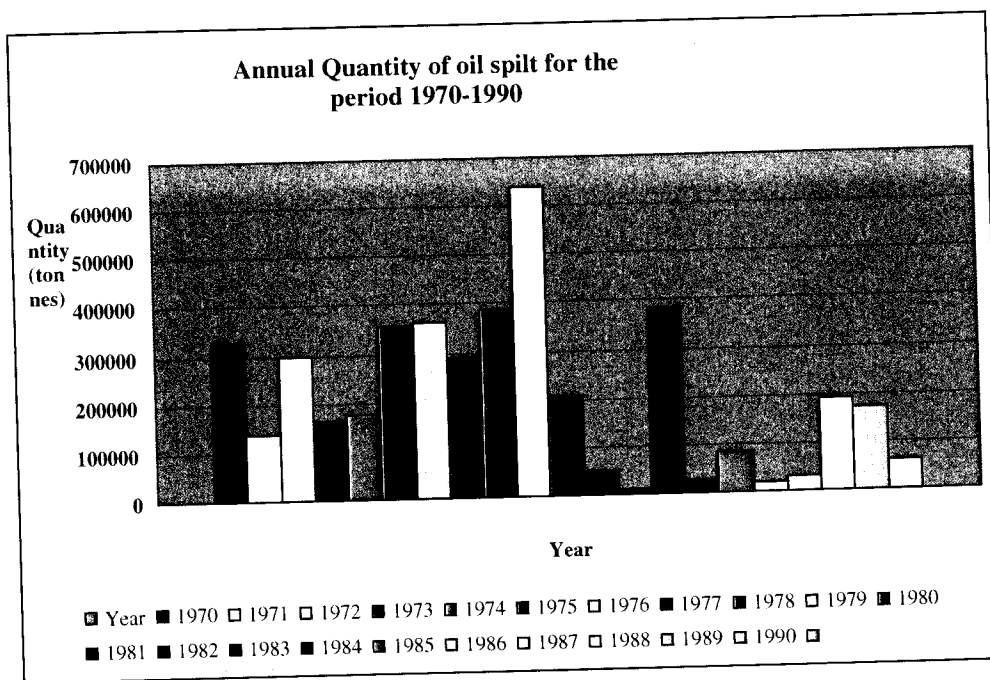
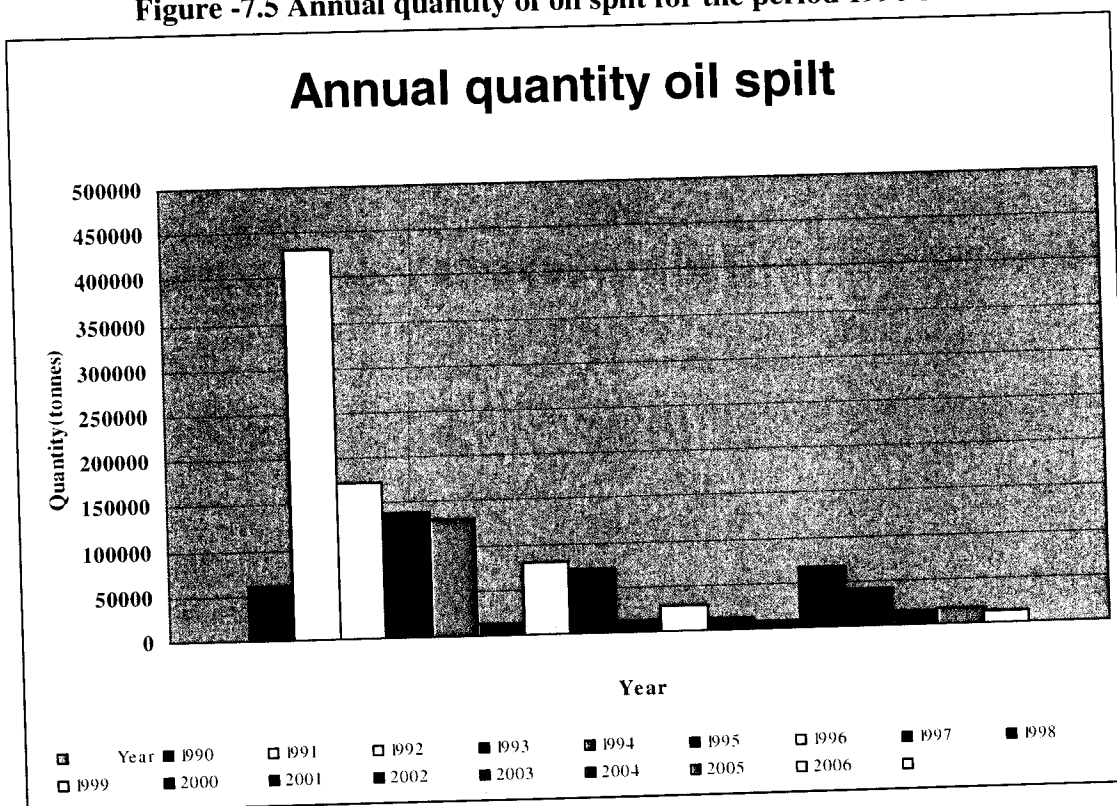


Figure -7.5 Annual quantity of oil spilt for the period 1990-2006



The annual quantities of oil spilt for the period 1970 – 1990 and for the period 1990 - 2006 are shown in Figure – 7.4 and Figure – 7.5 respectively. The data refers to oil spilt all over the world.

7.3 Incidence of Oil Pollution by cause for the period 1974-2006:

An attempt is made below to study the oil pollution incidents of spills caused from ships due to various causes. This is done to analyse the percentage of oil pollution caused during operations, accidents and other unknown reasons. While studying, the numbers of spills caused are grouped into three categories such as “less than 7 tonnes, between 7-700 tonnes and more than 700 tonnes”. Again, under the operations, they are categorized into three, and under the accidents; they are classified into four as shown in the table². The data are represented in the form of pie charts for better clarity.

Table - 7.3 Incidents of spills by cause, 1974-2006

	< 7 tonnes	7-700 tonnes	> 700 tonnes	Total
OPERATIONS				
Loading/discharging	2821	332	30	3183
Bunkering	548	26	0	574
Other operations	1178	56	1	1235
ACCIDENTS				
Collisions	173	296	97	566
Groundings	235	222	118	575
Hull failures	576	90	43	709
Fires & explosions	88	15	30	133
Other/Unknown	2181	148	24	2353
TOTAL	7800	1185	343	9328

From the Table-7.3 (Incidents of spills by cause) and from the figure – 7.6, it may be seen that the percentage of pollution caused (range <7 tonnes) due to loading /discharging of tankers for the period 1974-2006 is 36.04 per cent, pollution caused while doing bunkering operation is 7.27 per cent, pollution caused due to groundings is 3.09 per cent and due to collisions is only 2.21 per cent.

Referring to the figures-7.7 and 7.8, it may be seen that the percentage of pollution caused due to loading and discharging operation had come down to 28 per cent (range 7-700 tonnes) and then to 9 per cent (range >700 tonnes) respectively.

2. From the website of ITOPF

Figure 7.6 Incidence of spills (< 7tonnes) by cause- 1974-2006

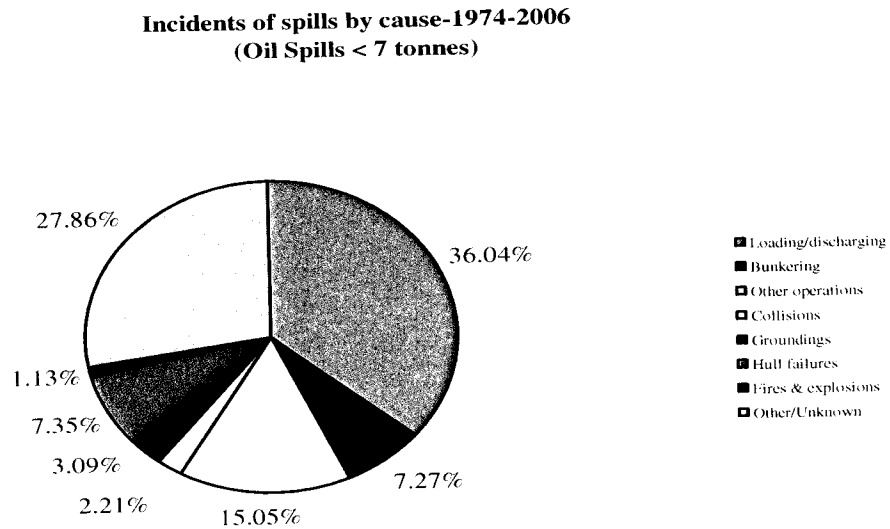


Figure -7.7 Incidence of oil spills (7-700 tonnes) by cause-1974-2006

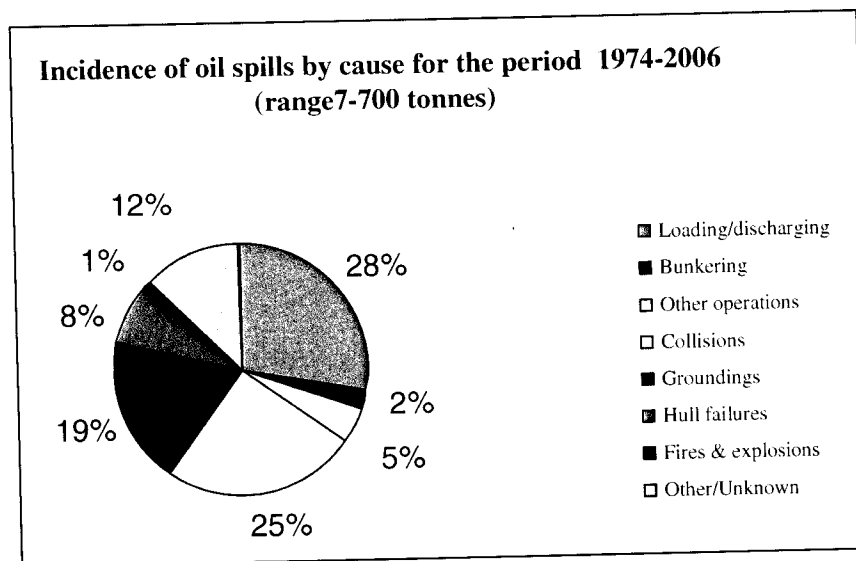
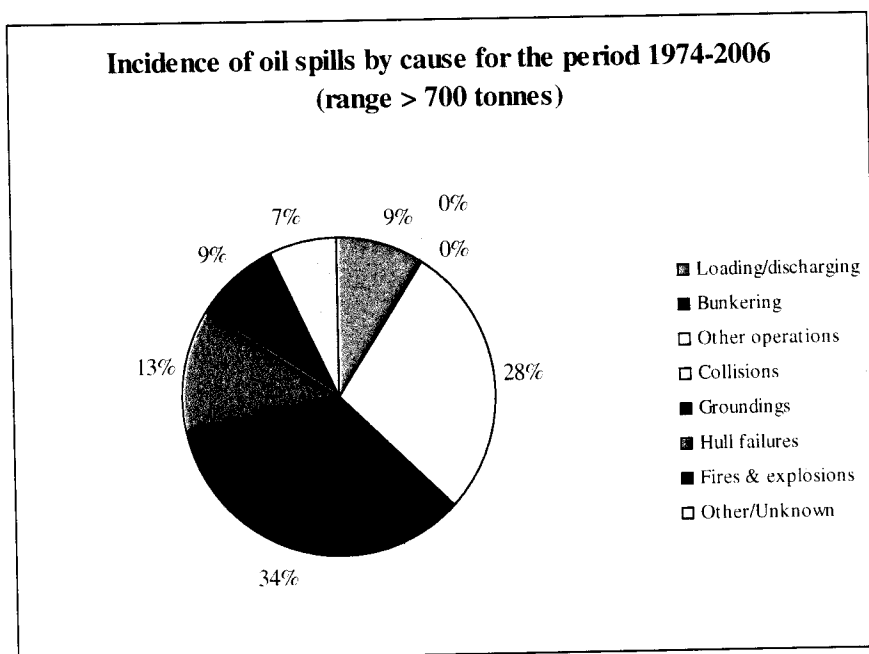


Figure -7.8 Incidence of oil spills (>700 tonnes) by cause – 1974-2006



Similarly, the percentage pollution due to bunkering operation came down to 2 for the range 7-700 tonnes and then to nil for the range >700 tonnes. However, the percentage of pollution is seen increased both for the collisions and groundings. Also the pollution percentage has gone up for both the higher ranges. The observations drawn from the above figures show the fact that the pollutions caused from ships due to operations are less (most of them within less than seven tonnes) and the oil spillages caused due to collisions/groundings are largely over seven hundred tonnes. At this point, it is worth to think whether the design modifications done to prevent / reduce the oil pollution due to collisions/groundings had helped in reality.

7.4 Comparison of Pollution Incidents in Indian ports and in ports abroad (Part-2)- A Case Study:

7.4.1 Oil Spills in Indian Waters (since 1982):

Indian Coast Guard who has been invested with the power of inspecting the vessels in Indian waters has listed out the following incidents of oil spills in Indian waters since 1982.

Table-7.4 Minor and Major Oil Spills in Indian Waters since 1982

Sr.no	Date	Qty. and type of spill (in tonnes)	Location	Spilled by
01	1982	Not assessed	West coast	Sagar Vikas
02	24/10/88	1000	Bombay Harbour	Lajpat Rai
03	1989	Not assessed	West Coast	SEDCO 252
04	1989	5500/ Diesel oil	795 nm off Bombay	M.T.Puppy
05	04/08/1989	Not assessed	Bombay Harbour	ONGC Tanker
06	29/8/1989	Not assessed	Sourashtra coast	Merchant ship
07	29/8/1989	Not assessed	Bombay Harbour	Unknown
08	22/3/1990	Not assessed	NW of Cochin	Merchant ship
09	07/9/1991	692/FO	Gulf of Mannar	M.T.Jayabala
10	14/11/1991	40000/Crude	Bombay High	M.T.Zakir Hussain
11	22/2/1992	Tanker wash	40NM s of New moore Is.	Unknown
12	2/9/1992	1000/Crude	54NM west of Cochin	M.T.Homi Babha
13	16/8/1992	1060/SKO	Madras harbour	M.T.Albert Ekka
14	17/11/1992	300/FO	Bombay Harbour	MV Moon River
15	21/1/1993	40000	Off Nicobar Islands	Mersk Navigator
16	26/3/1993	Not assessed/crude	Off Narsapur	Offshore rig at Kakinada
17	29/4/1993	110/Crude	Bombay Harbour	MT Nand Shivchand
18	10/5/1993	90/FO	Bhavnagar	MV Celelia
19	17/5/1993	6000/Crude	Bombay High	BHN Riser pipe rupture
20	2/8/1993	260/FO	Off New Mangalore	MV.Challenge
21	1/10/1993	90/Crude	Cochin Harbour	MT Nand Shivchand
22	12/5/1994	1600/Crude	Off Sacramento Pt.	Innovative-1
23	12/5/1994	Not assessed/FO	Off Porbunder	MV Stolidi
24	06/6/1994	1025/Crude	Off Aquada Lt.	M.V.Sea Transporter
25	20/7/1994	100/FO	Bombay harbour	Mv Maharshi Dayanand
26	27/11/1994	288/FO	Off Madras	MV.Sagar
27	26/3/1995	200/Diesel	Off Vizag	Dredger Mandovi-2
28	24/9/1995	Not Assessed/FO	Off Dwaka	MV.Pearl
29	13/11/1995	Tanker wash	Eliot Beach, Madras	Unknown
30	21/5/1996	370/FO	Hoogly River	MV Prem Tista
31	16/6/1996	120/FO	Off Prongs, Mumbai	MV Tupi Buzios
32	18/6/1996	132/FO	Off Bandra, Mumbai	MV Zen Don
33	28/6/1996	128/FO	Off Karanja,Mumbai	MV Indian Prosperity
34	23/6/1996	118/FO	Off Worli, Mumbai	MV Romanska
35	16/8/1996	124/FO	Malabar Coast	MV Al Hadi
36	25/1/1997	Tank wash	Kakinada coast	Unknown
37	19/6/1997	210/FO	Off Prongs Lt., Mumbai	MV Arcade Pride
38	19/6/1997	Not Assessed	Hoogly River	MV Green Opel
39	14/9/1997	Naphtha, Diesel, petrol	Vizag	HPC Refinery
40	2/8/1997	70/FO	Off Mumbai	MV Sea Express
41	10/3/1998	Gas leak	Bombay high	Drill rig Noble
42	12/5/1998	Gas leak	Bombay high	Bombay High Platform
43	01/6/1998	20/Crude	Off Vadinar	Vadinar SBM
44	09/6/1998	Not Assessed	Off Porbander	Ocean Barge
45	09/6/1998	Not Assessed	Off Varaval	Ocean Pacific
46	08/7/1999	500/FO	Mul Dwarka	MV Pacific Acadian
47	19/7/2000	Not Assessed	Off Sagar Nand	MV Prime Value
48	08/9/2000	Not Assessed	Off Fort Aguada	MV River Princess
49	17/12/2000	1/FO	Bombay Harbour	MV Stonneswall Jackson

50	08/6/2001	Not Assessed	Vadinar, Gulf of Kutch	Unknown
51	10/7/2001	1305/Diesel oil	Hoogly River	MV Lucnem
52	23/9/2002	Not Assessed	Off Pt. Calimare	MV Hiderbahy
53	29/4/2003	2000L Crude oil	Off Kochi	MT BR Ambedkar
54	09/6/2003	2000/Naphtha	Mumbai Harbour	MT Upgo-111
55	18/5/2003	145/FFO	Off Haldia	MV Segiteiru
56	10/6/2003	300/ Crude oil	ONGC Rig	URAN Pipe line
57	28/2/2004	01/Crude oil	36" pipe line	During transfer from Jawahar deep to ONGC
58	01/10/2004	500-600 Ltrs.	Berth no.8 MPT-Goa	During oil transfer
59	23/3/2005	110	Off Goa	MV Maritime wisdom
60	27/7/2005	80	Due to Fire	BHN Platform
61	30/8/2005	08	Sunken ship off Tuticorin	MV IIDA
62	21/4/2005	90	Sunken ship off Goa	INS Prahar
63	06/6/2006	<100 litres	Sunken tug off Pt. Calimer	DCI Tug-IV
64	30/6/2006	70 tonnes of FFO	Grounded off Karwar port	MV Ocean Saraya
65	15/6/2006	4500	Near A&N Islands	MV Bright Artemis& MV Amer

Source: Journal "Blue Waters"-Indian Coast Guard, July, 2007

Indian Coast Guard who keeps a vigilant watch on all around Indian coast had published the data provided in Table-7.4 shown above. It can be seen that the data, although made available for the period 1982-2006, provided therein is not complete. For example, the quantity spilled is not known or not assessed in few cases. The data made available refers to pollution from ships and other sources also. Pollution caused in the coastal area and outside limits and that too all around in Indian coast are not shown separately. No information is available for the period 1982-1988. However, as the Coast Guard is one of the authentic sources, the data provided by them is used in this study in order to have a brief picture of the pollution scenario both in Indian ports and in Indian waters.

In addition to the above stated data collected from the journal "Blue Waters" published by the Coast Guard, information about oil pollution incidents (oil spills) occurred in New Mangalore port, Mumbai port, Mormugao port, and Karwar port on the west coast and in Tuticorin port, Vizakhapattanam (Vizag) port, and Haldia port on the east coast and in Nicobar Islands were collected directly from the ports and also from the office of the Director general of shipping and the same are tabulated in Table -7.5.

Table -7.5 Pollution Statistics of Indian Ports for the period 2003-2007

1. New Mangalore Port

Date of incident	Name of ship	Flag	Substance soiled	Qty. Spilled(ltrs)
1-3-03	RN Tagore	India	Black oil	2L
28-7-03	Spring Glory	Singapore	Crude Palmolein	3L
29-8-03	Nand kishore	India	Furnace oil	3L
16-6-04	Bharati Dasan	India	Product oil	10L
2-7-04	Lok Manya Tilak	India	Crude oil	10L
4-7-04	Jag Largish	India	Crude oil	25L
6-9-04	M.T.Punita	India	Motor spirit	400L
4-3-05	M.V.Dynasty	Singapore	Black oil	50L
5-3-05	M.T.Maharshi Karve	India	Black soot with sludge	75L
22-7-05	M.T.Blossom	India	Bunker oil	50L
22-10-05	MRPL terminal	India	Black oil	50L
10-3-06	M.T Jag Arpan	India	Fuel oil	2L
18-3-06	M.T.Tarapore	India	Crude oil	2L
29-7-06	M.T.Punita	India	Oil slick from ballast water	Qty. not known
9-8-06	M.V.Asean Unity	Singapore	Oil from E/R bilges	200L
22-12-06	M.V.Helios-3	Panama	Fuel oil	2L
30-1-07	M.T.Punita	India	Kerosine	4L

2. Mumbai Port

9-5-03	MT UPCO-III	Panama	Naphta	2000 tonnes
30-1-04	M.T.Zuzanne	Panama	Oil	1.1 Kl
30-8-04	M.V.Sterling Sea	India	Oil	1.35 Kl
30-12-04	M.V.Love song	Croatia	Oil	8.05 KL
16-7-05	M.V.Al Jazy	Jorden	Oil	600L
24-8-05	Barge satyam	India	Oil	600L
3-9-05	Ocean Lapez	India	Oil	400L
19-11-05	M.V.Admas	Ethiopia	Oil	20L
24-3-06	M.V.Parsian	Malta	Oil	400L
24-4-06	M.V.Capricorn Ace	Panama	Oil	25L
1-6-06	Royal sheravathy	India	Oil	20L
11-12-06	Ispat Gourav	India	Oil	10L

3. Tuticorin Port

Date of incident	Name of ship	Flag	Type of oil	Qty.spilled
5-2-04	MV.SIC-05	India	Oil	50L
5-6-04	M.V Arck of God	India	Oil	15L
3-8-04	M.T.Pratibha Cauveri	India	Hyd.oil	100L
3-8-04	M.V.Med Lerici	Ireland	Black oil	50L
1-3-05	M.T.Punita	India	Fuel oil	50L
19-3-05	M.T.MMMG Alvaston	Malaysia	Paint spill	Qty.not known
18-8-05	M.V.Jag Preethi	India	Dense smoke	--do--
19-8-05	M.V.City of Dublin	Sri Lanka	Paint spill	--do--
11-9-05	--	--	Parafin wax	--do--

20-9-05	M.V.Tamil Kamaraj	India	Dense smoke	--do--
11-10-05	M.V.Jag Palak	India	Black oil	50L
21-12-05	M.V.North Sea	Liberia	Paint spill	Qty.not known
30-8-05	M.V.IIDA	Mongolla	Diesel oil	9287 L
2-3-06	M.V.Bang Yuan	Singapore	Fuel oil	3000L
30-3-06	M.T.Almorona	Qatar	Hyd.oil	Qty.not known
21-4-06	M.V.Pecan Challenger	Panama	Oil	--do--
5-5-06	M.V.Waadhee Venus	Maldives	Paint spill	--do--
26-5-06	M.V.City of Dublin	Sri Lanka	Rusty ballast water	--do--
30-5-06	M.V.Maersk Aberdeen	Singapore	Paint spill	--do--
2-6-06	M.V.Ocean Venture	Sri Lanka	Oil	--do--
9-6-06	ICG Ahalya bai	India	Engine oil	--do--
14-3-07	M.V.Tiger sky	Liberia	Oil	2 tonnes

4. VisakaPattanam Port (Vizag Port)

17-4-04	M.V.Poly Mok	Panama	Bunker oil	40L
26-6-04	Beluga Inspiration	Autigua	--do--	1.3 KL
2-7-04	M.V.Pearl	Panama	--do--	0.8KL
7-8-04	M.V.Nand Shrishti	India	--do--	1 KL
14-12-04	M.V.Thor Sailor	Thailand	--do--	1 KI
25-3-05	Gem of Paradeep	India	Fuel oil	100KL
5-5-05	M.V.Sea Dance	Malta	Fuel oil	11 L
18-5-05	Work boat	India	Fuel oil	8 L
28-9-05	M.V.Sisoli	India	Fuel oil	98 L

5. Mormugao Port

Date of incident	Name of the ship	Flag	Type of oil	Qty. spilled
23-3-05	M.V.Maritime Wisdom	Singapore	HFO	87 tonnes
22-4-06	INS Prahar	India	LSHF HSD	90 tonnes
27-1-07	M.V.Willena	Indian	HSD	Qty.not known

6. Haldia Port

18-5-03	M.V.Segitegu	Indinesia	FFO	145 tonnes
4-12-04	M.V.Cmaegmlea	Indonesia	Furnace oil	5 tonnes
25-3-07	M.T.Global Venus	Panama	HSD	870 L

7. Karwar Port

30-5-06	M.V.Ocean Seraya	Panama	Mix of Fuel oil+HSD	425 tonnes fuel oil+ 40 tonnes of HSD
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8. Nicobar Island

14-8-06	M.T.Bright Artemis	Singapore	Crude oil	4500 tonnes
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Source: The above said information was collected directly from the ports as well as from the office of the Director General of Shipping, Mumbai.

The data collected from the office of the Director General of Shipping and the data collected directly from the ports have been sorted out and tabulated, port wise, for the proper analysis and interpretation as shown below.

a) New Mangalore port:

It is seen that in the year 2003, there were 3 incidents reported causing a total pollution of about 8 litres only. For the years 2004, 2005, 2006 and 2007(up to July), the reported quantity spilled were 445 litres (4 incidents), 225 litres (4 incidents), 204 litres (5 incidents) and 4 litres in one incident.

b) Mumbai Port:

In 2004, in a single incident, there was a spillage of 2000 tonnes. Thereafter, for the period 2005-2006, there were 3, 4, and 4 incidents causing spillages of 10.5 litres, 1620 litres and 55 litres respectively. For the year 2007 (up to July), no spillage incidents were seen reported.

c) Tuticorin Port:

Four incidents were reported in the year 2004, causing a total spillage of 215 litres. However, the number of incidents rose up to 9 in 2005, spilling a total of 9387 litres. In 2006, 300 litres were spilled in 8 incidents. Up to July 2007, there was only one incident reported with a spillage amounting to 2 tonnes.

d) Visakhapattanam (Vizag) Port:

No incidents were reported in the year 2003, 2006 and 2007. However, 5 incidents totaling a spillage of 41 KL and 4 incidents totaling a spillage of 1.01KL were reported in the years 2004 and 2005 respectively.

e) Mormugao Port:

For the years 2003 and 2004, no incidents were reported. However, in the year 2005, one incident spilling 87 tonnes and in 2006 another incident spilling 90 tonnes of oil were reported. The quantity of oil spilled is not known in 1 incident reported in the half year 2007.

f) Haldia Port:

One incident each in the years 2003 and 2004 was reported spilling 145 tonnes and 5

tonnes respectively. Although no incident was reported for the years 2005 and 2006, one incident spilling 870 litres was reported for the first half of 2007.

g) Karwar Port:

Karwar port reported only one incident causing a spillage of 465 tonnes in 2006.

On analysis of the data shown above, it is seen that Tuticorin Port had maximum number of oil pollutions during the period 2003-07. New Mangalore port is the second. As regards to the quantity of oil spilt, Tuticorin port and Mumbai port are having maximum pollution discharges from ships.

7.5 Pollution Incidents in ports abroad:

In order to find out whether Indian ports are greener and cleaner while compared to the ports in other countries, a review of the oil pollution incidents of Australia, Baltic ports, European ports, US ports, UK ports, Mediterranean ports, Canada and Chitagong are done and the same are described below.

7.5.1 Oil Pollution Statistics in Australia for the period 1992-2004:

Table-7.6 Oil pollution in Australia for the period 1992-2004

Date of Incident	Vessel name	Vessel type	Flag	Location	Pollutant	Litres spilt
22/11/1992	Anro Australia	General cargo	Australia	Brotherson Dock	Oil	1000
28/01/1995	Pymont Bridge	General cargo		White Bay	Oil	150
26/11/1995	Palmstar Rose	Oil tanker	Bahamas	Kurnell	Oil	40
15/12/1995	Paola II	Oil tanker	Bahamas	VIC – Offshore	Oil	115
09/02/1996	Kokopo Chief	General cargo	Hong Kong, China	Brotherson Dock	Oil	150-200
27/03/1996	Capitaine Cook	General cargo	Norway	Geelong	Oil	2500
16/05/1996	Lijnsbaansgracht	General cargo	Netherlands	No 4 VIC Dock	Oil	10
24/07/1996	Kareliya	General cargo	Liberia	Sydney	Oil	Not quantified
14/12/1996	Stolt Otome	Chemical Tanker	Panama	Botany Bay	Oil	40
02/05/1997	Providence	Oil tanker	Ecuador	Melbourne	Oil	10

29/07/1997	Capitaine Fearn	General cargo	Vanuatu	Melbourne	Oil	Not quantified
09/09/1997	Alam Tenaga	General cargo	Malaysia	Portland	Oil	500
04/06/1997	Asian Glory	Bulk Carrier	Singapore	Newcastle	Oil	50
28/07/1997	Trinity Bay	General cargo	Australia	Thursday Island	Oil	18,000
06/08/1998	Trinity Bay	General cargo	Australia	Cairns	Oil	5,600
19/08/1998	Pernas Amang	Bulk carrier	Malaysia	Dalrymple Bay	Oil	45
21/08/1998	Palmerston	Oil Tanker	Australia	Hamilton, Brisbane	Oil	3000
03/08/1999	Laura D'Amato	Oil Tanker	Panama	Sydney Harbour	Oil	294,000
12/08/1999	Eburna	Oil tanker	Singapore	Kurnell	Unleaded petrol	30
18/12/1999	Sylvan Arrow	Oil tanker	Marshall Islands	Offshore Wilsons Promontary		90-2000
08/01/2000	Devil Cat	Ferry	Australia	Station Pier Melbourne	Diesel	1000
30/04/2000	Mukairish Alsades	Livestock carrier	Saudi Arabia	Adelaide	Oil	200
24/04/2000	Carmen	Ro Ro	Singapore	Wharf 8, Darling Harbour	Oil	500
05/05/2000	ChengTu	General cargo	Hong Kong	Wharf 3, Darling harbour	Oil	Not quantified
31/05/2000	Abydos (MISR Shipping)	Bulk carrier	Egypt	Port Kembla	Oil	Not quantified
4/01/2001	K. Phoenix	Bulk carrier	Panama	Newcastle	Oil	10
30/04/2001	P&O Nedlloyd Fos	Container ship	Liberia	Brotherson Dock, Port botany	Heavy Fuel Oil	Not quantified
23/05/2001	Sericata	Oil tanker	Isle of Man UK	Geelong	Oil	500
30/06/2001	Sericata	Oil Tanker	Isle of Man UK	Brisbane	Crude oil	30
01/09/2001	Pax Phoenix	Bulk Carrier	Panama	Offshore Whitsunday Islands.	Oil	167-666

11/10/2001	Tavake Oma	General cargo	Tonga	Glebe Island, Sydney	Oilsludge/slops tank	1050
24/10/2001	Humbolt Current	General cargo	St Vincent and Grenadines	Melbourne, Yarra River	Oil	Not quantified
01/12/2001	MSC Vivianna	Container Ship	Panama	Port Botany, Sydney	Oil	240-300
17/04/2002	Warden Point	Bulk carrier	Australia	Gladstone	Fuel oil	Not quantified
07/09/2002	Pacific Onyx	Oil tanker	Panama	Gore Cove, Sydney	Oil	200
25/12/2002	Pacific Quest	Container	Panama	Whitsunday Islands	Oil	9300
28-29/04/2003	Friendship R	Passenger (tourist) vessel	Australia	Rosslyn Bay Boat Harbour	Oil	200-1200
28/03/2003	ANL Pioneer	Container	Germany	Wollamai/Kilunda beaches	waste oil sludge	30-40,000
24/02/2004	Maersk Toba	Container	Greece	Yarra River, Swanston Dock, Melbourne.	oil	200
13/10/2004	Sea Angel	Cargo	Liberia	Port Adelaide	oil	30+

Source: AMSA site

It may be seen from the above table that the information provided is largely good except for the fact that the quantity spilled is not specified in few cases. As seen from the data shown above, it is observed that there were many pollution incidents in Australian ports during the period 1994-2004. However, the exact reasons for the number of pollution incidents occurred can not be inferred from the data. Nevertheless, it may be noticed that majority of the ships which caused pollution were registered under flag of convenience such as Panama, St. Vincent etc and could probably be substandard ships.

7.5.2 Oil Pollution Statistics in Baltic Sea ports -1990-2003:

About 10 per cent of all oil hydrocarbons in Baltic Sea originate from deliberate, illegal discharges from the machinery spaces in cargo tanks of vessels sailing in Baltic Sea. In 2000-01, the total amount of oil spilled into Baltic Sea was 2756 m³ of which 2500m³ was spilled in single accident. (Baltic Sea ports are Denmark, Estonia, Finland, Germany, Latvia, Lithuania and Poland). As per the available statistics, no major accident was reported in the Baltic Sea ports so far. But, the fast increase in the number of oil

transports through the Baltic Sea in combination with a fragile environment makes it more important than ever to work with maritime safety measures³.

Table -7.7 Major oil incidents in the Baltic Sea 1990 - 2003 (resulting in an outflow of more than 100m³).

Year	Name of the ship	Oil spilled	Location
1990	Volgoneft	1000 tonnes	Karlskrona, Sweden
1995	Hual Trooper	180 tonnes	The Sound, Sweden
1998	Nunki	100m ³	Kalundborg Fjord, Denmark
2001	Baltic Carrier	2700 tonnes	Kadetranden, Denmark
2003	Fushan Hai	1200 tonnes	Bornholm, Denmark/Sweden

Source: Helcom

As per Table -7.7, during the period 1990-2003, there were only 5 reported oil spillages. The above data available is only for the oil spillages of more than 100 m³. No data is available for any spillages of below this quantity and for the number of spillages that had occurred in different years. Figure- 7.9 may also be referred to for better understanding of the above facts. The table -7.8 shows the observed illegal discharges that had occurred in Baltic Sea ports (7 nos.) during the period 2000-2004. It is seen from the said table that the total observed illegal discharges had also come down from 472 tonnes to 272 / 273 tonnes over the said years. The table clearly shows that Sweden had maximum discharges of 600 tonnes totally for the said five years. The port Latvia had the least illegal discharge. The other ports had illegal discharges in between the said two quantities. No proper conclusion can be arrived at from the above interpreted data as the number of incidents that occurred in each port and the numbers of ships called at those ports are not made known. However, in the ports Denmark, Latvia and Finland, the quantity of illegal discharges is found decreasing. In the other ports, a swinging trend was observed.

3. The above information was obtained from the official website of Helsinki Commission (Helcom).

Figure -7.9 Oil spilled in Baltic sea during 1990-2003

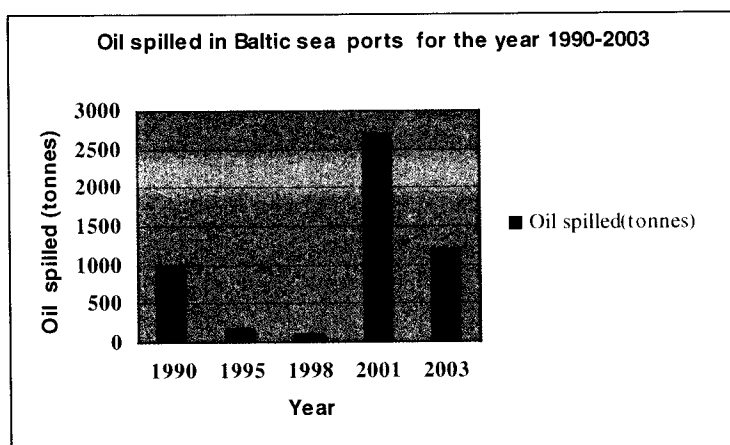
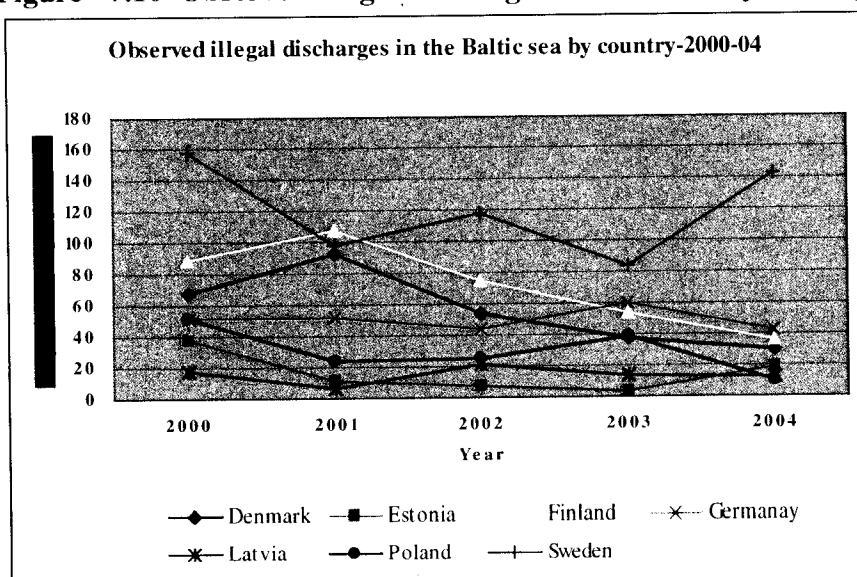


Table-7.8 Compiled data on observed illegal oil discharges (in tonnes) in the Baltic Sea by Country 2000-2004

Country	2000	2001	2002	2003	2004
Denmark	68	93	54	37	30
Estonia	38	11	8	4	19
Finland	89	107	75	54	36
Germany	51	51	44	60	42
Lithuania	-	-	-	-	-
Latvia	17	6	21	14	13
Poland	51	24	25	39	10
Russia	-	-	-	-	-
Sweden	158	98	117	84	143
Total	472	390	344	292	293

Source: Helcom

Figure- 7.10 Observed Illegal discharges in Baltic sea by country- 2000-2004



7.5.3 Major Oil Spills in European Waters -1967- 2002:

Oil pollution incidents occurred in the European ports for the period 1967 to 2002 are shown in table -7.9 given below.

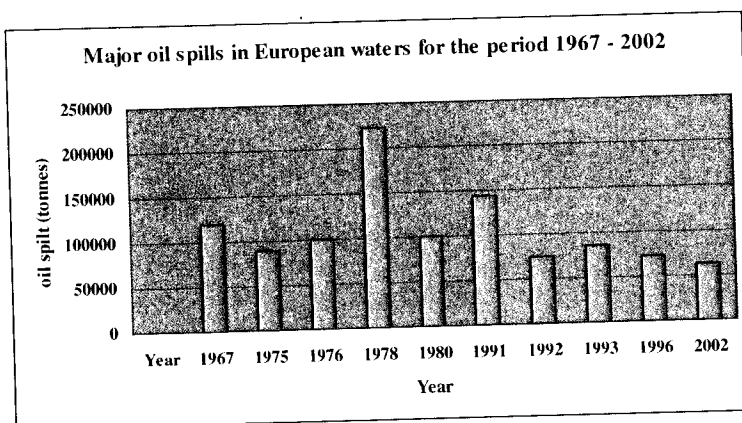
Table – 7.9 Major Oil Spills in European waters – 1967 to 2002

Year	Name of the ship	Oil spilled	Location
1967	Torry Canyon	119,000 tonnes	Scilli Isles, U.K
1975	Jakob Maersk	88,000 tonnes	Oporto, Portugal
1976	Urquiola	100,000 tonnes	La Coruna, Spain
1978	Amoco Cadiz	223,000 tonnes	Off Brittany, France
1980	Irenes Serenade	100,000 tonnes	Navarino Bay, Greece
1991	Haven	144,000 tonnes	Genoa, Italy
1992	Aegean Sea	74,000 tonnes	La Coruna, Spain
1993	Braer	85,000 tonnes	Shetland Islands, U.K
1996	Sea Empress	72,000 tonnes	Milford Haven, U.K
2002	Prestige	63,000 tonnes	Off Galicia, Spain

Source: ITOPF (International Tanker Owners Pollution Federation)

Major oil pollutions, spilling large quantities of oil, occurred around seven major European countries (U.K, Portugal, Spain, France, Greece, Italy, and Spain) are shown in Table -7.9. It can be seen that U.K and Spain had 3 major oil pollutions during the period 1967 -2002. Each of the other five countries had faced single major pollution during the

Figure -7.11 Major Oil Spills in European Waters for the period 1967-2002



above said period. All the pollutions were very major in size and as the environmental damages caused by each of them were very heavy, there were lots of hue and cry made by the public and the press. In fact, most of the important conventions made by IMO

were the after effect of some of these major accidents. Figure-7.11 given above shows the data in a bar chart form for more clarity.

7.5.4 Oil pollution Statistics in US waters for the period 1973-2004:

Oil pollution caused in US waters by spill size, spill size over 1000 gallons, total volume of spills by spill size, number of spills by source and volume of spills by source for the period 1973-2004 are shown below.

Figure- 7.12 Total number of oil spills by spill size for the period 1973-2004

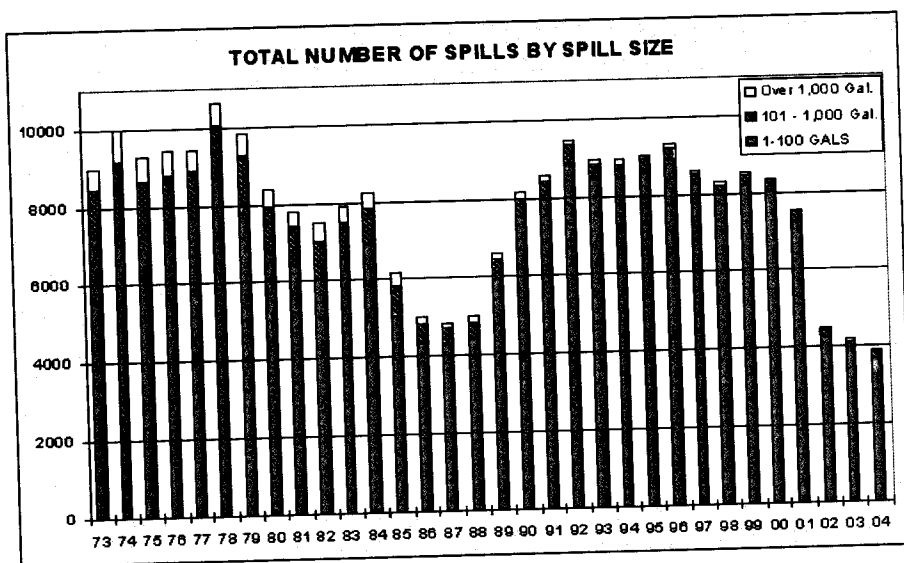
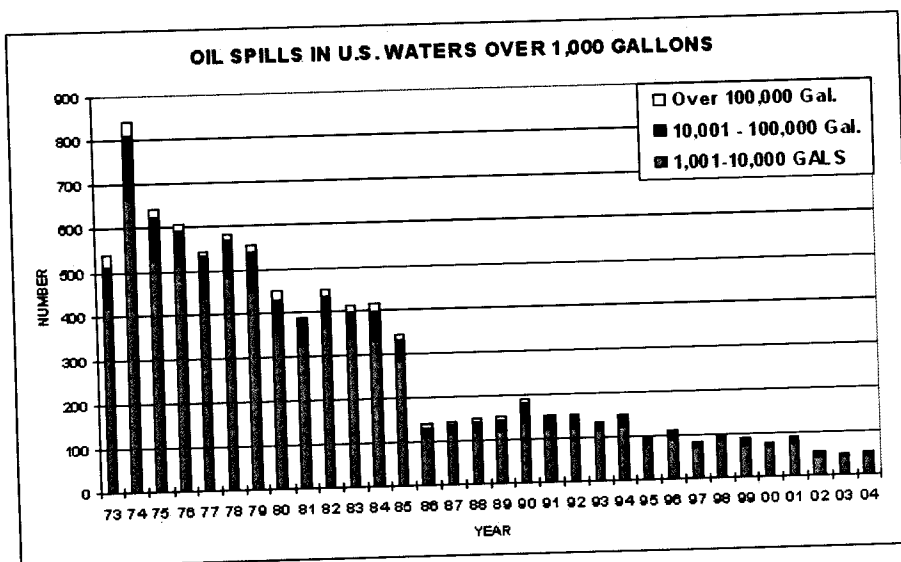
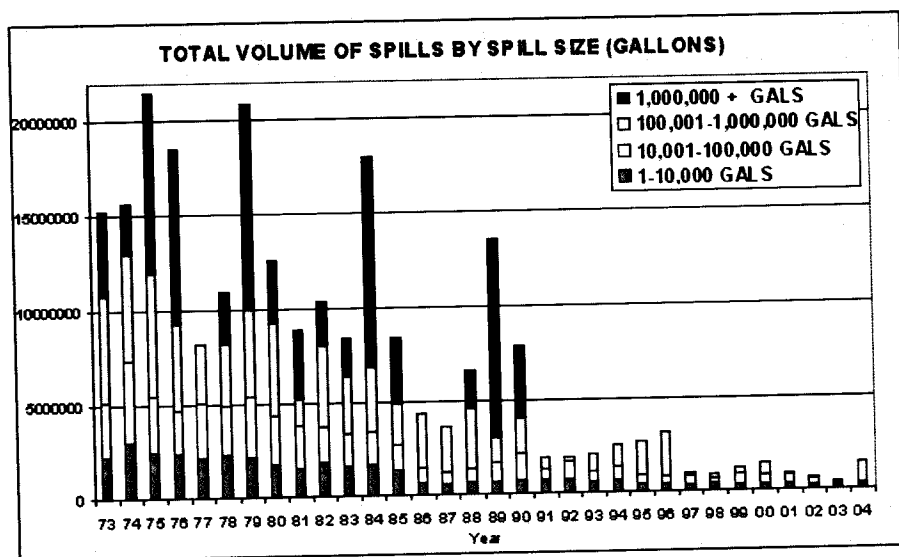


Figure -7.13 Oil spills in US waters over 1000 gallons for the period 1973- 2004



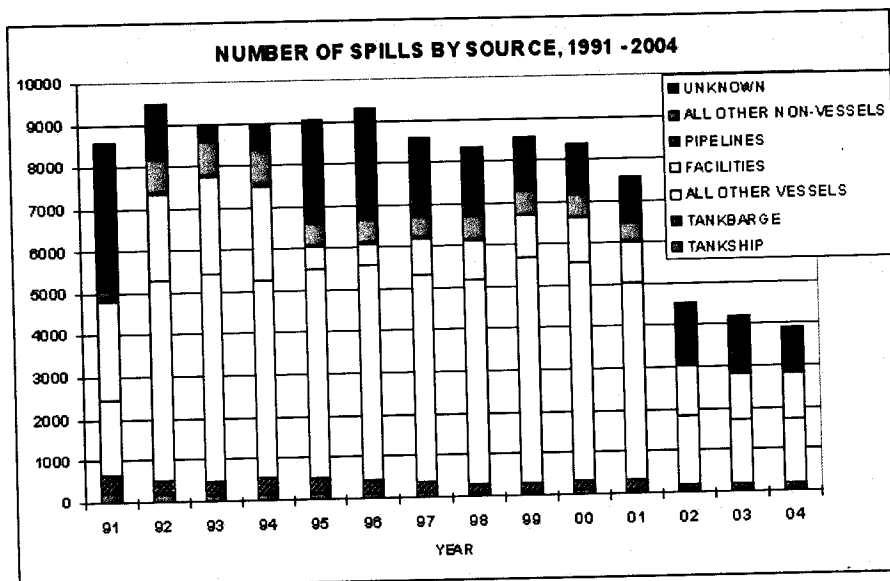
Note: 88.0% of all spills that occurred from 1973 - 2004 were between 1-100 gallons. Also, there is a general downward trend in the number of spills over 1,000 gallons.

Figure – 7.14 Total volume of spills by spill size (gallons) for the period 1973-2004



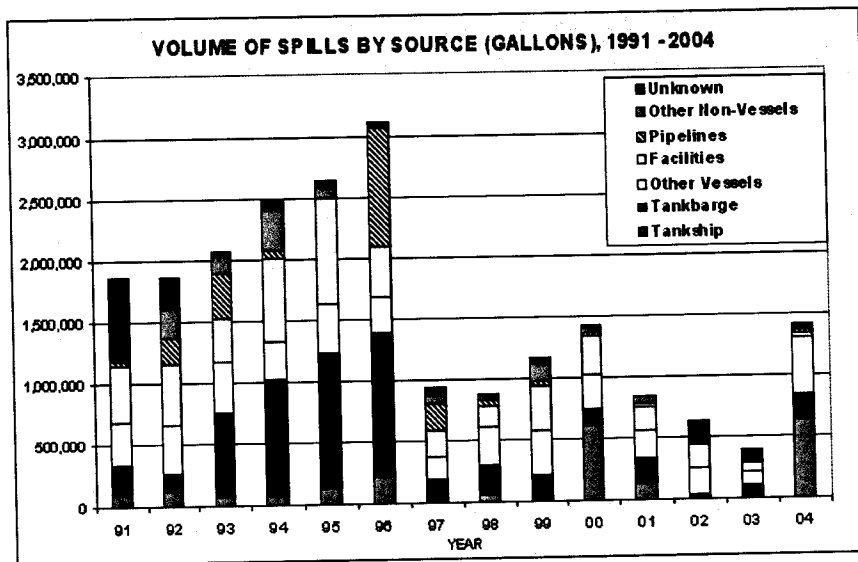
Note: 66.7 percentage of the volume of spills by spill size from 1973 - 2004 were as a result of spills greater than 100,000 gallons. However, there have been no oil spills over 1 million gallons between 1991 and 2004.

Figure-7.15 Number of spills by source for the period 1991-2004



Note: 51.8 percentage of the number of spills from 1991 - 2004 occurred from non-tank vessels; 20.0 percentage were mystery spills; 22.8 percentage were from facilities and other non-vessels; 5.0 percentage were from tank vessels (ships/barges); and 4 percentage were from pipelines.

Figure – 7.16 Volume of spills in US waters by source for the period 1991-2004



Note: 35.7 percentage of the volume of oil spilled from 1991 - 2004 came from tank vessels (ships/barges); 27.6 percentage from facilities and other non-vessels; 19.9 percentage from non-tank vessels; 9.3 percentage from pipelines; 7.4 percentage from mystery spills.

On scrutiny of the Figure-7.12, detailing the total number of spills by spill size for the period 1973-2004, it is seen that the total number of spills of spill size 1-100 gallons for the said period is more (about 80 per cent). The number of spills of size 101-1000 gallons was found less and the total number of spills of spill size over 1000 gallons was found the least. The total number of spills of size 1-100 gallons was also found varying in a cyclic way with ups and downs.

Figure -7.13 showed the oil spills of over 1000 gallons. It is noted that oil spills of size between 1001-10000 gallons was found more. However, the same found coming down from 1990 onwards. Same is the case with oil spills of size 10001-100,000 gallons. From the year 1994 onwards, oil spills of over 100,000 gallons were reported nil. On going through the Figure-7.14, it is observed that 66.7 percentage of the volume of spills for the period 1973-2004 was due to spills greater than 100,000 gallons. However, during the period 1994-2004, there has been no oil spill of over one million gallons.

From the Figure -7.15, it is seen that the maximum oil spills for the period 1991-2004 was from all other vessels that is from ships other than tankers. The total number of spills

from other ships found more or less the same during the period 2002-2004. For the period 1999-2004, no much variations was noticed in the total number of spills from unknown sources. Referring to the Figure-7.16, it is noticed that 35.7 per cent of the volume of oil spilled for the period 1991 - 2004 came from tank vessels (ships/barges), 27.6 per cent from facilities and other non-vessels, 19.9 per cent from non-tank vessels, 9.3 per cent from pipelines, and 7.4 per cent from mystery spills.

7.5.5 Marine pollution in ports of Canada:

Transport Canada keeps a watchful eye over ships transiting Canadian waters through its National Aerial Surveillance Program (NASP). The NASP is the primary tool for detecting ship-source pollution in waters under Canadian jurisdiction. Evidence gathered by NASP crews is used by Transport Canada and Environment Canada to enforce the provisions of all Canadian legislation applicable to illegal discharges from ships, including the Canada Shipping Act and the Migratory Birds Convention Act.

During the 2005-06 fiscal years, there were 78 pollution incidents detected. Five of those were ship source spills and 73 were mystery spills. Six of those pollution incidents or 8 percentage of the total were detected in Newfoundland and Labrador waters. Two were ship-source spills, three were mystery spills and one was a land-based spill⁴.

7.5.6 Pollution in U.K Ports:

The WWF-UK published figures in February 1999 show the number of oil tanker incidents off the UK coast since 1992. Government figures show a rise from 17 accidents in 1992 to 22 in 1999 (please refer Table -7.10), an average of almost one oil tanker accident every two weeks. As per Oil Tanker Accident Information provided by the DETR's Marine Accident Investigation Branch, between 1992 and 1999, 148 accidents were recorded off the UK coast, an average of 1.5 accidents a month.

Table -7.10 Number of ship accidents in UK waters for the period 1992-1999.

Year	No.of accidents	Year	No. of accidents
1992	17	1996	26
1993	13	1997	21
1994	17	1998	17
1995	15	1999	22

On behalf of the Maritime and Coastguard Agency (MCA) and the DTI, the Advisory Committee On Protection of the Sea (ACOPS) had conducted annual surveys of discharges into UK waters since 1978. The 2004 annual survey of Reported Discharges Attributed to Vessels and Offshore Oil & Gas Installations Operating in the United Kingdom was published in October 2005. The report suggests that from the year 2000 onwards oil pollution incidents have decreased.

Following analysis of 1,354 incident reports and supporting information, 664 separate discharges from vessels and offshore oil and gas installations were identified in the survey area during 2004. The reported discharges comprised 89.2 percentage mineral oils, 5.1 percentage chemicals, 0.3 percentage vegetable or animal oils, 0.2 percentage garbage and 5.3 percentage other substances. An overall 13.5 percentage increase was evident in the total number of incidents reported over the previous year's total.

The overall geographical pattern for vessel-source oil discharges in the survey area during 2004 did not differ significantly from that plotted during the previous year. Minor clusters were again identified near oil and gas installations operating in the northern North Sea, southern North Sea off the Norfolk coastline, Strait of Dover, western English Channel and The Minches.

During 2004, a total of 177 discharges were attributed to vessels and since 2000 a continuing decline in the total number of reported vessel-sourced discharges was evident at an average rate of 15 per cent per year. During 2004 a total of 487 accidental discharges were attributable to oil and gas installations, an increase of 99 from the 2003 data. As reported, 81 percentage discharges were at sea, 16 percentage in ports and harbours and 3 percentage in other marine environmental zones. 10 prosecutions took place totalling €170,000 in fines. Incidents in ports have reduced by 8 percentage per year since 2000 ⁵.

4. Taken from the website www.marinepollution.com.gc.ca.

5. From APCOS (2004 Pollution Statistics).

7.5.7 Pollution in Mediterranean Ports:

Table -7.11 Analysis of ship-incidents causing or likely to cause oil pollution in the Mediterranean Sea (recorded during the period 1981-2000)

Year	No. of reported incidents to REMPEC	No. of incidents that caused oil pollution
2000	28	7
1999	24	8
1998	13	6
1997	15	5
1996	23	7
1995	9	3
1994	20	8
1993	18	9
1992	15	12
1991	14	10
1990	8	6
1989	17	10
1988	8	4
1987	7	4
1986	8	3
1985	11	4
1984	7	5
1983	8	3
1982	7	2
1981	13	7
TOTAL	273	123

Source: REMPEC⁶ database (2001)

By examining the presented data (please refer to table-7.11 and 7.12), it is obvious that between 1981 and 1993, the number of incidents that resulted in an oil spill is substantially bigger than the number of those that did not cause oil pollution. For the next period 1994-2000, the situation is reversed, although the frequency of reported incidents is higher. Further, in the first period, spills over 100 tons are attributed to collisions, fire/explosion, contacts and terminal operations whereas in the second period grounding, contact and collision are the primary causes for the oil spill. It is worth noting that no spill, even minor, has been reported for almost all fire/explosion incidents during the

6. REMPEC means Regional Marine Pollution Emergency response Centre for Mediterranean sea.

second period. This brings to the focus the real causes of the incidents. It is also seen that tankers and bulk carriers are responsible for almost 77 per cent of oil spills, the main reasons were attributed to accidents and to the receiving of bunkers.

Table- 7.12 Ship-incidents that caused oil pollution in respect of type of ships and type of incidents

Type of ship	No.of incidents	%	Cause of incident	No.of incidents	%
Tanker	64	52	Terminal operation	32	26
Bulk Carrier	30	24,3	Grounding	22	17,8
Chemical Tanker	7	5,6	Sinking	15	12,1
Container Ship	6	4,8	Collision/ramming	13	10,5
Ro-Ro Ship	5	4	Contact	12	9,7
Other	5	4	Fire/explosion	9	7,3
Passenger Ship	2	1,6	Structural damage	6	4,8
Unknown	2	1,6	Bunkering	6	4,8
			Leakage	4	3,2

Source: REMPEC database (2001)

7.5.8 Marine Pollution in Chittagong port area:

Hundreds of foreign and local ships visiting Bangladesh's main port Chittagong are taking advantage of lax laws and logistic backups against dumping of pollutants into the sea with officials struggling to stop it with only a binocular and a camera. Taking advantage of the situation, many of the ships dump pollutants in the port and in outer anchorage area or pollute the air emitting black smoke.

"We detected about 700 offending vessels over the last three years and fined them" but could not completely stop the oil spillage, dumping of other pollutants and emission of black smokes, said Mohammad Munir Chowdhury, a magistrate with the Chittagong Port Authority (CPA). The port magistracy, he said, equipped with only one ordinary camera and a binocular is fighting against the pollution. "I see the ships with binocular and photograph the scenes as evidence for fining them." Chowdhury and other officials, however, said many foreign ships used to dump burnt oil in the outer anchorage of the

port defying international regulations but tough vigilance and mobile court actions have stopped such attempts ⁷.

The 117-year-old port handles more than 80 per cent of Bangladesh's foreign trade with average 1,600 ships using the facility annually. Nearly Taka 1.5 crore was realised as fine from 700 ships, of them 130 foreign ones, while 50 of them were detained on charges of dumping pollutants. An environment department official alleged that despite their repeated pleas to the CPA for creating necessary provisions for clearing garbage on shore and at sea yielded a little result. "Any other international port would impose heavy penalties or even seize ships if they violated marine laws or polluted the sea,"he said⁸.

7.5.9 Chemical Pollution Statistics:

Although Annex-II of MARPOL 73/78 regarding chemical pollution from ships is made mandatory by IMO and accepted by the required number of member countries, the necessary data related to chemical pollution from ships are available only for Australia and United States. Hence, a comparative study is made only between these two countries.

7.5.10 Chemical Spills in Australia for the period 1994-2006:

Table – 7.13 Chemical pollution statistics in Australia from 1994-2006

Date of Incident	Vessel name	Vessel type	Flag	Location	Pollutant	Litres spilt
12/12/1994	Hegg	Oil Tanker	Panama	White Bay	Chemical	500
04/09/1995	Fua Kavenga	General cargo	Vanuatu	White Bay/Sydney	Chemical coconut oil	300
04/08/1998	Golden Frontier	Chemical tanker	Panama	Offshore Botany Bay	Lauryl alcohol	3500-5000
12/08/1998	Alam Tenteram	General cargo	Malaysia	Corio Bay:	Oil/chemical	not quantified
09/09/1998	Stolt Aquamarine	Chemical Tanker	Cayman Islands UK	Bass Strait/Phillip Island	Chemical	not quantified
19/01/2000	Andhika Adhisatya	Product carrier/tanker	Singapore	Wharf 5, Darling Harbour	Vegetable oil	Not quantified
06-02-2001	Golden Lucy I	Chemical tanker	-	Gore Cove, Sydney	Oil (bitumen feed stock)	40
01/06/2001	Caltex			Kurnell Refinery	Heavy lube	Not

					oil	quantified
05/07/2001	Tasman	Oil tanker	Australia	Yarraville, Victoria.	ULP and air pollution	4000
30/09/2004	Bow de Silver	Chemical Chemical tanker	Hong Kong, China	OffshoreVictoria. Polluted Cape Woolamai,Phillip Island	chemical/oil Tank washings	Not quantified

Source: AMSA site.

7.5.11 Chemical spills in US Waters for the period 2000-2004:

Table -7.14 Number of Chemical spills in US waters for the period 2000-2004

Year	1-100 gallons	101-1000 gallons	1001-5000 gallons	5001- 10,000 gallons	10,001- 50,000 gallons	>100,000 gallons	Total
2000	120	9	6	2	3	2	142
2001	86	10	2	5	1	1	105
2002	137	7	5	1	4	-	154
2003	49	9	2	1	2	2	65
2004	34	1	1	-	3	1	40

Table -7.15 Chemical spilt (in gallons) in US waters for the period 2000-2004

Year	1-100 gallons	101- 5000 gallons	5001- 10000 gallons	10001- 50000 gallons	50001- 100000 gallons	>100001 gallons	Total
2000	1774	17367	16980	45300	100000	250200000	250381421
2001	624	10686	38390	21680	-	200049	271429
2002	751	15356	8400	84218	-	-	108725
2003	774	8087	6006	54000	-	292900	361067
2004	698	2600	-	64700	-	3629526	3700524

Table -7.16 Chemical spills in US waters by source wise-2000-04

Year	Tankship	Tankbarge	All other v/l's	Unknown or other
2000	12gallons 5 spills	2432gallons 19 spills	12299 gallons 33 spills	250200425gallons 15 spills
2001	11 gallons 2 spills	200059 gallons 8 spills	4046 gallons 16 spills	12616 gallons 17 spills
2002	25280 gallons 5 spills	51 gallons 4 spills	60548 gallons 22 spills	1339 gallons 94 spills
2003	39570 gallons 7 spills	190080 gallons 8 spills	127505 gallons 25 spills	1459gallons 10 spills
2004	3629537 gallons 3 spills	12020 gallons 2 spills	19663 gallons 18 spills	195 gallons 7 spills

7. From www.planetarch.com – “Bangladesh port area faces growing sea pollution”.

8. Taken from BSS, Independent – July 29, 2005.

Figure -7.17 Number of Chemical spills in US waters for the period 2000-2004

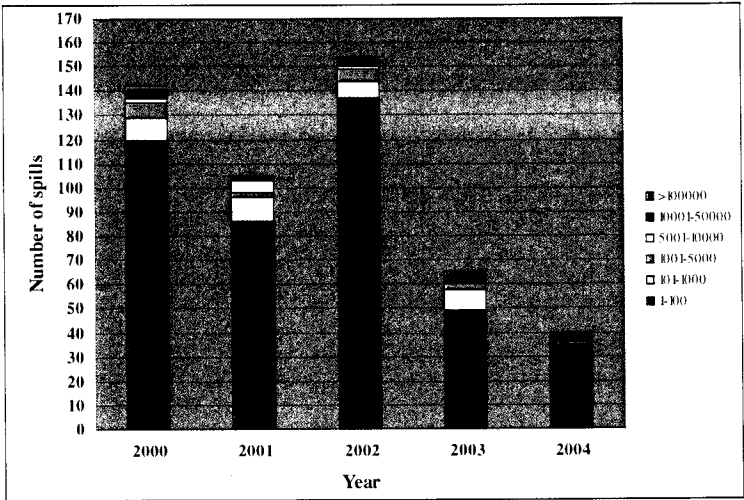


Figure -7.18 chemicals spilt in US waters for the period 2000-2004

Chemicals spilt in US waters for the period 2000-2004

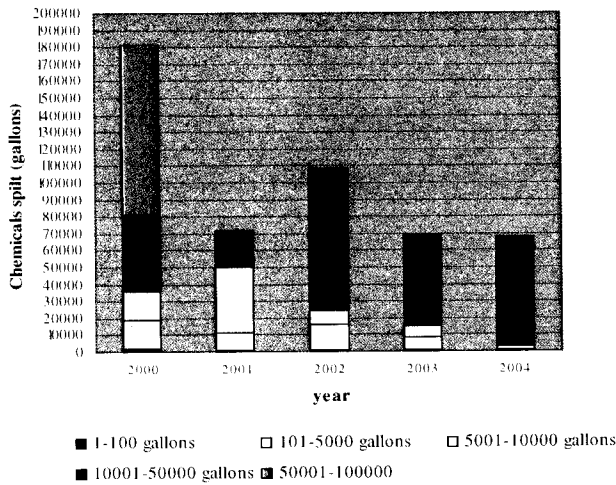
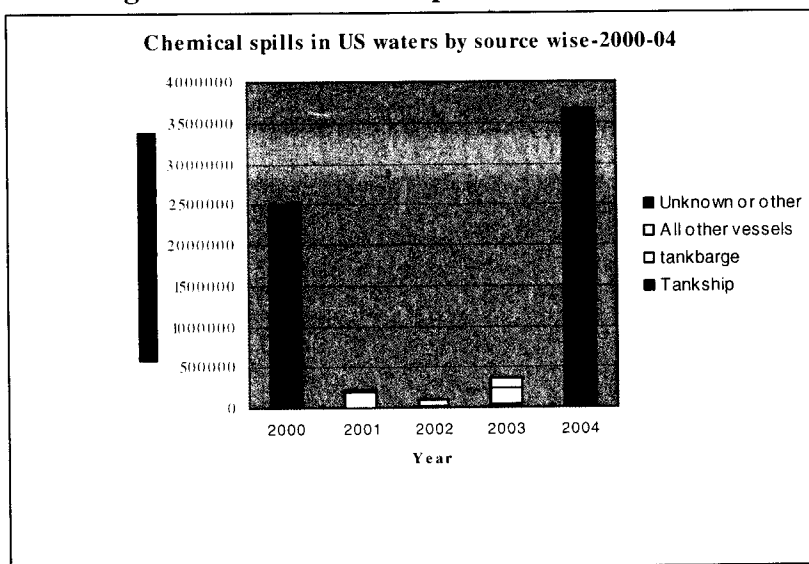


Figure – 7.19 Chemical Spills in US waters by source wise- 2000-2004



Tables 7.14, 7.15, 7.16 and figures 7.17, 7.18 and 7.19 shown above show the details of the chemical pollutions that occurred in US Waters during the period 2000-04. From the Table-7.14 showing the number of chemical spills that occurred during the period 2000-04, it is seen that the number of spills in the range 1-100 gallons were more during the said period. However, it can be seen that the number of spills in all ranges is found decreasing from the year 2000 to 2004. Further from the Table-7.15, it is seen that the quantity of chemicals spilt in all range of spills is also found decreasing during the period 2000-2004 except for the range 10001 – 50000 which is found slightly increasing. On analysis of the data shown in Table -7.16, it is noted that the chemical spills from the tankers and other vessels were found increasing during the period 200-2004.

7.6 Pollution Incidents related to Annex-III to V:

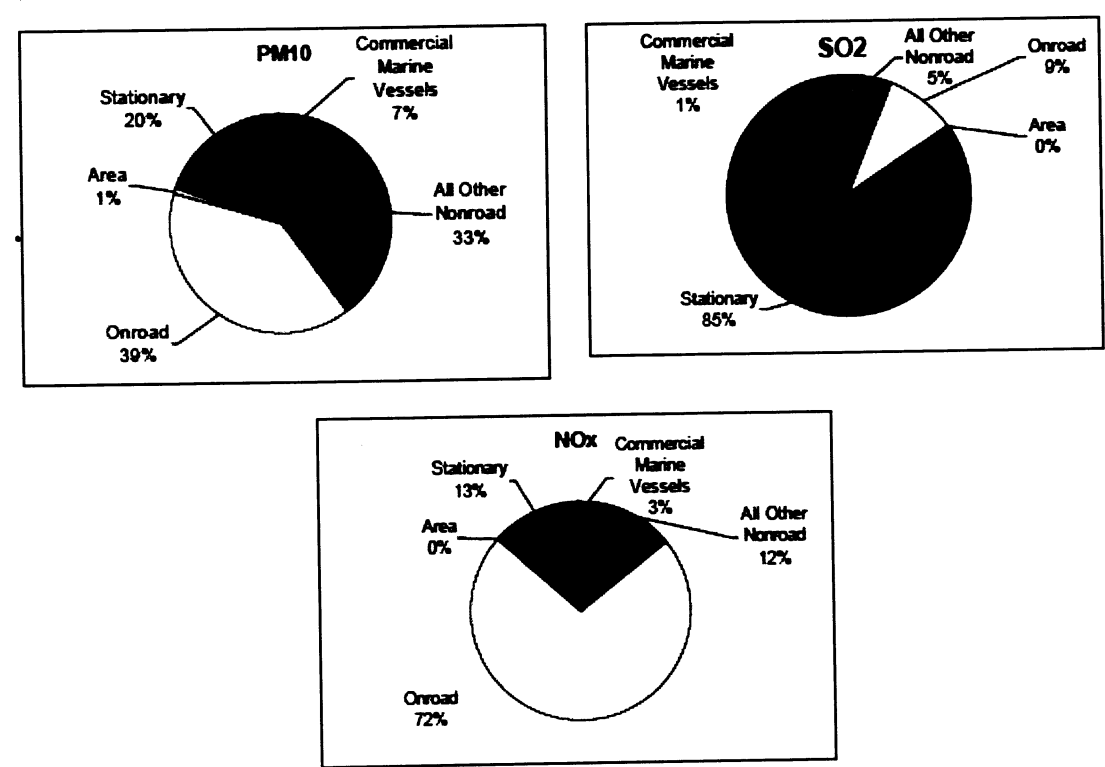
No authentic data are available on vessel source pollution incidents regarding Annex-III. Regarding annexes -IV and V, data available is limited and refers to Australia only. Hence, no comparative study is done pertaining to those annexes.

7.7 Annex-VI of MARPOL 73/78 -Air Pollution from ships:

Although Annex-VI has come into force very recently, it is picking up importance in the shipping industry due its severe effects in the marine environment. Hence, this enquiry includes a brief study of air pollution from ships. The details of the effects of air

pollution have been discussed in the first chapter. It is seen that no proper and systematic study has been conducted regarding air pollution in different ports of the world. However, the data available from the Cumberland country where the port Portland is located is given below ¹⁸.

Figure- 7.20 Commercial Marine Vessel (Cargo) Emissions in Cumberland County



Assuming an annual growth of between 1.5 and 3 per cent, projection of air pollution from ships, according to the EU directive on national emission ceilings, prepared by the Swedish NGO Secretariat on Acid Rain is given below.

Table- 7.17 Emissions of sulphur dioxide (SO2) and Nitrogen oxides (NOx) in 1990, 2000, and 2010 (million tons)

	SO ₂		NO _x	
	Land-based	shipping	Land based	shipping
1990	16.4	2.0	13.4	2.8
2000	5.8	2.6	9.5	3.6
2010	3.9 ¹	2.8-3.2 ²	6.6 ¹	4.0-4.6 ²

Source: Fact sheet by the Swedish NGO Secretariat on Acid rain, May, 2003

 18. “ Air Emissions from Marine Vessels” – Report to the joint committee on Natural Resources-
 Dt. January 15, 2005.

7.8 Worldwide Review of Marine Oil Spill Fines and Penalties (Part-3) –A Case Study:

Spills ranging from bilge washing or other illegal but intentional discharges from ships, to major accidental oil spills due to groundings or collisions, are all subject to fines and other penalties in many nations, especially those that are parties to the international convention MARPOL 73/78 and various regional conventions. Most national legislation regarding oil pollution fines and penalties related to pollution from ships is based on national implementation of these international conventions, which requires that the signatory country enact laws to carry out the actions and responsibilities outlined in the treaties. The severity of these penalties varies greatly between nations and even between offenses within the same nation. The variations in the fines and penalties imposed by different nations for the same offence have made impact on the vessel source pollution caused in underdeveloped countries. Hence, based on the reported data available, a comparative study has been made on the penalties and fines imposed by sixteen countries.

7.9 International Summary of Marine Oil Spill Fines and Penalties:

The magnitude of the fines and penalties varies considerably from one nation to another based on legal and socioeconomic factors in each nation. Unlike the oil spills from land based sources, when oil pollution is traced to a ship, the issue of jurisdiction becomes much less clear and is potentially wrought with the complexities of both national and international laws.

Table -7.18 International Summary of Marine Oil Spill Fines and Penalties

Nation	Marine Oil Spill Law	Fines and Penalties
Australia	Marine Pollution Act of 1987	To Aus\$200,000 [US\$130,907] vessel master
Canada	Canada Shipping Act Migratory Bird Act (MBA) Fishing Act Canadian Environmental Protection Act	Minor offenses: To C\$250,000 [US\$168,175] and/or to 6 mos. Prison. Major offenses: To C\$1 million [US\$672,700] and/or to 3 yrs. Prison Under MBA: To C\$520,000 [US\$350,000]
China	Marine Environmental Protection Law	Causing pollution: To 100,000 Yuan [US\$11,961] Failure to report: 1,000-5,000 Yuan [US\$120-\$598] Failure to observe rules for dispersants: 1,000-5,000 Yuan [US\$120-\$598] Oil record book violation or false information: 1,000 Yuan [US\$120]
France	MARPOL 73/78	Large tanker violations: To 1million Francs

	implementation	[US\$146,228] and up to 2 yrs. Prison Smaller tanker violations: To 300,000 Francs [US\$43,875] and up to 1 yr. prison
Germany	Penal Code	Intentional discharges: To 10,000 DM [US\$5,388] per day or 5 yrs. Prison Administrative fine: To 100,000 DM [US\$53,883] Oil record violation: To 50,000 DM
India	Water Prevention and Control Act of 1974 Environmental Protection Act of 1986	Giving false information: 10,000 Rupees [US\$224] and/or 3 mos. Prison Tampering with monitors: 10,000 Rupees [US\$224] and/or 3 mos. Prison Allowing pollution: 6 mos. to 6 yrs. Prison plus possible fine. Repeat pollution offenses: 1 ½ to 7 yrs. Prison plus possible fine Other pollution offenses: 10,000 Rupees [US\$224] and/or 3 mos. prison plus 5,000 Rupees [US\$112] per day
Japan	Marine Pollution Prevention Law	Intentional spill: To ¥10,000,000 [US\$93,370] Unintentional but at fault: To ¥5,000,000 [US\$46,685]
Kenya	Merchant Shipping Act	12,050 Shillings [US\$158]
Malaysia	Merchant Shipping (Oil Pollution) Act of 1994 Merchant Shipping Act of 1952	Failure to obey official orders: To 50,000 Ringgit [US\$13,160] per day Violations of pollution prevention regulations: To 10,000 Ringgit [US\$2,632] and/or up to 1 yr prison
Netherlands	National Maritime Law	To 300,000 Guilders [US\$142,418]
Norway	Norwegian Pollution Control Act	Vessel owners: 50,000-120,000 Krona [US\$6,347-\$15,233] and/or 5-10 yrs. Prison Crew: One-month's salary
Russia	Instruction for the Prevention of Pollution From Ships	<i>Pollution violations:</i> To 3,000 times minimum national salary
Singapore	Prevention of Pollution Sea Act	To Sing\$500,000 [US\$293,028] and/or 2 yrs. prison
United Kingdom	Merchant Shipping (Prevention of Oil Pollution) Regulations of 1996	Magistrate's Court: To £250,000 [US\$409,641] Crown Court (most serious offenses): unlimited fines
United States of America	Oil Pollution Act of 1990 (OPA 90) Federal Water Pollution Control Act Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)	Class I civil penalties: To US\$10,000 to US\$25,000 maximum Class II civil penalties: To US\$10,000 per day to US\$125,000 maximum Judicial civil penalties: To US\$25,000 per day or to US\$1,000/bbl (US\$7,000/t) spilled Gross negligence: US\$100,000 minimum to US\$3,000/bbl
Ukraine	1995 Water Resources Act	To 600,000 Hryvnias [US\$131,901]

Source: www.environmental-research.com (A world wide review of oil spill fines and penalties)

7.10 Pollution violations and penalties imposed in Indian Ports- 2003-2006:

Table –7.19 Statistical report of Penalties imposed for MARPOL 73/78 violations

Year	Type of violation				Penalties imposed			
	Illegal discharge	ORB	IOPP	Other	Max.	Min.	Average	Imprisonment
2003	6	13	8	36	Rs.1Lakh	Rs.15000	Rs.62500	Nil
					Rs.1Lakh	Rs.34500	Rs.58625	Nil
2004	4	1	1	6	Rs.2.051L	Rs.25500	Rs.1.153L	Nil
2005	-	5	7	23	Rs.5Lakhs	Rs.56000	Rs.2.78 L	Nil
2006	1	1	1	10	Rs.60000	Nil	-	Nil
					Rs.25000	Nil	-	Nil
					Nil	Nil	-	Nil
					Rs.105000	Rs.50000	-	Nil

Source: D.G Shipping, India.

From the table-7.18 shown above, it can be seen that the fines and penalties imposed by the sixteen countries are different. This is definitely bound to increase the tendency of dumping the pollutants from ships into those countries where fines and penalties are less or where the laxity of law exists. This fact has already been proved by the statement made by the port authority of Chittagong of Bangladesh¹⁹. Table -7.19 shown above shows the penalties imposed by Indian Administration.

7.11 Discharges from ships at different ports- Criminal Prosecutions (Part-4)– Case study:

In this part of the study, criminal prosecutions done against the officers and owners of ships which had discharged pollutants at different ports around the world are detailed out. The following list of cases illustrates²⁰ the fact that many countries have not waited for the sanctions given in the EC Directive for the Criminal prosecutions, but are prosecuting maritime cases under their own national environmental laws.

Australia:

In November, 1999, Australia had its first successful conviction for illegally disposing of garbage pursuant to legislation implementing Annex V of MARPOL. In this case, a yacht owner observed plastic and other garbage being thrown into a lagoon from a yacht and reported it to authorities. Similarly, in November, 1999, the owners of the

19. From website www.planetarch.com-“Bangladesh port area faces growing sea pollution”.

20. Extracts from “Criminal Prosecutions and the Marine Industry- a World-Wide Trend” by Jeanne M. Grasso and Allison Barlotta, presented at the International Oil Spill Seminar held on January 15, 2005.

cruise ship “Fairstar” were convicted and fined \$10,000 for an illegal discharge of garbage in Australian waters. The pollution was reported by two members of the public who collected the loose garbage that had washed up on the beach.

In February, 2001, the owner of the ship “Bunga Teratai Satu” pled guilty for negligently grounding a container ship on the Great Barrier Reef and was fined \$400,000. The officer responsible for the grounding also pled guilty.

In July, 2003, Mobil pled guilty after it caused a 50-meter wide oil spill off the Victoria coast in 1999. The company faced a fine of up to \$1 million Aus. for the spill from Mobil's “Sylvan Arrow”, allegedly caused by equipment failure.

In July, 2004, criminal charges were filed against the operator and masters of the containership “Doria”, as well as several other companies and individuals, in connection with the vessel's oil spill in February, 2003. The spill oiled part of the local population of fairy penguins and other native birds. If convicted, the companies could face fines up to \$1M Aus. and the individuals could be sentenced to seven years in jail and a fine up to \$250,000 Aus., as per the law of the country.

In October, 2004, Japan-based Sanzo Enterprises, the owner of “Pax Phoenix”, was fined \$85,000 Aus. by an Australian District Court after pleading guilty to discharging an oily substance at sea. Australian authorities discovered the oil emanating from the vessel through the use of satellite technology. The Australian Maritime Safety Authority then boarded the vessel and obtained oil samples, which confirmed that the “Pax Phoenix” was the source of the spill.

Canada:

In April, 2001, the operator of the “M.V Sandviken” pled guilty and was fined for unlawfully discharging an oily substance in Canadian waters. Again, the investigation was initiated after an oily discharge was detected during a routine surveillance mission.

In February, 2002, Canada prosecuted the “M.V Baltic Confidence”, a Philippines-registered bulk carrier, for unlawfully discharging an oily substance in Canadian waters. The operator of the vessel pled guilty and was fined the largest penalty ever issued for ship-source pollution in Canada. This investigation began because an oily discharge from the ship had been sighted by a Canadian Coast Guard helicopter and a private aircraft.

In May, 2004, a Canadian court ordered owner of the fishing vessel “Olga” to pay a \$170,000 fine for unlawfully discharging an oily substance and failing to report the discharge in violation of the Canada Shipping Act. A Canadian Coast Guard surveillance flight first discovered the “Olga” trailing an oil slick. The fine marks the highest monetary penalty ever assessed for a violation of the Canada Shipping Act. One month earlier, the Olga's owner was fined \$113,000 in connection with another pollution incident that occurred in 2001.

In February, 2005, a Nova Scotia provincial court ordered the fishing vessel “Hime Maru No. 38” to pay \$40,000 for violating the Canada Shipping Act by unlawfully discharging an oily substance into Canadian waters. Additionally, the master was found guilty of misreporting information in the ORB and failing to report a pollution incident. He was fined \$20,000. This case marks the first time a crew member has been convicted of ORB violations in Canada.

Denmark:

In February, 2005, British shipping company “Norbulk Shipping Ltd.” cooperated with Danish authorities and pled guilty to causing pollution in Danish national waters, and was fined 50,000 Danish Kroner, plus 150,000 Danish Kroner in cleanup costs.

France:

In April, 2004, French prosecutors sought a 250,000 euro fine against the master of the St. Vincent and Grenadines-flagged bulker, “Nicholas M”, for his role in causing an oil slick. Prosecutors claim the pollution was the result of modifications to the ship's waste treatment system, which allowed waste to be discharged directly into the sea rather than stored on board. In June, 2004, the master of the Cyprus-flagged “Pantokratoras” was fined 500,000 euro for oil pollution off the French Atlantic Coast. The fine was twice

the normal level for such an offense; however, the amount was increased because the master failed to stop the ship when ordered to do so by the French navy.

In June, 2004, French authorities detained the United Arab Emirates-flagged container ship, “Khaled Ibn Al Waleed”, after customs investigators photographed an oil slick 18 kilometers long by 50 meters wide behind the vessel in France's Mediterranean waters. The Correctional Court of Marseilles imposed a 500,000 euro fine and a deferred 12 month prison sentence on the ship's captain. In July, 2004, the Spanish-flagged “Casablanca” was detained at the French port of LeHavre awaiting judicial action after it was observed trailing an oil slick 6.5 meters long by 40 meters wide.

In July, 2004, French Coast Guard officials observed the Greek-flagged “Captain Diamantis” trailing an oily wake 2.8 kilometers long and 30 meters wide. The vessel was ordered to proceed to the French port in Brest; however, it reportedly refused the order and continued southward on its route toward Morocco. The vessel's operator, Diamlemos Shipping, claims that the master did not intend to flee French authorities, but continued on its voyage after waiting thirty hours for the outcome of negotiations between French and Greek authorities, which did not resolve the issue. French prosecutors maintain that they can institute proceedings against the master or arrest the ship on its next voyage in French waters.

In August, 2003, the captain of the Bulgarian-registered cargo ship, “Dobrudja”, was prosecuted after dumping oil in the Bay of Biscay. A patrol aircraft spotted a slick in the water and samples taken from the ship's hold confirmed that the “Dobrudja” was to blame. The captain was ordered to pay a record fine of 200,000 euro. These recent prosecutions likely result from France's establishment of three regional court jurisdictions in 2003 at Marseilles, Brest, and Le Havre in an effort to aggressively prosecute ship owners who are involved in pollution incidents.

In September, 2004, the French Coast Guard observed a visible hydrocarbon wake 11 kilometers long and 40 meters wide emanating from the Panama-flagged Atlantic Hero

The vessel was detained by French authorities and ordered to pay a fine of 300,000 euro.

Germany:

In March, 2000, the master and chief engineer of the Maltese bulk carrier, “Mimi Selmer”, were charged criminally for negligently polluting the water and illegally disposing of hazardous waste after an oil spill on the Baltic Coast.

Singapore:

In February, 2002, Meridian Petroleum had its license revoked as a bunker supplier for supplying contaminated fuel, and Singapore authorities plan to prosecute it for breach of anti-pollution laws, as Meridian failed to comply with the legal requirements for bunker barges and tankers. This crackdown follows a recent trend in Singapore whereby owners and masters of the vessels have been charged with the contravention of the Prevention of Pollution of the Sea Act for failing to maintain Oil Record Books as required.

Pakistan:

In April, 2004, eight crewmembers (officers) from the “Tasman Spirit” were released after they had been arrested and detained for eight months in Pakistan in connection with the grounding of the vessel, which resulted in an oil slick near the Karachi Port. The crewmembers' release followed months of negotiations involving the vessel's insurer, the Government of Greece, the EU, the international maritime community, and the United Nations International Maritime Organization. The crewmembers have agreed to return to Pakistan for court proceedings if necessary.

Puerto Rico:

In January, 2005, officials from Turismo Nautico Del Mar De Cortes, operator of the “Topaz”, agreed to pay a \$100,000 fine, and will be restricted from operating in U.S. waters for three years for bypassing the oil-water separator and discharging contamination into the sea.

Spain:

In February, 2003, the captain of the “Prestige” was released on a 3 million euro bail after being detained in connection with the sinking of the Prestige; however, the captain remains unable to leave the country. The “Prestige” sank over 100 miles off the coast,

releasing almost 20,000 tons of heavy fuel oil, causing multi-million dollar damages to the fishing and tourist industries.

Thailand:

In August, 2000, the owner of the containership, "Coastal Bay", was fined for spilling implement a safe watch keeping system.

In November, 2000, the owners of the shuttle tanker "Stena Alexita" were prosecuted for violating pollution laws. The owners were fined and forced to pay cleanup costs after being photographed discharging oily water overboard during routine operations, where there was a breakdown in ship's procedures.

In January, 2002, the captain of the "Eastern Fortitude" was sentenced to six months in jail for failing to promptly report an oil spill after the ship hit a rock and spilled diesel. United Kingdom. In August, 2002, the owner and captain of the fishing vessel "St. Jacques II" made history by being the first "third party" to be prosecuted for causing pollution by a tanker. The spill resulted from a collision in the English Channel between the fishing vessel and the "Gudermes". The "polluter pays" principle was applied as the collision was caused by the fishing vessel. In December, 2002, the government filed a complaint against the operators of the tanker "Sky Ace" and the cargo ship "Kota Wijaya", which collided and spilled diesel. A criminal prosecution is ongoing.

United States:

The criminal prosecutions of the maritime industry in the United States over the last ten years are too numerous to mention. In 2002 alone, there were 10 overall prosecutions of vessel cases, resulting in 21 guilty pleas - 10 for companies and 11 for individuals. Eight of the 11 individuals were either detained for a lengthy period of time in the United States or were sentenced to jail for a period ranging from three months to one year. The fines paid by the ten companies exceeded \$25 million, and most companies were required to implement a court-supervised environmental compliance plan. The majority of cases in 2002 involved by-passing oil-water separators, falsifying the ORBs, and making false statements to government agents, i.e., lying to the U.S. Coast Guard.

It is worth to note the case brought against “M.V Khana” and “M.V Sohoh” and their owners/operators Boyang Maritime, Boyang Limited, Oswego Limited, and Trans-Ports International. The four companies pled guilty in Alaska and paid a \$5 million fine relating to bypassing oil-water separators, falsification of logbooks, and obstruction of justice. The captain and two chief engineers pled guilty to false statements, obstruction of justice, and witness tampering and were sentenced to six months, six months, and eight months in prison, respectively; and a member of the board of directors and two senior shore side managers also were indicted for conspiracy and obstruction of justice for their roles in bypassing the oil-water separators and encouraging crewmembers to lie about it.

This trend continued upto 2003, with seven overall prosecutions, resulting in eight guilty pleas - five for companies and three for individuals. Jail terms for the three individuals ranged up to two years, and over \$4 million as fines were assessed on the companies. The year 2003 closed with numerous indictments pending and cases being investigated.

Despite the number of prosecutions, the significant fines, and unprecedented prison sentences, vessel owners and operators seemingly are not learning from the mistakes of others as this disturbing trend continued unabated through the present. Notable prosecutions in 2004 include:

“M.V Guadalupe” – January, 2004 in New Jersey, OMI Corporation pled guilty to preparing false documents in an effort to cover up an illegal oil discharge from the “Guadalupe” and agreed to pay a \$4.2 million fine. The captain and chief engineer on the “Guadalupe” also pled guilty in 2002 to submitting false ORBs to the U.S. Coast Guard after the second engineer reported the illegal dumping to a local police department when the ship docked in New Jersey. The whistleblower was awarded a record \$2.1 million for disclosing the unlawful conduct. This marks the largest bounty ever paid to a whistleblower under the Act to Prevent Pollution from Ships.

“Spring Drake” - April 2004 in Oregon, following a Coast Guard inspection of the grain ship, the ship's owner and manager pled guilty to obstruction of justice and false statements charges, and were ordered to pay a \$2 million fine. Additionally, the chief engineer pled guilty to making false statements and was sentenced to serve one month in prison.

“M.S Hoegh Minerva” – June, 2004 in Washington, Hoegh Fleet Services, A/S was ordered to pay a \$3.5 million fine after pleading guilty to seven felony counts, including obstruction of justice and false statements relating to illegal discharge of waste oil into the ocean. An engineering officer also pled guilty in 2003 to obstructing the U.S. Coast Guard's investigation. According to the plea agreement, the chief instructed crewmembers to bypass the oil-water separator and took steps to conceal evidence of the bypass activity from U.S. Coast Guard inspectors making false and fraudulent entries in the vessel's ORB. The engineering officer agreed to cooperate with the government's investigation of Hoegh Fleet Services, and in return, he was sentenced to only 30 days in prison, followed by two years of supervised release. \$300,000 of the company's fine was awarded to the crewmember who reported the illegal dumping to the U.S. Coast Guard.

Holland America Line – July, 2004 in Alaska, a former Vice President pled guilty for delivering audit reports representing that a court-ordered audit program existed when it did not. He was sentenced to three years probation, 450 hours of community service, and ordered to pay a \$10,000 fine. HAL pled guilty in December 2004 to negligently discharging untreated sewage and other pollutants, and agreed to pay a \$200,000 fine plus community restitution, and to implement an ECP.

Bouchard Transportation Company –March, 2004 in Massachusetts, the company pled guilty to Clean Water Act and Migratory Bird Treaty Act violations related to an oil spill from the tugboat “Evening Tide”. Bouchard agreed to pay a fine of \$10 million, institute numerous operational restrictions, and implement an environmental compliance plan, which provides for external audits.

“Katerina” – January, 2005 in California, the chief engineer pled guilty to obstruction of justice for concealing an oil-water separator bypass from the U.S. Coast Guard. He was sentenced to twenty years in prison. The captain and second engineer later pled guilty to obstruction of justice. DST Shipping, Inc., the ship's parent company, also agreed to plead guilty to obstruction of an official proceeding and failure to maintain an accurate ORB.

John G. Lemos – January, 2005 in Oregon, the owner, operator, and chief engineer were charged with impeding a federal investigation by falsifying the vessel's ORB, and releasing oil into the Pacific Ocean via a bypass pipe in violation of the Clean Water Act. The vessel's operator pled guilty to falsifying the ORB and was ordered to pay a \$500,000 fine and implement an ECP.

Venezuela:

In May, 2000, the master of the “Nissos Amorgos” was convicted in absentia and sentenced to 16 months in prison after a 1997 oil spill in the Maracaibo Channel as a result of grounding.

From the reports of the case study detailed above, it is seen that in spite of the various national and international laws existing for the prevention of pollution and the ships are subjected to inspections and survey at different levels, pollution from ships is still continuing.

7.12 Summary and analysis of the case studies:

In the first part of the case study, as stated earlier, an attempt was made to study the trend of the oil pollution from ships from the reported data of ITOPF in order to find out as to what extent the changes made in the CDEM and Discharge standards and the introduction of new legal regimes have helped in preventing/reducing the pollution from ships, globally. From the database of nearly 10000 incidents held by ITOPF, as reported, the vast majority (84 per cent) fall into the smallest category of ‘less than 7 tonnes’. It was seen from the study made that the number of large spills of ‘over 700 tonnes’ type had decreased significantly during the last thirty years and the average number of large spills per year during the 1990s was less than one third of that witnessed during the 1970s.

It is also seen that a few very large spills were responsible for a high percentage of the oil spilt.

It was observed that for the period 1970-79, there were 25.2 spills per year on an average. However, for the period 1980-89, the average fell down to 9.3 spills per year on an average. The average value of spills per year fell further down to 7.8 per year for the period 1990-1999 and for the period 2000-2006, the average became 3.7. Although the study generally confirmed considerable reduction in percentage of oil spills during the period under consideration, it could not be made out whether the reduction was due to improvements made in the technical standards or due to the strict implementation and enforcement of the legal measures or due to both.

The study made on the incidents of oil spills by cause, showed that the percentage of pollution caused due to loading /discharging of tankers for the period 1974-2006 is 36.04 per cent for the range less than 7 tonnes, pollution caused while doing bunkering operation is 7.27 per cent, pollution caused due to groundings is 3.09 per cent and due to collisions is only 2.21 per cent. However, it was found that the percentage of pollution caused due to loading and discharging operation had come down to 28 per cent, for the range 7-700 tonnes, and then to 9 per cent, for range more than 700 tonnes, respectively.

Similarly, the percentage pollution due to bunkering operation came down to 2, for the range 7-700 tonnes, and then to nil, for the range less than 700 tonnes. However, the percentage of pollution is seen increased both for the collisions and groundings. Also the pollution percentage has gone up for both the higher ranges. This observations show the fact that the pollutions caused from ships due to operations are less (most of them within less than seven tonnes) and the oil spillages caused due to collisions/groundings are largely over seven hundred tonnes. This increase in percentage of pollution due to collisions/groundings is likely to make any one to think whether the design modifications done to prevent / reduce the oil pollution due to collisions/groundings had helped in reality. Another point worth to consider at this point is that whether the necessary training imparted to the crew and officers as per the STCW convention is adequate enough.

As regards to the pollution study made in Indian ports, it was seen that the data, made available from the Indian Coast guard data base for the period 1982-2006, was not adequate enough to compare with the reported pollution incidents of ports abroad. For example, the quantity spilled is not known or not assessed in few cases. The data available refers to pollution from ships and other sources also. Pollution caused in the coastal area and outside limits are not shown separately. However, on analysis of the reported data of ports of India for the period 2003-2007, it is seen that Tuticorin Port had maximum number of oil pollutions and New Mangalore port is the second. As regards to the quantity of oil spilt, Tuticorin port and Mumbai ports had maximum pollution discharges from ships.

On going through the reported pollution incidents of Baltic ports, Mediterranean ports, UK ports, European ports, Australia etc. it is noticed that they all had pollution incidents during the past ten years. In fact, it is surprising to see that most of the major accidents that had occurred within the past over ten years due to collisions/groundings had occurred near US, UK and European ports, spilling thousands of tonnes of oil. However, the total number of oil spill incidents was less. It was also seen in the earlier chapters of this study that these major accidents occurred in the past had only forced IMO to take immediate actions to make new conventions or make amendments to the existing conventions. Besides, it is seen that in US, the reporting system to USCG is working very well due to which the database maintained by the USCG is much better and the same can be noticed from the figures shown earlier, showing reduction in oil spillages of higher quantities.

Further, from the reported details of USCG, it may be noted that the maximum oil spills for the period 1991-2004 was from all other vessels that is from ships other than tankers. The total number of spills from other ships found more or less the same during the period 2002-2004. For the period 1999-2004, no much variations was noticed in the total number of spills from unknown sources. It is also noticed that 35.7 per cent of the volume of oil spilled for the period 1991 - 2004 came from tank vessels (ships/barges), 27.6 per cent from facilities and other non-vessels, 19.9 per cent from non-tank vessels,

9.3 per cent from pipelines, and 7.4 per cent from mystery spills. The fact that maximum percentage of oil spills was not from tankers was also proved in the study made earlier.

Another interesting thing noticed from the comparative studies is the less quantity of oil spillages reported in Indian ports. The most probable reason for this could be that the reporting was not made properly. Personal visits made to various Indian ports and ports of other countries generally showed that some of the berths of Indian ports like Chennai, Paradeep, Kandla, Kolkata and Mormugao, particularly the coal berths and iron ore berths are very heavily polluted than their counter parts of other countries. The main reason for this could also be due to the land based pollution. The probable reason for more pollution in Indian ports by other pollutants like oil, chemicals, garbage and sewage could be due to the reduced amount of fines and penalties imposed by our state compared to other states.

As regards to the pollution incidents by chemicals, the data available is only for Australia and US. Again in this case also, it may be seen that the database of USCG is very strong. Though it is seen that the quantity of chemical split was found decreasing during the period 2000-04, the pollution from chemical tankers found increasing slightly.

The case study conducted regarding the fines and penalties imposed by various states for the same offence found varying considerably. The other observation noticed is the complexity of national laws/international laws existing on the punitive measures taken. Due to the variation in the fines and penalties imposed by the states, the tendency for discharging of pollutants from ships into those countries where the fines and penalties are comparatively much less like in India, Bangladesh and African countries etc. is bound to increase undoubtedly.

From the last part of the case study, it is seen clearly that many countries have already started filing criminal cases against the officers and owners of ships, even before the EC directive, using their national laws. The cases booked against them, as seen above, were for the violations of the MARPOL convention/national laws and/or for illegally discharging pollutants from the ships. If each country starts filing criminal cases as per

their own national laws and take actions in the unilateral way, as the shipping being a global industry, there can be lot of problems. It is high time that IMO should take up this issue and frame uniform regulations and effectively implement them for fixing up of the criminal liabilities of the actual polluters.
