MARITIME KNOWLEDGE CENTRE

Information Resources on International Shipping: trade, safety, security, environment- facts and figures

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1. Introduction

We live in a global society which is supported by a global economy – and that economy simply could not function if it were not for ships and the shipping industry. Shipping is truly the lynchpin of the global economy: without shipping, intercontinental trade, the bulk transport of raw materials and the import/export of affordable food and manufactured goods would simply not be possible.

Shipping is perhaps the most international of all the world's great industries and one of the most dangerous. It has always been recognized that the best way of improving safety at sea is by developing international regulations that are followed by all shipping nations. Regulating the maritime industry to promote safety and security and prevention of pollution from ships worldwide has been the function of the International Maritime Organization since its inception in 1959. The work of IMO is well documented through its numerous conventions and codes and on the Organization's website.

Of all the sectors that make up the global transport infrastructure, shipping probably has the lowest public profile and the least representative public image. Its importance is not well known although not a single area of our life remains unaffected by it. The IMO Council at its 93rd session in November 2004 endorsed the proposal of Secretary-General Mr. Efthimios Mitropoulos that the theme for World Maritime Day 2005 would be "**International Shipping - Carrier of World Trade**". The theme was chosen to provide an ideal opportunity to draw attention to the vital role that shipping plays in underpinning the international economy and its significant contribution to international trade and the world economy as the most efficient, safe and environmentally friendly method of transporting goods around the globe.

2. Globalization and International Trade

It may seem obvious to say that, today, we live in a global world, and it is certainly true that international trade among all the nations and regions of the world is nothing new. From the Phoenicians, through the Egyptians, the Greeks and the Carthaginians, the Chinese, the Vikings, the Omanis, the Spaniards, the Portuguese, the Italians, the British, the French, the Dutch, the Polynesians and Celts, the history of the world is a history of exploration, conquest and trade by sea.

But there is no doubt that we have now entered a new era of global interdependence from which there can be no turning back. In today's world, national boundaries offer little impediment to multi-national corporations: cars with far-eastern brands are not only sold but also assembled in Europe, while European brands are assembled and sold in North America; "western" energy companies invest millions of dollars in Asia and the Far-East and the strategy and investment decisions they make can affect millions of people all over the world.

The high-flyers of the business world can cross oceans in just hours, communicating by e-mail and mobile phones as they go. In the financial markets, brokers and traders have thrown off the constraints of time zones and distance and now access the world markets via computer. In the 21st century, industries such as computer software, media and fashion have no obvious geographical dimension and recognise no physical boundaries. In today's consumer world, the same brands are recognised, understood and valued all over the world.

Looking back into history, we can trace the stages through which we have progressed to arrive at this new world order. There was a time when, for any given community, the most important raw materials, the most important products and the most important markets were essentially local. But, as interaction between communities grew, trade developed and regional specialities, often founded on the availability of particular raw materials or on saleable skill-sets that had been developed over time, began to emerge.

As the world became more developed, proximity to raw materials and to markets became the factors that, above all others, shaped the world's economy and, in particular, the major trade patterns and shipping routes. Eventually, the great seaborne trades became established: coal from Australia, Southern Africa and North America to Europe and the Far East; grain from North and South America to Asia, Africa and the Far East; iron ore from South America and Australia to Europe and the Far East; oil from the Middle East, West Africa, South America and the Caribbean to Europe, North America and Asia; and now we must add to this list containerized goods from the People's Republic of China, Japan and South-east Asia to the consumer markets of the western world. Global trade has permitted an enormous variety of resources to be widely accessible and thus facilitated the widespread distribution of our planet's common wealth.

Today, international trade has evolved to the point where almost no nation can be fully self-sufficient. Every country is involved, at one level or another, in the process of selling what it produces and acquiring what it lacks: none can be dependent only on its domestic resources. Global trade has fostered an interdependency and inter-connectivity between peoples who would previously have considered themselves completely unconnected. The potential benefits are clear: growth can be accelerated and prosperity more widespread; skills and technology can be more evenly dispersed, and both individuals and countries can take advantage of previously unimagined economic opportunities.

Shipping has always provided the only really cost-effective method of bulk transport over any great distance, and the development of shipping and the establishment of a global system of trade have moved forward together, hand-in-hand. Those with access to natural resources; those with the ability to convert those resources into useful products for the good of mankind; and those with a requirement and the wherewithal to utilize and consume those end products are all joined by the common thread of shipping. The eternal triangle of producers, manufacturers and markets are brought together through shipping. This has always been the case and will remain so for the foreseeable future.

2.1. Shipping and the global economy

It is generally accepted that more than 90 per cent of global trade is carried by sea. Throughout the last century the shipping industry has seen a general trend of increases in total trade volume. Increasing industrialization and the liberalization of national economies have fuelled free trade and a growing demand for consumer products. Advances in technology have also made shipping an increasingly efficient and swift method of transport.

World seaborne trade figures i.e. the amount of goods actually loaded aboard ships have increased considerably since the 70's and in 2008, reached 8.2 billion tons of goods loaded. As with all industrial sectors, however, shipping is not immune to economic downturns and 2009 witnessed the worst global recession in over seven decades and the sharpest decline in the volume of global merchandise trade. In tandem with the collapse in economic growth and trade, international seaborne trade volumes contracted by 4.5 per cent and total goods loaded went down to 7.8 billion tons in 2009. While no shipping segment was spared, minor dry bulks and containerized trades suffered the most severe contractions. This reflected the weak consumer confidence which depressed the retail sector, and the low level of capital investment, as well as a slowdown in the real estate and housing sectors, especially in advanced economies. In contrast, iron ore and coal trade volumes held strong on the back of China's robust import demand, driven, in particular, by China's large stimulus package.

Developing countries continued to account for the largest share of global seaborne trade (61.2% of all goods loaded and 55 % of all goods unloaded), reflecting their growing resilience to economic setbacks and an increasingly leading role in driving global trade. Developed economies' shares of global goods loaded and unloaded were 32.4 % and 44.3 % respectively. Transition economies accounted for 6.4 % of goods loaded and 0.8 % of goods unloaded. (UNCTAD Review of Maritime Transport 2010, p. 6)

Table 1 - Development of World Seaborne Trade

(selected years in millions of tons loaded)

Year	Oil	Main bulks[a]	Other dry cargo	Total (all cargoes)
1970	1 442	448	676	2 566
1980	1 871	796	1 037	3 704
1990	1 755	968	1 285	4 008
2000	2 163	1 288	2 533	5 984
2006	2 698	1 849	3 135	7 682
2007	2 747	1 972	3 265	7 983
2008	2 732	2 079	3 399	8 210
2009[b]	2 649	2 113	3 081	7 843

Source: Compiled by the UNCTAD secretariat on the basis of data supplied by reporting countries as published on the relevant government and port industry websites, and by specialist sources. The data for 2006 onwards have been revised and updated to reflect improved reporting, including more recent figures and better information regarding the breakdown by cargo type. a. Iron ore, grain, coal, bauxite/alumina and phosphate. The data for 2006 onwards are based on *Dry Bulk Trade Outlook* produced by Clarkson Research Services Limited. b. Preliminary.

Source: UNCTAD Review of Maritime Transport 2010 p 8

In his paper "How shipping has changed the world and the Social impact of shipping" Dr Martin Stopford, Managing Director of Clarkson Research Services Ltd estimates that the world is well along the road to an economically integrated global economy (60% is his guess) and shipping has played a crucial and highly effective part in the process. If the trade growth trend of the last 150 years continues, he estimates that by 2060 the 8 billion tonnes of cargo will have grown to 23 billion tonnes, and unless something is done about it, it will expand the shipping carbon footprint by 300%.

2.2 Current economic outlook

In his recent speech at Nor-Shipping in June 2011, the IMO Secretary-General offered his views on the current economic outlook. Container trades, he said, are facing their shortest ever cycle, with freight rates plummeting again after the crash of 2009 and the relative boom of 2010; similarly, in the dry bulk markets, freight rates remain far from the partial recovery of 2010. And, although one should differentiate among rates for VLCCs, Aframaxes and product carriers, one cannot ignore the sluggish tanker market that has seen rates fall dramatically and earnings struggle to rise above operating costs – except, of course, for the short-term charter rates for LNG carriers that rose spectacularly recently.

Owners, who placed orders for new tonnage in the euphoria of 2004 to 2007, may live to regret their decisions, as growth in the supply side of shipping is seemingly set to outpace growth in short-term demand and fleet utilization to drop below the levels usually regarded as comfortable.

To make crystal-ball gazing even more difficult, completely unpredictable events have recently served to make an already opaque picture even more disjointed. Floods in Australia, the earthquake and tsunami in Japan, and unrest in North Africa and the Middle East, for example, have all had a detrimental effect on certain trades, and it is still not known what the full consequences of the situations they created will be.

Against this gloomy background, there are indications that long-term demand continues to grow. Both India and China, for example, where even modest per capita growth in consumption is expected to generate strong demand in the corresponding trades, are now embarked on huge power-generation projects. The coal and iron ore sectors are expected to be the major beneficiaries, with Australia and Brazil leading the group of exporters – the latter having already embarked on an ambitious project comprising 6 ultra large ore carriers, of the Chinamax type, of 400,000 dw tons each; not to mention the massive 600,000-dwt very large ore carrier currently on the drawing board of a Chinese shipyard.

3. World Trading fleet

3.1. The world fleet and modern ships

There is no doubt that the magnificent square riggers of the era of sail or the early 20th century's prestigious ocean liners could stir the hearts of all those that beheld them. But the ships of today are just as worthy of our admiration, for shipping today is in another truly golden age. Ships have never been so technically advanced, never been so sophisticated, never been more immense, never carried so much cargo, never been safer and never been so environmentally-friendly as they are today.

Mammoth containerships nudging the 18 000 TEU barrier yet still capable of 25 knot operating speeds; huge oil tankers and bulk carriers that carry vast quantities of fuel, minerals, and grain and other commodities around our planet economically, safely and cleanly; the complex and highly specialized workhorses of the offshore industry; and the wonderful giants of the passenger ship world are all worthy of our greatest admiration.

In shipping today we can see many marvels of state-of-the-art engineering and technology that deserve to be ranked alongside the very finest achievements of our global infrastructure. We all marvel at the wonders of the modern world – skyscrapers, bridges, dams, ship canals, tunnels and so on. Although they all deserve our admiration, there should be no question that today's finest ships are also worthy of the sort of recognition usually reserved for the great icons of land-based civil engineering – with one substantial difference in favour of the former: while skyscrapers, bridges, dams *et al* are static structures designed to withstand the elements coming to them, the very essence of vessels sends them out to sea to face the elements at full force, alone in the vastness of the ocean. They should, therefore, be robust when built and maintained as such throughout their entire lifetime.

Ships are high value assets, with the larger of them costing over US $100 million to build. They are also technically sophisticated: you are more likely to find one of today's modern vessels being controlled by a single joystick and a mouse-ball in the arm of the helmsman's seat than by a horny-handed bosun grappling with a spoked wheel; the chief engineer will probably have clean hands and the calluses on his or her fingers will be from tapping a keyboard rather than wielding a spanner. The crew accommodation will be clean, light and airy with modern recreation facilities; the food will be good; and you may well find the first officer exchanging emails with his family at home via the satellite communication system. Ships today are modern, technologically advanced workplaces and the work of the **International Maritime Organization (IMO)** has played, and continues to play, an important part in shaping that environment.

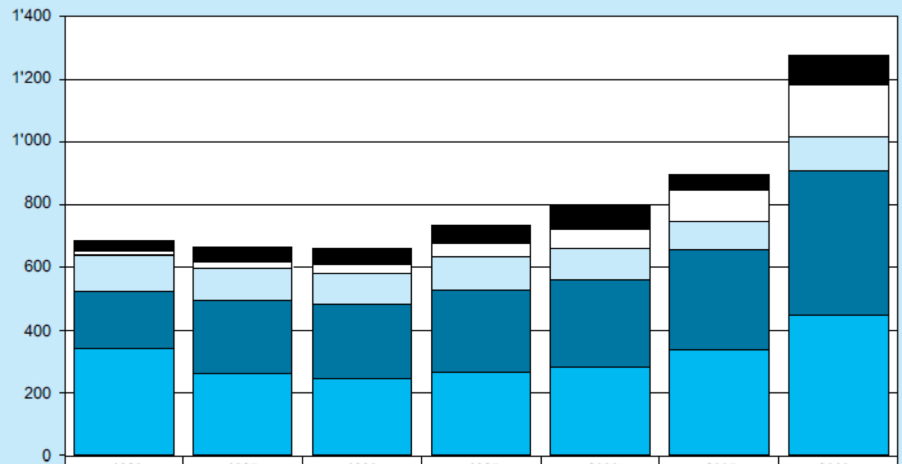
3.2. The world fleet in 2010

As at December 2010, today's world fleet of propelled sea-going merchant ships of no less than 100 GT comprises 103,392 ships of 958 million GT with an average age of 21 years; they are registered in over 150 nations and manned by 1.5 million seafarers of virtually every nationality.

The world's cargo carrying fleet is 54,897 ships of 1,349.4 million Dwt (910.1million GT)) and the average age is 19 years. Completions during 2010 totalled 2,602 ships of 147.6 million Dwt (93.9 million GT). *(Source: Lloyd's Register/Fairplay – World Fleet Statistics 2010).*

**Dwt: Deadweight: the weight a ship can carry when loaded to its marks, including cargo, fuel, fresh water, stores and crew*
***GT: Gross ton: internal measurement of the ship's open spaces. Now calculated from a formula set out in the IMO Tonnage Convention*

Figure 1 - Development of world fleet by millions of dwt*



	1980	1985	1990	1995	2000	2005	2010
Other	31	45	49	58	75	49	92
Container	11	20	26	44	64	98	169
General cargo	116	106	103	104	101	92	108
Dry bulk	186	232	235	262	276	321	457
Oil tanker	339	261	246	268	282	336	450

** cargo carrying vessels of 100 GT and above*

Source: Compiled by the UNCTAD secretariat, on the basis of data supplied by IHS Fairplay. *: UNCTAD Review of Maritime Transport 2010, p.31*

In January 2010, there were 102,194 commercial ships in service with a combined tonnage of 1,276,137 thousand dwt. Looking at individual sectors, oil tankers accounted for 450 million dwt (35.3 %) and dry bulk carriers for 457 million dwt (35.8%), representing an annual increase of 7.6% and 9.1 % respectively. and dry bulk carrier tonnage, which together account for nearly 72 % of the word fleet (increased by 6.5 % and 6.4 % respectively in 2007); the containership fleet reached 169 million dwt (4.5% over 2009). The fleet of general cargo ships showed a decrease, reaching 108 million dwt (8.5% of the fleet). The tonnage of liquefied gas carriers continued to grow, reaching 41 million dwt (an increase of 12%). (*Source: UNCTAD Review of Maritime Transport 2010)*

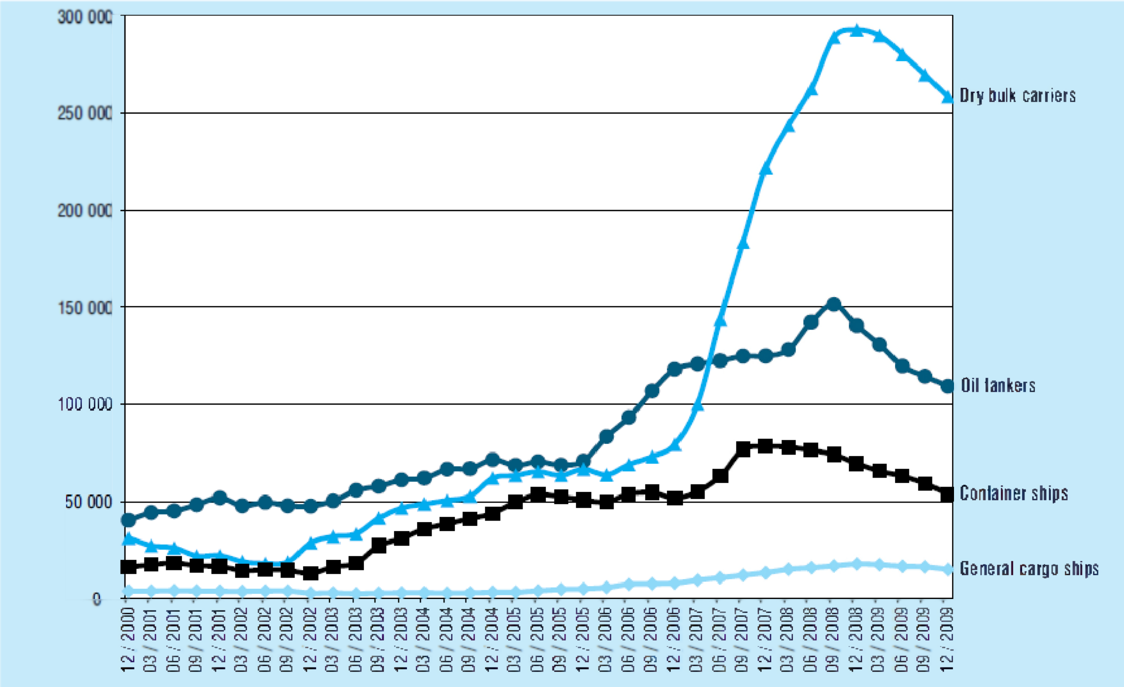
3.3. Age distribution of the world merchant fleet

The average age of the world fleet of propelled sea-going merchant ships of no less than 100 GT is 21 years and the average age of the world cargo-carrying ships 19 years. *(Source: Lloyd's Register/Fairplay - World Fleet Statistics 2010)*

3.4. Developments in shipbuilding

New building deliveries reached a record level of 117.3 million dwt in 2009. There were 3,658 newbuildings recorded as delivered, an increase of 22 % in terms of vessels numbers. In terms of deadweight tonnage, newbuildings stood at 117.3 million dwt, against 82.3 million dwt in 2008.
In 2009 the total tonnage on order stood at 9,222 vessels with a combined capacity of 474 million dwt.

Figure 2 - World Tonnage on order (2000-2010) (thousands of Dwt)



Source: UNCTAD Review of Maritime Transport 2010, p. 56 on the basis of data supplied by IHS Fairplay.

3.5. Prices of new-buildings

Table 2 - Representative new-building prices (millions of dollars, annual averages)

Type and size of vessel	2003	2004	2005	2006	2007	2008	2009	March 2010	Percentage change 2009/2008
Dry bulk - Handysize, 30,000 dwt	16	19	21	22	33	38	29	25	-23.7
Dry bulk - Panamax, 75,000 dwt	23	32	35	36	47	54	39	35	-27.8
Dry bulk - Capesize, 170,000 dwt	38	55	62	62	84	97	69	57	-28.9
Container - geared, 500 TEU	13	18	18	16	16	21	14	10	-33.3
Container - gearless, 6,500 TEU	67	86	101	98	97	108	87	74	-19.4
Container - gearless, 12,000 TEU	n.a.	n.a.	n.a.	n.a.	154	164	114	105	-30.5
Oil tanker - Handy, 50,000 dwt	28	35	42	47	50	52	40	34	-23.1
Oil tanker - Suezmax, 160,000 dwt	47	60	73	76	85	94	70	63	-25.5
Oil tanker - VLCC, 300,000 dwt	67	91	119	125	136	153	116	99	-24.2
Chemical tanker - 12,000 dwt	12	16	18	21	33	34	33	30	-2.9
LPG carrier - 15,000 m3	28	36	45	49	51	52	46	40	-11.5
LNG carrier - 160,000 m3	153	173	205	217	237	222	226	210	1.8

Source: Compiled by the UNCTAD Secretariat, on the basis of data from Drewry Shipping -UNCTAD Review of Maritime Transport 2010", p. 56

3.6. Transport costs

The transport cost element in the shelf price of consumer goods varies from product to product, but is ultimately marginal. For example, transport costs for a television set (typical shelf price of $700.00) amount to around $10.00 and only around $0.15 for of a kilo of coffee (typical shelf price $15.00).

The typical cost to a consumer in the United States of transporting crude oil from the Middle East, in terms of the purchase price of gasoline at the pump, is less than a US cent per litre.
The typical cost of transporting a tonne of iron ore from Australia to Europe by sea is about US $10. The typical cost of transporting a 20 foot container from Asia to Europe carrying over 20 tonnes of cargo is about the same as the economy airfare for a single passenger on the same journey.

Table 3 - Overview of Transport Costs

	Unit	Shelf price	Shipping costs
TV set	1 unit	$ 700.00	$ 10.00
DVD/CD player	1 unit	$ 200.00	$ 1.50
Vacuum cleaner	1 unit	$ 150.00	$ 1.00
Scotch Whisky	Bottle	$ 50.00	$ 0.15
Coffee	1kg	$ 15.00	$ 0.15
Biscuits	Tin	$ 3.00	$ 0.05
Beer	Can	$ 1.00	$ 0.01

Source: Marisec

3.7. Leading fleets

Table 4 - Top 20 merchant fleets

Figures in brackets are in gross tonnes of shipping registered in the countries and territories listed. *(Data based on IHS Fairplay " World Fleet Statistics 2010" data as at 31 December 2010).*

1. Panama (201,264,453)
2. Liberia (106,708,344)
3. Marshall Islands (62,011,182)
4. Hong Kong, China (55,543,246)
5. Bahamas (50,369,836)
6. Singapore (44,869,918)
7. Greece (40,795,358)
8. Malta (38,737,657)
9. China (34,705,141)
10. Cyprus (20,732,488)
11. Italy (17,044,319)
12. Japan (16,857,860)
13. United Kingdom (16,477,909)
14. Germany (15,282,545)
15. Norway NIS (13,828,168)
16. Republic of Korea (12,512,549)
17. United States (11,941,087)
19. Isle of Man (11,620,778)
18. Denmark DIS (11,530,364)
20. Antigua and Barbuda (10,737,659)

Table 5 - Top 20 controlled fleets

Based on total Gross Tonnage controlled by parent companies located in these countries and territories. (Data based on IHS Fairplay " World Fleet Statistics 2010" data as at 31 December 2010).

1. Japan (131,955,001)
2. Greece (118,089,051)
3. Germany (85,371,604)
4. China (67,156,101)
5. United States (42,982,683)
6. United Kingdom (40,700,626)
7. Norway (33,794,824)
8. Republic of Korea (29,547,097)
9. Denmark (26,445,159)
10. Hong Kong, China (23,427,839)

11 Taiwan Province of China (20,917,259)

12. Singapore (19,977,240)
13. Italy (17,716,680)
14. Russian Federation (14,267,814)
15. Canada (13,242,100)
16. Turkey (12,438,626)
17. Malaysia (10,884,115)
18. India (10,751,903)
19. France (8,685,204)
20. Belgium (7,965,964)

3.8. Overview of ship types

3.8.1. Overview world merchant fleet

The world's cargo carrying fleet is 54,897 ships of 1,349.4 million Dwt (910.1 million GT) and average age of 19 years. (*Source: Lloyd's Register Fairplay - World Fleet Statistics 2010)*

3.8.2. General cargo ships

Although general cargo ships are still the largest single category in terms of number of vessels, the trend among new ships is more and more in favour of specialization, although it could be argued that handy-sized, geared bulk carriers and versatile medium-sized containerships, of which some have the ability to accommodate several different box sizes as well as palletised cargo are the natural successors of the old general cargo vessels.

3.8.3. Tankers

Tankers make up the second largest category. There are many different types of tanker, ranging from those carrying crude oil, through those built to transport various refined hydrocarbon products, to highly specialized ships that carry liquefied petroleum gas and natural gas. There are even tankers designed to carry cargoes such as fresh water, wine or orange juice. The first purpose built tanker was the ***Gluckauf,*** a 3,000 dwt vessel built in 1886. It had a steam engine and two masts**.** In size terms, the heyday of the tanker was the early 1970s, when the so-called Ultra-Large Crude Carriers (ULCCs), capable of lifting more than half a million tonnes of cargo, sailed the oceans. After the oil crisis of the 70s, tanker owners became a little more modest in their ambitions and, since then, most large modern tankers are in the 200-300,000 tonnage range. These are still massive vessels and enormously expensive to build, but today's high price of oil means they can pay for themselves in a relatively short period of time.

Classes and sizes:

Panamax : The largest size crude oil tanker that can travel through the Panama Canal: up to 70,000 DWT.

Aframax: Size of crude oil tanker which uses the Average Freight Rate Assessment (AFRA) method to calculate the cost of transportation: 70,000 to 120,000 DWT.

Suezmax: largest size crude oil tanker that can travel through the Suez Canal while Loaded: 120,000 – 200,000 DWT.

Very Large Crude Carrier (VLCC): Size of a large crude oil carrier (200,000-325,000DWT)

The world's largest ship was a 564,765 dwt tanker with a length overall of 458.45m (1,504ft); She was longer than many of the world's tallest buildings with an interesting and varied history. Built in 1976 and having undergone some work to increase her load-carrying capacity, she was finally floated two years later and named *Seawise Giant*. At first, she operated in the Gulf of Mexico and the Caribbean Sea, but was then used for exporting oil from Iran during the Iran-Iraq War. In 1986, she was attacked but not sunk in the Strait of Hormuz and at the end of the war in 1989 she was repaired and renamed *Happy Giant***.** In 1991, she was renamed again, this time to *Jahre Viking***.**

In March 2004, the ship was sold and sent by its new owner to be refitted as a floating storage and offloading unit. There, she was renamed *Knock Nevis* and she operated in the Al Shaheen oilfield in the waters of Qatar until 2010 when, renamed *Mont, she* was delivered for breaking up at Gujarat's Alang-Sosiya shipyard in India.

3.8.4. Bulk carriers

Bulk carriers are often called the workhorses of the international shipping fleet. They can be thought of as simple, relatively unsophisticated but nevertheless highly efficient vessels that typically transport commodities such as grain, coal and mineral ores. If tankers provide the fuel that powers the modern economy, bulk carriers are responsible for moving the raw materials that are its lifeblood. The first modern bulk carrier was the *John Bowes* 650 dwt built in 1852.

In terms of size, the world's bulk carrier fleet has three categories; ships of up to 50,000 dwt are known as "handy-sized"; ships of 50,000 to 80,000 dwt are known as "Panamax" (being the largest ships able to transit the Panama Canal) and ships of more than 80,000 dwt are known as "capesize". Bulk carriers embrace a number of variations – single or double hull, with or without their own cargo-handling equipment – but all are characterized by the huge hatch covers that can be rolled or lifted away to reveal to cavernous holds beneath.

	Size (deadweight tonnes)	**No. in World fleet**
Handies	10 - 49,999 dwt	3212
Panamax	50 - 79,999 dwt	1453
Capesize	80,000+ dwt	796

Source: *Intercargo*

Because of the nature of the cargoes they carry – often heavy, high-density commodities – accidents involving bulk carriers have sometimes resulted in considerable loss of life. For this reason IMO has, over a long period of time, undertaken a great deal of work to improve the safety of this type of vessel. There is, for example, a special chapter on bulk carrier safety in *the Safety of Life at Sea Convention (SOLAS)*, covering such topics as damage stability, structural strength, surveys and loading.

3.8.5. Passenger ships

Passenger ships come next in the world fleet league table. There are two basic categories – which can be summed up as "fun" or "function". In the latter category are those which are designed to move people and, often, vehicles on regular itineraries from one place to another as quickly and cheaply as possible (ie ferries) and, in the former, those which the passengers see as a leisure destination in their own right (ie cruise ships).

Ferries range from small passenger ferries crossing rivers such as the River Hudson or Norwegian fjords, to big Ro-Ro (Roll-on Roll-off) ferries with a capacity to carry 3000 passengers and 650 cars such as those operating across the English Channel.

In both categories, the size, sophistication and the sheer number of passengers that can be carried have reached mind-boggling proportions. Because of their individuality, as well as their resonance with the great ocean liners of a bygone era, these ships tend to be the best known and most recognized among the general public at large.

One of the finest modern examples is the world's largest cruiseship *Oasis of the Seas* delivered by STX Europe's Turku shipyard in Finland for Royal Caribbean International in 2009.
A true maritime giant, her capacity of 6,360 passengers plus some 2,100 crew is quite astonishing, and, with a gross tonnage of 225,000 tons, makes her the largest passenger ship afloat. It is difficult to find the words to aptly describe such a feat of naval architecture, shipbuilding and marine engineering; but "monumental" and "awesome" spring to mind. She incorporates all the very latest international

standards with regard to safety, security and environmental protection, offering her passengers an unparalleled opportunity to experience the wonders of ocean travel in the finest style. Her sistership, the *Allure of the Sea* was delivered at the end of 2010.

Despite the economic downturn, which has clearly had a negative impact on revenues throughout the leisure market, the Cruise Lines Industry Association reports that "the 13.44 million people, who cruised in 2009, represented a 4.8 per cent increase on 2008, a strong sign of continuing consumer interest and demand." It seems, therefore, that the cruise and passenger sector remains one of the shipping industry's more vibrant, witnessing substantial growth on all fronts – numbers of passengers, numbers of ships, new destinations and ship sizes.

3.8.6. Containerships

But the one sector which can be said to have transformed the face of shipping, certainly in the latter half of the 20th century, is that of container shipping. Unheard of before the 1960s, the container is now ubiquitous and is the standard unit of cargo for just about every form of manufactured item on the planet (there are exceptions: cars, for example, are transported in special ships designed solely for the purpose).

Today's giant containerships typically operate between purpose-built ports served by massive cranes that can load and unload containers at astonishing rates. Containership operators can offer fixed sailing schedules with tight delivery margins and these ships are now an integral part of the modern, multi-modal transport and logistics industry.

The *M/S Emma Maersk*, built by Odense Steel Shipyard was delivered to Maersk in 2006; it measures 397x56m and is able to carry 11,000 20-ft. containers. The *MSC Daniela* built in 2008 by Samsung Shipbuilding & Heavy Industries Co. Ltd for the Mediterranean Shipping Company is the size of an aircraft carrier; Daniela completed its maiden run packed with 13,800 containers each big enough to contain the contents of a three-bedroom house.

On 21 February 2011, Maersk placed an order worth $1.9 billion for 10 even larger container ships from Daewoo shipbuilding & Maine Engineering, the Triple E class. Scheduled for delivery between 2013 and 2015, they will entirely change the shipping industry's understanding of size and efficiency. Called the 'Triple-E' class for the three main purposes behind their creation — Economy of scale, Energy efficient and Environmentally improved — these new container vessels do not just set a new benchmark for size: they will surpass the current industry records for fuel efficiency and CO2 emissions per container moved held by the *Emma Mærsk* class vessels:

Four-hundred metres long, 59 metres wide and 73 metres high, the Triple-E is the largest vessel of any type on the water today. Its 18,000 TEU (twenty-foot container) capacity is 16 percent greater (2,500 containers) than today's largest container vessel, *Emma Mærsk*. It will produce 20 percent less CO2 per container moved compared to *Emma Mærsk* and 50 percent less than the industry average on the Asia-Europe trade lane. In addition, it will consume approximately 35 percent less fuel per container than the 13,100 TEU vessels being delivered to other container shipping lines in the next few years, also for Asia-Europe service.

The Unctad Review of Maritime Transport 2010 states that the world cellular container ship fleet stood at 4,677 vessels, with a combined total carrying capacity of 12.8 million TEU by the beginning of 2010.

3.8.7. Fishing vessels

The world totals for fish catching vessels amounts to 21,589 ships with a GT of 9,438,394 and an average age of 28 years. Other fishing vessels (fish carriers, support vessels etc.) amount to 1,242 with a GT of 1,232,856 and an average of 25 years. (*Source: Lloyds Register/Fairplay. World Fleet Statistics 2010, Table 2K)*

4. Marine Technology Outlook

In his recent speech at Nor-Shipping in June, the IMO Secretary-General stated that although the economic outlook for shipping may, in the prevailing circumstances, be uncertain, the march of technology seems inexorable, as the industry seeks constantly to improve its efficiency and improve performance – both from the commercial and environmental viewpoints.

Economic and environmental concerns are already prompting concerted efforts to cut fuel consumption. Kites and delta wings harness the wind in a modern-day nod to a bygone era; the use of liquefied natural gas as a fuel is sparking a great deal of interest – and not just for ships carrying LNG as a cargo: the Secretary-General cited the case of Norway, where a variety of LNG-powered passenger ferries and other vessels are already in operation, while one company is reported to be taking delivery of two LNG-powered ro-ro cargo vessels later this year; and ports are now beginning to develop the necessary infrastructure for LNG re-fuelling.

Air lubrication, aimed at reducing the friction between hull and sea water to reduce fuel consumption, is also being looked at by a number of shipowners, while fuel-cell technology appears to have a strong future in smaller vessels, or as a replacement for auxiliary engines aboard larger ships.

On the bridge, integrated systems (including ECDIS and electronic navigational charts) have become the norm (with AIS and LRIT used for both navigational safety and security purposes), while the concept of e-navigation seems set to open doors to enhanced berth-to-berth navigation, including new ways of tracking and monitoring vessels at sea. And we should not be surprised, he added, if, along with the greater conceptual integration of safety, efficiency and environmental concerns epitomized in IMO's Marine Electronic Highway project for the Malacca and Singapore Straits, we see, sooner than we can imagine, e-navigation eventually ushering in a satellite-based, global vessel traffic management and monitoring system through harmonization of marine navigation systems and supporting shore services.

The future may also bring new and unforeseen dangers. New navigational hazards, such as extensive offshore wind farms or tidal energy installations, may emerge; while the melting of the polar ice caps may re-write not only the map of the world but also the charts of the oceans – which has prompted IMO to intensify its efforts to develop a Code for ships operating in polar waters.

5. Maritime Safety

The sea has always been a potentially hazardous and dangerous working environment. Yet, ship operators today have new factors and new pressures to contend with. The structure of the global marketplace requires that goods and materials be delivered not only to the geographical location where they are required but also within a very precise timeframe. Today, goods in transit are carefully factored-in to the supply chain and, as a result, the transportation industry – which embraces both shipping and ports – has become a key component of a manufacturing sector which sets its store by providing a complete "door-to-door" service.

As a consequence, safety and efficiency have now, more than ever before, become two sides of the same coin: accidents are not only undesirable outcomes in themselves; they also have a negative impact on the supply chain that is at the heart of the global economy. Seen in this light, IMO's responsibility to ensure the highest practicable, globally acceptable, standards that will improve maritime safety and security and, at the same time, help prevent marine pollution takes on a new dimension.

Shipping in the 21st century is the safest and most environmentally benign form of commercial transport. Commitment to safety has long pervaded virtually all deep sea shipping operations and shipping was amongst the very first industries to adopt widely implemented international safety standards.

From the mid-19th century onwards, a number of international maritime agreements were adopted. A treaty of 1863, for example, introduced certain common navigational procedures that ships should follow, when encountering each other at sea, so as to avoid collision, and was signed by some 30 countries. And the infamous *Titanic* disaster of 1912 spawned the first Safety of Life at Sea - or ***SOLAS Convention***, which, albeit completely modified and updated, and nowadays within the responsibility of IMO, is still the most important international instrument addressing maritime safety today, covering, among others, such areas as ship design, construction and equipment, subdivision and stability, fire protection, radio-communications, safety of navigation, carriage of cargoes (including dangerous cargoes), safety management and maritime security.

5.1. Loss of ships

The overall safety record of shipping has been improving steadily for many years. However, major casualties at sea continue at a disturbing level; IHS Fairplay World Casualty statistics 2010 report that 172 ships of 0.81 million gross tonnage were reported as total losses. The number of total losses of cargo carrying ships was 119 of 0.78 million GT(1.19 million Dwt).

The safety level of a vessel can be influenced by many factors and it is therefore not so easy to measure. Such variables could be general ship particulars (flag, classification society, ship type, age, etc.), the changes thereof, ship safety inspections and ship economic cycles. It has been demonstrated by Bijwaard and Knapp (2008)[1] and by means of survival analysis based on ship life cycles that the shipping industry is a safe industry since its hazard rate is low. The hazard rate in this concept is to be understood as the instantaneous potential per unit time for the event to occur, given that the ship has survived up to time t which can vary from zero to infinity. The baseline hazard which when based on

[1] Bijwaard G and Knapp S, 2008, Analysis of Ship Life Cycles –The Impact of Economic Cycles and Ship Inspections, Marine Policy 2009, volume 33, pp. 350-369.

age of the vessel varies per ship type and increases with age 20 significantly while it decreases in the first two age brackets (5-10 and 11-15 years). Another interesting relationship is the effect of ship economic cycles where an increase in earnings decreases the hazard rate for all ship types except container vessels.

5.1.1. Loss of ships subject to IMO Conventions

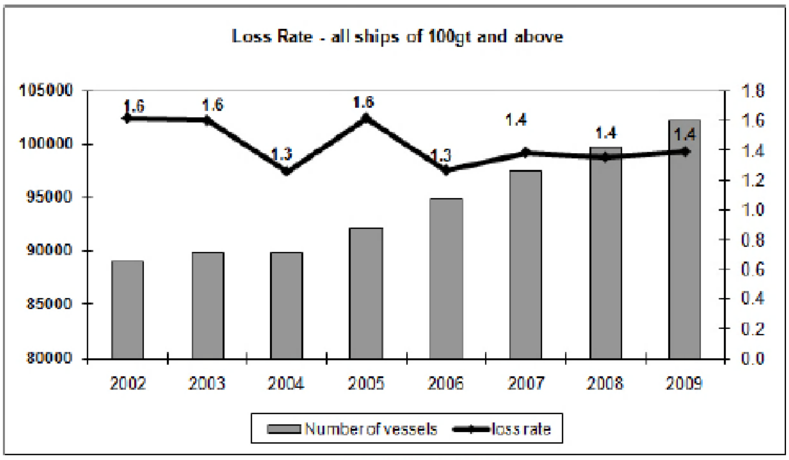
Ships subject to IMO conventions lost for any safety related reason, other than those declared constructive total losses for insurance purposes, to total number of ships subject to IMO conventions (per 1,000 vessels)

Table 6 - Number of ships lost 2002-2009

	2002	2003	2004	2005	2006	2007	2008	2009
Ships of 500 GT and above	95	97	75	96	88	91	80	98
Ships between 100 and 499 GT	49	47	38	53	32	44	55	44
Loss rate (all ship types)*	1.6	1.6	1.3	1.6	1.3	1.4	1.4	1.4

*Source: IHS Fairplay. *per 1,000 ships at risk*

Figure 3 - Loss Rate all ships of 100gt and above (2002 to 2009)



Source: IMO Secretariat

(IMO document C 105/3(a)/1) , data based on IHS Fairplay data

5.2. Loss of lives subject to IMO Conventions

As in all transport sectors, lives are sadly lost as a result of accidents. However, the loss of life in shipping is in fact relatively modest and the overall trend is one of reduction in the number of fatalities, which is all the more impressive in view of the growth in the number of ships in the world fleet.
The International Association of Dry Cargo Shipowners (Intercargo) reported that nine bulk carriers (>10,000 dwt) were lost in 2009 resulting in the loss of 39 seafarers' lives. These figures show a deterioration on those for 2008, when 15 lives were lost on four vessels. However, it is noted that the overall ten year rolling average of losses remains on a downward trend, with an average of 24 lives and 6.6 ships per year lost in the period 2000-2009 compared with 78 lives and 14.5 ships per year in the previous decade. (Source: INTERCARGO –Bulk Carrier Benchmarking and Casualty Report quoted in IMO Document MSC 87/INF.11 of 8 March 2010)

Table 7- Loss of lives (2002-2009)

Number of lives lost (seafarers, fishers and passengers) due to safety-related accidents and incidents on ships subject to IMO Conventions and other instruments

	2002	2003	2004	2005	2006	2007	2008	2009
IHS Fairplay raw data	1,308	248	664	470	1,825	525	1,160	699
IMO	1,274	198	592	173	n/a	n/a	1921	2395

Source: IHS Fairplay (merchant vessels over 100 GT). Note: no data on fishers has yet been obtained.

	2002	2003	2004	2005	2006	2007	2008	2009
Loss of life, per 1,000,000 lives	1.14	0.18	0.45	0.33	1.11	0.31	0.61	0.32

Source: IMO Secretariat IMO Document C 105/3(a)/1) based on IHS Fairplay data

Table 8 - Ratio of lives lost (seafarers, fishers and passengers) due to safety related accidents and incidents on ships subject to IMO Conventions and other instruments, to total number of lives at risk

	2005	2006	2007	2008	2009
IHS Fairplay lives lost all ships	470	1,825	525	1,160	699
Estimated amount of seafarers	1,187,000	1,232,000	1,277,000	1,246,200	1,266,200
Estimated total number of ferry passengers	1,395,306,149	1,629,573,558	1,681,931,684	n/a	n/a
Estimated total number of cruise passengers	16,719,322	16,927,718	17,857,711	n/a	n/a
Estimated total number of passengers	1,412,025,471	1,646,501,276	1,699,789,395	1,913,962,859	2,155,122,179
Total amount of passengers and crew	1,413,212,471	1,647,733,276	1,701,066,395	1,915,209,059	2,156,388,379
Ratio best estimate	3.33E-07	1.11E-06	3.09E-07	6.06E-07	3.24E-07

Source: Source: IMO Secretariat IMO Document C 105/3(a)/1), based on IHS Fairplay data for loss of lives, Shippax for number of passengers, BIMCO/ISF Manpower 2005 Update and Drewry 2008 Manpower report for numbers of seafarers. Note: no data on fishers has yet been obtained.

5.3. Port state control detention and non-compliance rate

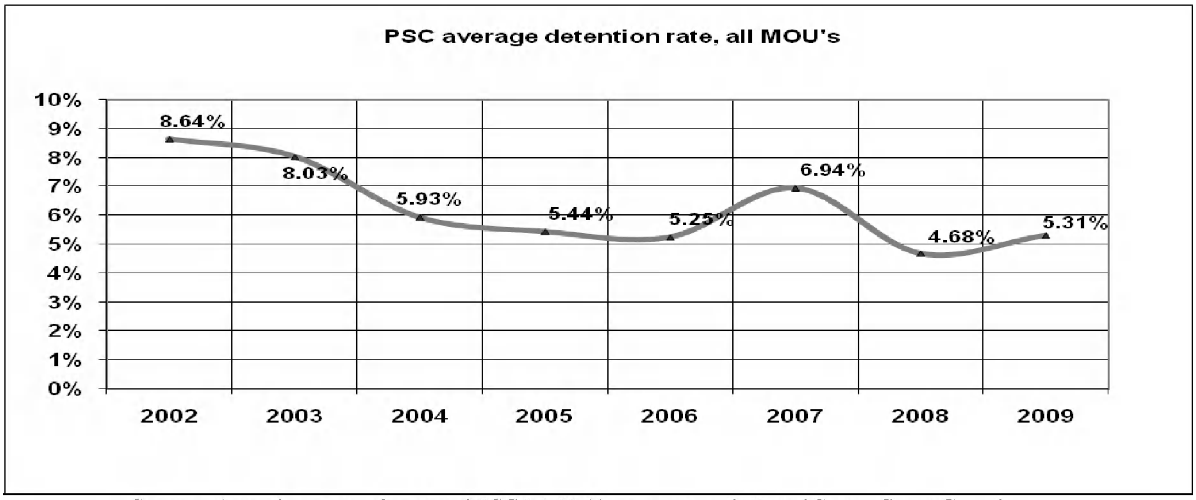
Based on the provisions in the international conventions, flag states are to be seen as the first line of defence against stub-standard vessels. They are followed by the second line of defence, the port states that perform port state control inspections (PSC).

The establishment of port state control as a legal institution to enhance enforcement of international maritime legislation followed after the loss of the *Amoco Cadiz* off the coast of Brittany in 1978. Since then, PSC evolved into an important instrument to enhance safety at sea and to prevent pollution. PSC can best be described to be the right of a country to inspect a vessel coming into its port. It is not an obligation according to the IMO conventions (e.g. SOLAS, MARPOL, STCW, Load Lines, etc.) but if a country decides to exercise this right, a set of IMO resolutions are applied which cover the basic principles on how substandard vessel should be identified and be treated

IMO has encouraged the establishment of regional port State control organizations and agreements on port State control - Memoranda of Understanding or MoUs - have been signed covering all of the world's oceans: Europe and the north Atlantic (Paris MoU); Asia and the Pacific (Tokyo MoU); Latin America (Acuerdo de Viña del Mar); Caribbean (Caribbean MoU); West and Central Africa (Abuja MoU); the Black Sea region (Black Sea MoU); the Mediterranean (Mediterranean MoU); the Indian Ocean (Indian Ocean MoU); and the Riyadh MoU.

A PSC inspection follows a set of procedures to check if a vessel complies with the standards established in the international conventions. The inspection is unannounced and carried out by inspectors who come onboard and in the first instance check the certificates of the ship and the crew. A deficiency is a deviation or violation against a measure in the international conventions which needs rectification. The deficiencies are recorded at the end of the inspection and discussed with the master along with a set of recommendations on when they should be rectified. The IMO collects yearly statistics on the PSC detention rate and non-compliance rate. The non compliance rate is the rate of inspections where deficiencies are found to the total number of inspections.

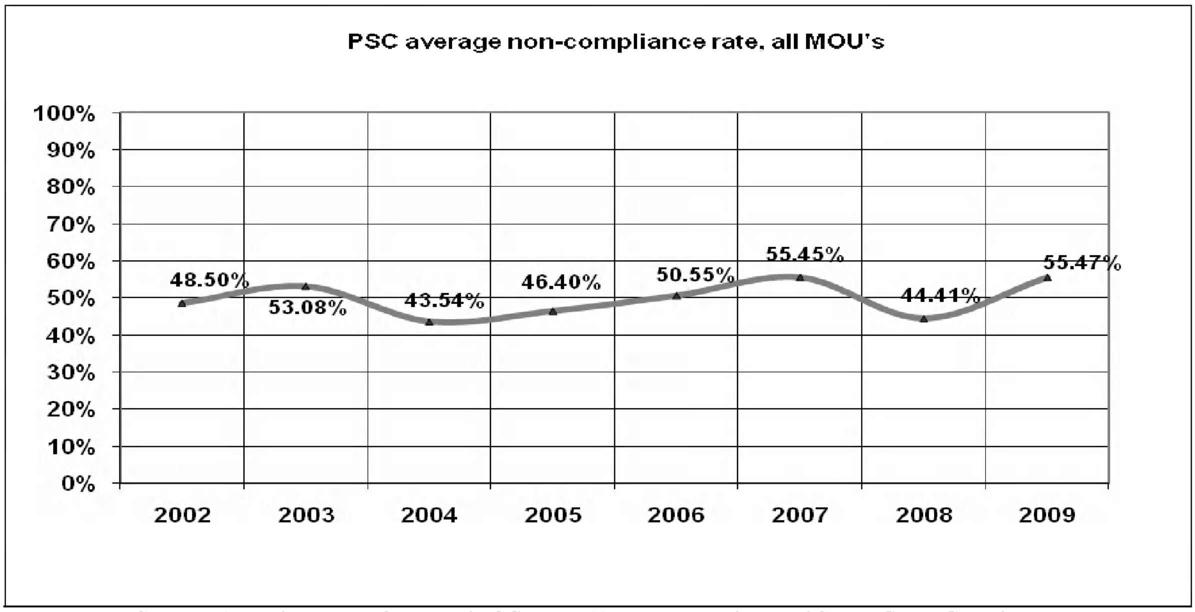
Figure 4- Average PSC detention rate for all PSC regimes (percentage rate) 2002-2009



Source: Annual reports of regional PSC MoUs/Agreement and United States Coast Guard.
United States Coast Guard data incorporates separate safety and security inspections

The above figure is taken from the latest IMO document on performance indicators [C 105/3(a)/1]

Figure 5 - Average PSC non-compliance rate for all PSC regimes (percentage rate)(2002-2009)



Source: Annual reports of regional PSC MoUs/Agreement and United States Coast Guard
United States Coast Guard data incorporates separate safety and security inspections.

The above figure is taken from the latest IMO document on performance indicators [C 105/3(a)/1]

6. Maritime Security

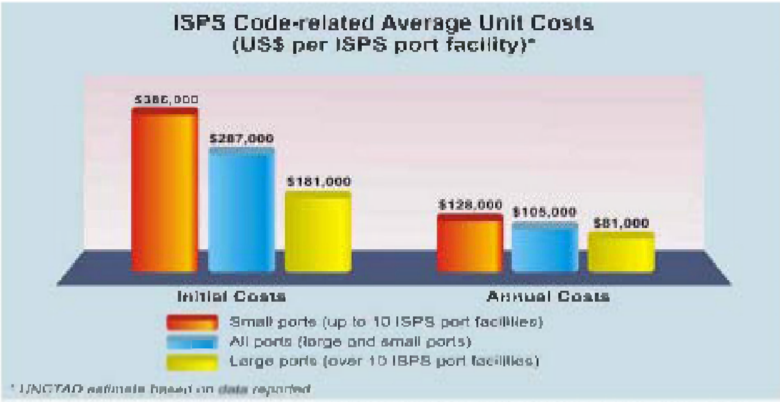
Maritime security is an integral part of IMO's responsibilities. A comprehensive security regime for international shipping entered into force on 1 July 2004. The mandatory security measures, adopted in December 2002, include a number of amendments to the 1974 Safety of Life at Sea Convention (SOLAS), the most far-reaching of which enshrines the International Ship and Port Facility Security Code (ISPS Code), which contains detailed security-related requirements for Governments, port authorities and shipping companies in a mandatory section together with a series of guidelines about how to meet these requirements in a second, non-mandatory section.

6.1. Cost of security measures

A 2007 UNCTAD global study on the cost of implementing the ISPS Code puts ISPS investment costs per port worldwide at $ 287,000 and annual running cost at $105,000.

An example of IMO's initiative is the "Co-operative mechanism", a new framework, in which the littoral States of the Straits of Malacca and Singapore (the Straits) can work together with the international maritime community to enhance navigational safety, security and environmental protection in the Straits.

Figure 6 - Cost of ISPS compliance



The relevant sample represents respondent ports handling about 7% of the global port cargo throughput (tonnes).

Source: Maritime security: ISPS code implementation, costs and related financing, Report by the UNCTAD secretariat (UNCTAD/SDTE/TLB/2007/)

6.2. Piracy and armed robbery against ships

The escalating problem of piracy off the coast of Somalia is "completely unacceptable" and requires an urgent and coordinated response, United Nations Secretary-General Ban Ki-moon said at the launch (on 3 February 2011) of the International Maritime Organization (IMO)'s action plan to promote the 2011 World Maritime Day theme: "Piracy: orchestrating the response".

Piracy attacks are becoming more violent and the tactics used by pirates include using hijacked ships as bases ("mother ships") for carrying out further attacks, with their crews remaining on board as "human shields". Piracy hit an all-time high in the first three months of 2011, with 142 attacks worldwide, driven mainly by raids off the lawless Somali coast. At the time of writing (31 March 2011), the International Maritime Bureau reports that 596 seafarers of various nationalities are being held for ransom on board 28 ships. A total of 97 attacks were recorded off Somalia in the first quarter, up from 35 in the same period last year. Pirates hijacked 18 vessels and took 344 crew members hostage, and kidnapped six seafarers from their boats. A further 45 vessels were boarded, and 45 more reported being fired upon. Pirates killed seven crew and wounded 34.

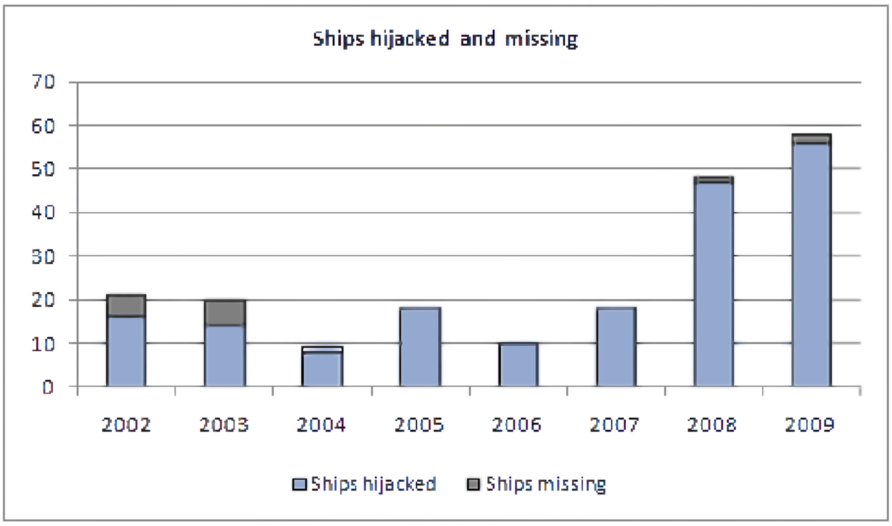
Dozens of countries have deployed warships to the region in a bid to eliminate the piracy menace. In a recent show of force, the Indian navy captured 61 Somali pirates on a hijacked ship off India's west coast. Five incidents were recorded for Nigeria and three attacks against vessels in Lagos. The International Maritime Bureau that said crews in the area were reporting increased violence, including one incident where all 27 crew members were injured.

Table 9 - Number of ships and lives lost due to piracy and armed robbery and number of such incidents against ships engaged on international voyages (2002-2009)

Year	Number of acts	Lives lost	Wounded crew	Missing crew	Crew hostage/ kidnapped	Crew assaulted	Ships hijacked	Ships missing
2002	383	6	38	99	125	86	16	5
2003	452	12	75	32	113	35	14	6
2004	330	29	60	44	147	145	8	1
2005	267	0	29	11	367	67	18	0
2006	254	17	23	0	224	225	10	0
2007	310	22	75	57	223	39	18	0
2008	330	6	22	38	773	21	47	1
2009	406	8	57	9	746	2	56	2

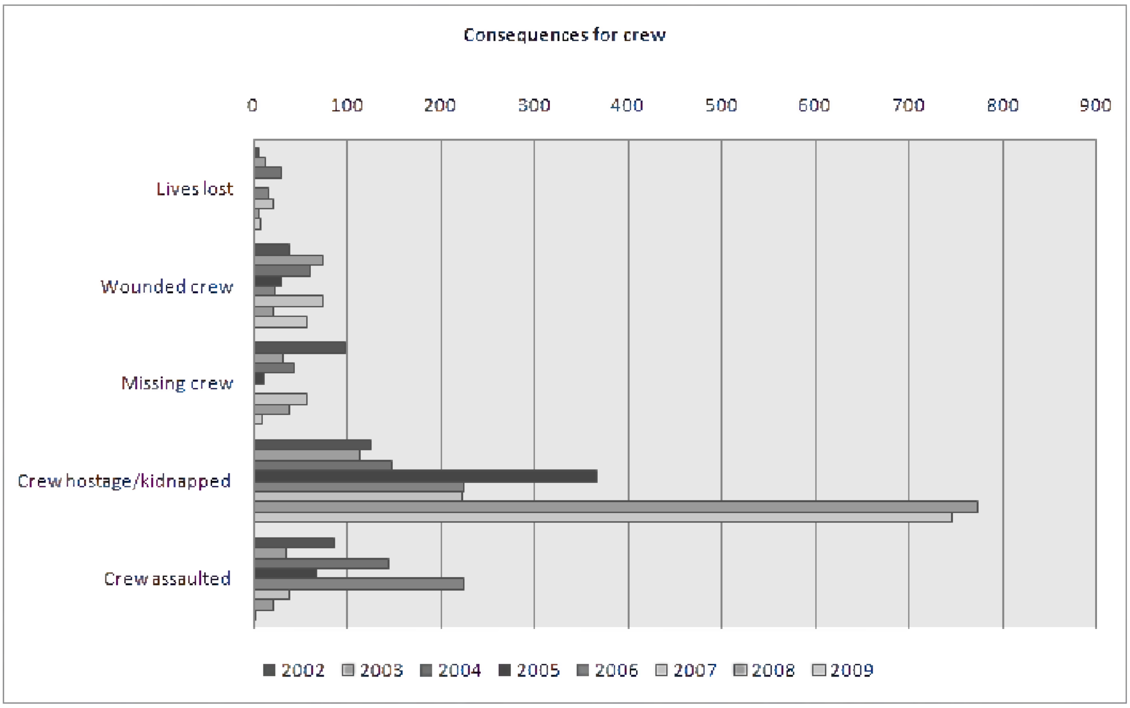
Source: IMO- GISIS Database (IMO Document C 105/3(a)/1)

Figure 7- Ships hijacked and missing (2002-2009)



Source: IMO- GISIS Database (IMO Document C 105/3(a)/1)

Figure 8 - Consequences for crew (2002-2009)



Source: IMO- GISIS Database (IMO Document C 105/3(a)/1)

6.2.1. Economic cost of piracy

The average ransom paid to release hostages and vessels has increased dramatically. In 2010, the average ransom for hijacked ships was $5.4 million, including a record $9.5 million paid in November for a South Korean oil tanker. This is up substantially from 2005 when the average ransom paid was about $150,000, according to oil industry analyst PIRA Energy Group.

Shipping lines protect themselves against piracy in a number of ways: by paying for kidnap-and-ransom insurance, which pays for the costs of negotiating and the ransoms demanded by pirates if their ships are hijacked; by paying a surcharge for operating ships in war-risk zones and also for the measures they have to install on their vessels to ward off pirates, such as safe rooms, high-pressure hoses, loudspeakers and searchlights. They also must pay for the additional fuel it takes to steam through those waters at high speed, or diverting their ships around the most dangerous zones. These costs come over and above the normal premiums carriers pay for hull insurance.

Ron Widdows, group president of Neptune Orient Lines and chairman of the World Shipping Council, stated at the April 2011 conference on piracy in Dubai that piracy costs the global shipping industry $3.5 billion to maybe upward of $8 billion a year.

Maersk Line expects its piracy-related costs to double in 2011 to $200 million to cover insurance premiums, hardship allowances and the rerouting of vessels away from high-risk zones in the region. Maersk has increased its piracy risk surcharges from $110 to $170 per 40-foot equivalent unit on containers moving between the Indian subcontinent, the Middle East, Europe and Central/South America.

The Oceans Beyond Piracy project estimates the total cost of piracy in 2010 (also including Naval forces, prosecutions, anti-piracy organizations and cost to regional economies) to be between $7 and $12 billion.

Table 10- Total cost of piracy

Cost Factor	Cost
Ransoms: (excess costs)	$148 million[3]
Insurance Premiums	$460 million to $3.2 billion
Re-Routing Ships	$2.4 to 3 billion
Security Equipment	$363 million to $2.5 billion
Naval Forces	$2 billion
Prosecutions	$31 million
Anit-Piracy Organizations	19.5 million[4]
Cost to Regional Economies	$1.25 billion
TOTAL ESTIMATED COST	**$7 to $12 billion per year**

3.We do not include actual ransom value paid, as this is covered by insurance costs below. 4. We do not include the annual UNODC budget ($5 million) in the total costs of piracy, as much of these funds are dedicated to improving the prosecutorial capacity of Kenya and the Seychelles, so are already accounted for in the cost of prosecutions. Source: www.oceansbeyondpiracy.org

To download a copy of the full report click here

6.2.2 Human cost of piracy

The economic cost of piracy is now well-known, but the extent of the human cost is much less well-known and understood. In addition to its study on the economic cost of piracy, the Oceans Beyond Piracy project published a new study in June 2011 entitled: The Human cost of piracy.

The study's findings indicate that during the course of 2010:

- 4185 Seafarers were attacked with firearms and Rocket Propelled Grenades.
- 342 Survived Incidents in Citadels (ships' reinforced security rooms).
- 1090 Seafarers were taken hostage.
- 516 Seafarers were used as human shields.
- The cost to the Somali community is also concerning. Piracy affects food security and endangers Somali youth.

6.3. Stowaways

The International Ship and Port Facility Security Code (ISPS Code) provides ships with procedures to prevent stowaways from boarding ships. According to the Standard Club, nearly 50% of stowaways come from West Africa. Stowaways are likely to be found in containerships and geared multipurpose ships in containers, car decks, trailers, engine-rooms, hold ventilation, under or near the stern, ballast tanks, rudder trunks and lifeboats. A significant number are also found on bulk carriers, car carriers, general cargo and ro-ro ships.

The IMO annual report on stowaway incidents reported to the Organization recorded 253 stowaway cases in 2010, involving 721 stowaways (FAL.2/Circ.121).

The statistics indicate that 136 stowaways travelled from the Mediterranean, the Black Sea and the North Sea region; 63 from West African countries; 25 from North and South America and the Caribbean region; and 12 from the Indian Ocean and East Africa region. According to the reports provided to the Organization, 485 stowaways embarked in unknown ports. It also appears, from the information reported that 8 stowaways requested political asylum, 4 escaped after being arrested and 8 boarded the ship dressed as stevedores. In 195 cases the stowaways were repatriated by authorities.

7. Shipping and the Environment

"I do not wish to see the maritime community stand accused of failing in its duty towards the protection and preservation of this beautiful planet, which, it seems to me, we have neglected for too long." Efthimios E. Mitropoulos, IMO Secretary-General in his speech on World Maritime Day, 2007

IMO, as the specialized agency of the United Nations with the responsibility for creating the industry's regulatory framework governing such matters, has been both a focal point and a driving force to regulate oil pollution, the use of harmful anti-fouling paint on ships' hulls, preparedness, response and co-operation in tackling pollution from oil and from hazardous and noxious substances; It also regulates the right of States to intervene on the high seas to prevent, mitigate or eliminate danger to their coastlines from pollution following a maritime casualty. IMO has also put in place a series of measures designed to ensure that the victims of pollution incidents can be financially compensated.

The MARPOL Convention remains the most important international treaty instrument covering the prevention of pollution by ships. It sets out regulations dealing with pollution from ships by oil; by noxious liquid substances carried in bulk; by harmful substances carried by sea in packaged form; by sewage; by garbage; and with the prevention of air pollution from ships.

The issue of ship recycling has also become a growing concern, not only from the environmental point of view but also with regard to the occupational health and safety of workers in that industry. In May 2007, IMO adopted a new Convention on the removal of Wrecks that may present either a hazard to navigation or a threat to the marine and coastal environments, or both.

Many reductions have been achieved by addressing the technical, operational and human-element issues and are all the more noteworthy when compared with the significant growth in the world's shipping industry – both the size of the world fleet and the distances that it travels. It has also been pressing hard to ensure that shore-based facilities keep up with international regulatory requirements, so that ships are not left in the position of being unable to operate in full compliance due to a lack of shore facilities.

Aside from MARPOL, IMO's environmental work in recent years has covered a remarkably broad canvas, embracing everything, from the management of ships' ballast water and the removal of shipwrecks from the seabed to the prohibition of certain toxic substances in ships' anti-fouling systems. Other IMO Conventions deal with issues such as preparedness, response and co-operation in tackling pollution from oil and from hazardous and noxious substances; the right of States to intervene on the high seas to prevent, mitigate or eliminate danger to their coastlines or related interests from pollution following a maritime casualty; and the safe and environmentally-friendly recycling of ships that have reached the end of their lifetimes. Furthermore, IMO has developed a comprehensive range of measures aimed at ensuring that proper compensation is available for the victims of marine pollution incidents involving ships.

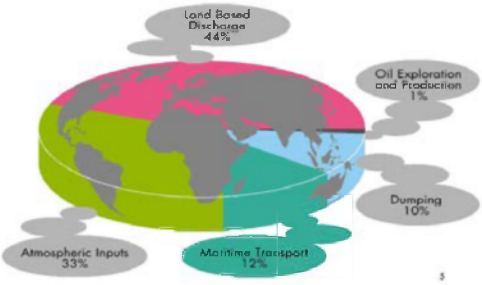
The Organization is also tackling potentially "new" inputs that ships may have on marine biodiversity, such as the transfer of invasive species through ships' biofouling; or the effects of underwater noise from ships on living sea creatures; and even ship strikes on cetaceans. And it is only right that we should always be thinking proactively about improving shipping's environmental performance and about how to make it part of the solution to any adverse impacts that may be indentified in the future.

7.1. Pollution from land-based activities

Estimates by GESAMP (the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection) suggest that land-based discharges – such as sewage, industrial effluent and urban/river run off, together with atmospheric inputs from land industry sources – accounted, in 1990, for some 77 per cent of marine pollution generated from human activities, while maritime transport was estimated to be responsible for some 12 per cent of the total.

When drawing on the latest available estimates (2002) by UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, some 80 per cent of the pollution in the world's oceans originates from land-based activities, with the maritime sector representing just 10 per cent of human sources of marine pollution – a two per cent decrease from the aforementioned 1990 figure, which is not as negligible as it might appear when considered against the increase in shipping operations during the intervening years.

Figure 9- Overview of Total Sea-Pollution



Source: Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP)

7.2. Discharges of wastes that are generated on land and disposed of at sea

Dumping at sea of waste generated on land and loaded on board specialized dumping vessels had been carried out for several years by industrialized countries before international rules to prevent marine pollution from this practice entered into force in 1974: the Oslo Convention for the North-East Atlantic and in 1975 the London Convention 1972 for marine waters worldwide other than the internal waters of States.

The London Convention 1972 is an international treaty that limits the discharge of wastes that are generated on land and disposed of at sea. Currently there are 86 Parties to the Convention (i.e., States that have signed, ratified, and otherwise acceded to it).

The 1996 Protocol is a separate agreement that modernized and updated the London Convention, following a detailed review that began in 1993. The 1996 Protocol entered into force 24 March 2006 and will eventually replace the London Convention. So far, 38 States have acceded to the 1996 Protocol Parties to the Protocol. States can be a Party to either the London Convention 1972, or the 1996 Protocol, or both

7.2.1. Dumping in relation to other sources of pollutants in the oceans

The relative contribution of dumping to the overall input of potential pollutants in the oceans is estimated at 10%. The main sources of such inputs are: Run-off and land-based discharges (44%), land-based discharges through the atmosphere (33%), followed by Maritime transportation (12%). Offshore productions contributes 1%. The following trends can be distinguished, based on reports by Contracting Parties to the Office of the London Convention 1972:

Industrial waste

Ocean dumping of industrial waste was - until recently - an accepted practice of waste disposal in many regions of the world. In the 1970s the quantity of industrial wastes dumped rose from 11 million to 17 million tons corresponding to an increase of Contracting Parties from 23 to 43. Since the early 1980s the quantity decreased and stabilized at about 8 million tons. For the period 1992 - 1995 the total quantity dumped varied from 4.5 million to 6 million tonnes, most of which was dumped by Japan and the Republic of Korea. The overall reduction has been achieved by switching to alternative disposal methods, to re-use of wastes and to cleaner production technologies. Reports by Parties on dumping permits issued since 1996 indicate that no permits for dumping of industrial waste have been issued. However, these reports have led questions concerning interpretation of the ban, which are being discussed

Sewage sludge

In the 1970s the annual amount of sewage sludge dumped at sea increased from 12.5 to 17 million tons, and then decreased to 14 million tons in 1985. From 1986 quantities remained at a steady level of about 20 million tonnes, before falling to 12 million in the early 1990s, reflecting the phase out of this practice by several countries. From 1992 - 1994 the total annual quantity dumped rose again from 12,5 to 16,25 million tonnes. Currently, only three Contracting Parties dump sewage sludge at sea: Japan, Philippines and Republic of Korea. Ireland and the United Kingdom phased out dumping of sewage sludge by the end of 1998. The main alternatives used are incineration, deposit on land and agricultural use.

Dredged material

The amount of dredged material annually dumped in Convention waters varies between 150 and 400 million tonnes. Dumping of these materials in internal waters adds another 100 - 150 million tonnes annually. Yearly fluctuations occur due to the variation in maintenance dredging and new works associated with shipping activities, or with exceptional projects such as the huge dredging activities in recent years in connection with the extension of the airport of Hong Kong, China. Probably two-thirds of the material is connected with maintenance operations to prevent that harbours, rivers and other waterways are silting up. Approximately 10% of the dredged material is moderately to heavily contaminated from a variety of sources including shipping, industrial and municipal discharges, and land run-off.

Dredged material has always had a special position under the Convention. About 70% of all dumping permits notified to the Office for the London Convention 1972 concerned dredged material. This percentage rose to 80 - 85% following the cessation of incineration at sea and the ban on dumping of industrial waste. Specific guidance has been developed for dredged material.

Incineration at sea

Incineration at sea, mostly of liquid chlorinated hydrocarbons as well as other halogenated compounds, started in the late 1960s and focused on wastes generated in Western Europe and the United States. From the mid 1970s to the late 1980s the annual amount of wastes incinerated at sea was about 100.000 tonnes. Since 1987 a steady decline can be observed and as a result of decisions made in the late 1980s this practice was phased out in early 1991, followed by the decommissioning of the last incineration vessel.

Radioactive wastes

Dumping of high-level radioactive wastes has never been allowed under the London Convention. Since 1983 a moratorium on the dumping of low-level radioactive wastes has been in place pending the completion of scientific and technical studies as well as studies on the wider political, legal, economic and social aspects of radioactive waste dumping. Following completion of these studies, the Parties agreed in 1993 to amend the Annexes I and II to the London Convention to ban the dumping of all radioactive wastes. This legally binding prohibition entered into force on 20 February 1994.

Other waste categories

Other categories of wastes dumping of which is reported annually to IMO include inert, geological materials such as mine tailings (varying from 1.5 to 7 million tonnes annually); decommissioned vessels of all kinds and sizes and fish waste (about 50,000 - 100,000 tonnes annually.

Enforcement

The provisions set out in Article VII of the Convention cover a wide range of measures for its enforcement. However, the basic thrust of these provisions is that each coastal State has a duty to enforce the Convention within its jurisdiction. Responsibility for enforcement on the high seas lies primarily with the State where the dumping vessel is registered (i.e., the flag State). In this context enforcement means verification that no illegal dumping operations are carried out and that conditions set out in dumping permits are met, including that the waste is dumped at the selected site and not somewhere else.

7.3. Pollution from sea-based activities

The 2007 GESAMP study "Estimates of Oil* Entering the Marine Environment from Sea-based Activities" provides the following estimated average inputs of oil entering the marine environment, in metric tonnes per year, from ships and other sea-based activities; these are based on the most recent 10 year period of data available (1988-97): "oil" as defined in MARPOL 73/78, annex I, i.e. oil means petroleum, in any form including crude oil, fuel oil, sludge oil refuse and refined products (other than petrochemicals).

Table 11 - Distribution of pollution from seabed activities

	Tonnes/year
Ships	457,000
Offshore exploration and production	20,000
Ships plus offshore	477,000
Coastal facilities	115,000
Ships plus offshore plus coastal facilities	592,000
Small craft activity	53,000
Natural seeps	600,000
Unknown (unidentified sources)	200
Grand total	**1,245,2000**

Operational discharges from ships make up 45% of input of 457,000 tonnes/year (ships), followed by shipping accidents at 36 % of the input. Fuel oil sludge from vessels is the major routine operational input (186,000 tonnes/year), or 68% of ship operational inputs.

Oil tankers, which are often identified as being major routine polluters, account for 10.3% of ship inputs as tank washings and oil in ballast waters, an operational input. However, tanker and barge accidents are a major input (158,000 tonnes/year). Ship accidents are a major input still, even with the decline of large spills from tankers in recent years

(Source: GESAMP-(IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP Joint Group of experts on the Scientific Aspects of Marine Environmental Protection) 2007. Estimates of Oil Entering the Marine Environment from Sea-based Activities. London, International Maritime Organization, 2007 Reports and Studies GESAMP No 75, 96pp) ISBN 978-92-801-4236-5

(N.B from GESAMP: Few countries and organizations have reliable databases, thus this report relies heavily on data available in the North Sea region and for North America).

Deep water Horizon

Although it was not shipping-related, the devastating loss of 11 lives and the impact of the Deepwater Horizon oil spill had on the marine environment and on the ecosystem and wildlife of the Gulf was met with immense sadness by the maritime community.

IMO has asked that the report of the investigation into it be submitted to IMO so that the Organization might move swiftly to introduce, into the regulatory regime of the Organization, whatever lessons might be learned from it in order to enhance safety and environmental protection in the offshore industry and strengthen, should that prove necessary, the provisions of any relevant IMO instrument.

7.4. Ship-generated water pollution

Industry figures show that in 2009 goods loaded at ports worldwide are estimated to have reached 7.8 billion tons; seaborne shipments of crude oil amounted to 1.72 billion tons and world shipments of petroleum products amounted to 924.6 million tons. *(Source: UNCTAD Review of Maritime Transport, 2010, p 8).*

Measures introduced by IMO have helped ensure that the majority of oil tankers are safely built and operated and are constructed to reduce the amount of oil spilled in the event of an accident. Operational pollution, e.g. from routine tank cleaning operations, has also been cut.

Despite the rare major accident, which can cause a spike in the annual statistics, the overall trend demonstrates a continuing improvement, both in the number of oil spills and quantity of oil spilled each year. The biggest single "decade-to-decade" reduction in oil spills was from the 1970s to the 1980s, coinciding with the adoption and entry into force of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto MARPOL 73/78 which is rightly credited with having had a substantial positive impact in decreasing the amount of oil that enters the sea from maritime transportation activities. The International Convention for the Safety of Life at Sea (SOLAS), 1974 also includes special requirements for tankers.

The amount of oil spilt at sea today bears no comparison with the levels of twenty or even ten years ago, accidents involving tankers causing serious pollution still happen from time to time. There is also concern about continuing instances of deliberate non-compliance, whereby a small minority of ship officers flout company procedures and MARPOL pollution prevention rules, despite the million-dollar fines being imposed on parties found guilty of such malpractices.

7.4.1. Numbers of spills and quantity of oil spilt

Figure 10- Numbers of large spills (over 700 tonnes) 1970-2010

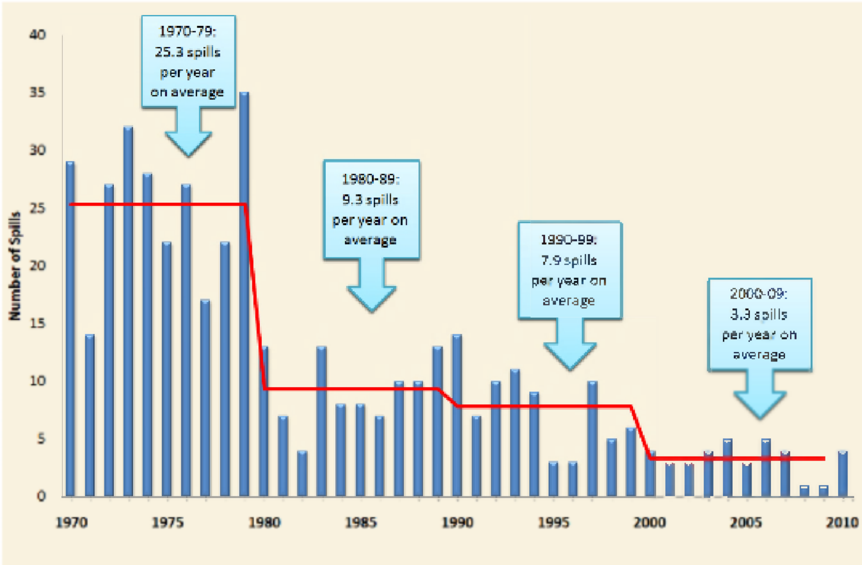
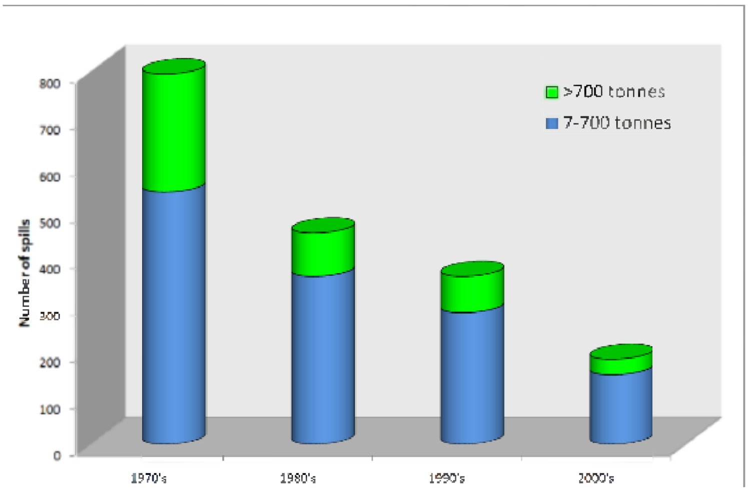


Figure 11 - Number of medium sized (7-700T) and large (>700T) spills per decade from 1970-2010



Source: ITOPF Annual Statistics

The incidence of large spills is relatively low and detailed statistical analysis is rarely possible, consequently emphasis is placed on identifying trends. Thus, it is apparent from Figure 11 above that the number of large spills (>700 tonnes) has decreased significantly during the last 41 years. The average number of major spills per year for the previous decade (2000-2009) is just over three, approximately eight times less than for the 1970s. Looking at this downward trend from another perspective, 55% of the large spills recorded occurred in the 1970s, and this percentage has decreased each decade to 7% in the 2000s

For 2010, four large spills were recorded. Whilst this is an increase on the figures for 2008 and 2009, this represents a minor deviation from the average of 3.3 spills per year in the 2000s as a whole. Four medium spills were also recorded in 2010, representing the lowest annual figure recorded for this category. The total of all spills over 7 tonnes for 2010 shows no change against 2009 and is a significant reduction compared to the average for the previous decade.

A decline can also be observed with medium sized spills (7-700 tonnes. The average number of spills in the 2000s was close to 15, whereas in the 1990s the average number of spills was almost double this number.

It may be noted that the ITOPF figures above do not include operational discharges, whereas those of GESAMP above do, providing a broader picture. Even so, the addition of operational discharges (based *on estimates) raises the ratio of oil discharged into sea, when compared to the total quantity to an estimated 0.018%, the estimated ratio remains minimal.*

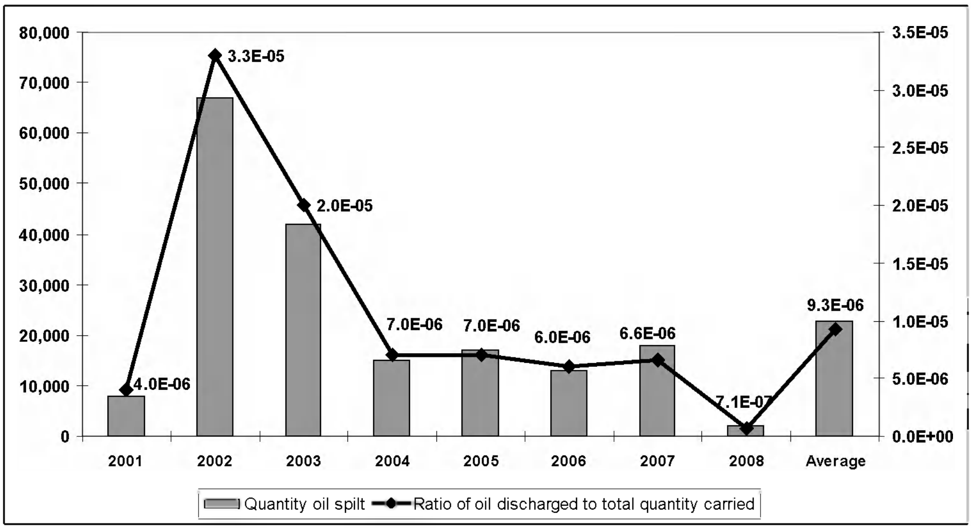
The tables and figures in this section are taken from the latest IMO document on performance indicators [C 105/3(a)/1]

Table 12 - Ratio of oil discharges into the sea to total carried by sea (2003-2008)

	2003	2004	2005	2006	2007	2008
Annual quantity of oil spilt (tonnes)	42,000	15,000	17,000	13,000	18,000	2,000
Annual quantity of oil carried by sea (million tonnes)	2,345	2,470	2,556	2,644	2,719	2,798
Ratio	2.0E-05	7.0E-06	7.0E-06	6.0E-06	6.6E-06	7.1E-07

Source: ITOPF Annual Statistics[2] *and Clarkson's Shipping Intelligence Network*

Figure 12 - Comparison of Quantity Spilled with Quantity of oil carried (2001-2008)



Source: ITOPF Annual Statistics/Clarkson's Shipping Intelligence Network, Average is from 2001 to 2008

To provide better visualization, a few examples of graphs are given below based on a system developed by ITOPF which distinguishes between vessel movements and substances spilled and plots them in the areas where they were spilled. The first graph shows spills by vessel type and area. The second one combines vessel movements with the top 100 tanker accidents and the third graph divides spills into the types of substances spilled such as bunkers; cargo fuel oil; cargo crude oil; HNS cargo; non-persistent cargo; no spill; and unknown.

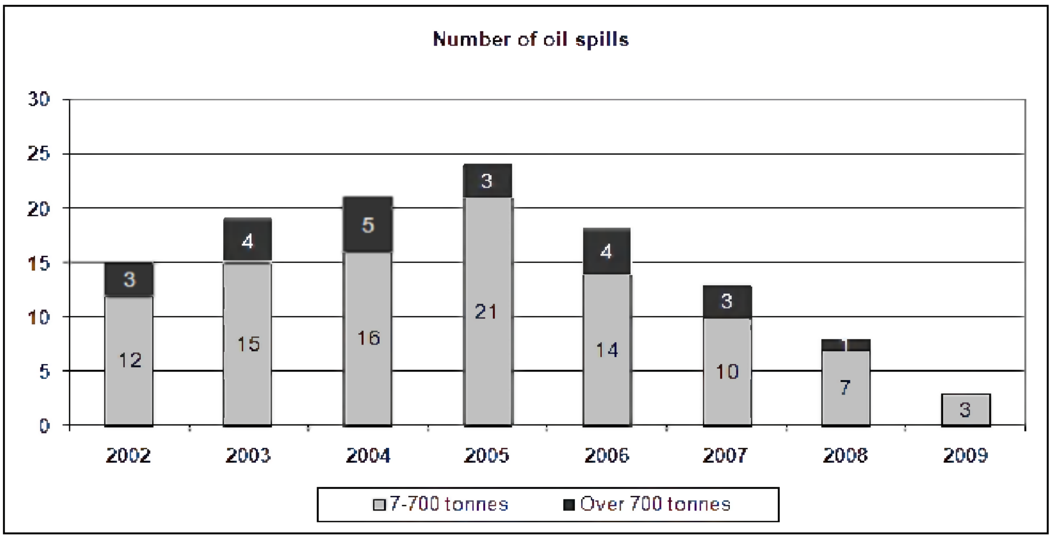
Table 13 - Number of spills occurring from ships subject to IMO instruments (2002 – 2009)

	2002	2003	2004	2005	2006	2007	2008	2009
Nr. oil spills over 7 tonnes but less than 700 tonnes	1	15	16	21	14	10	7	3
Nr. oil spills over 700 tonnes	3	4	5	3	4	3	1	0
Total	**15**	**19**	**21**	**24**	**18**	**13**	**8**	**3**

Source: ITOPF

Figure 13 - Number of oil spills (2002-2009)

[2] Note: the higher incidence of oil spilt in 2002 may be ascribed to one casualty, namely, the oil tanker *Prestige*, which sank off Spain spilling 63,000 tonnes.



Source: ITOPF

Figure 14 - Annual quantity of oil spilt over 7 tonnes, 1970-2010

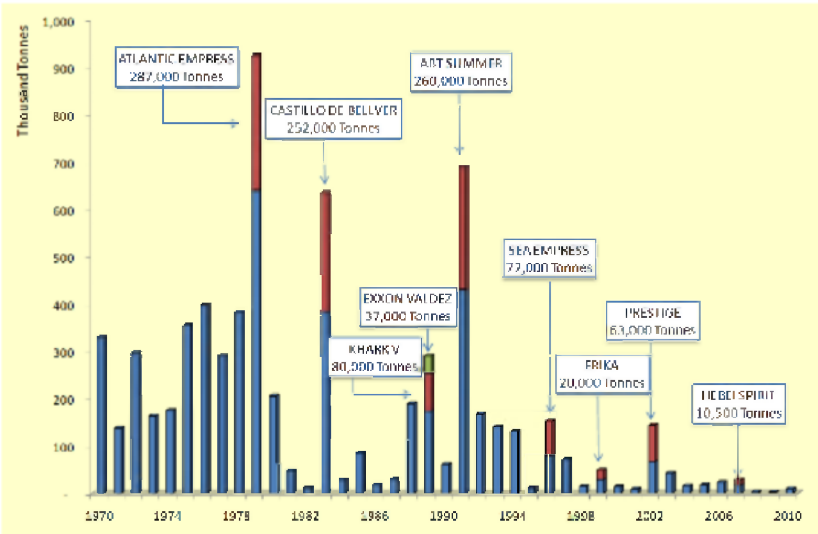


Table 14 - Ratio of oil (cargo and bunkers) discharged into the sea, to total quantities carried by sea (2002-2009)

	2002	2003	2004	2005	2006	2007	2008	2009
Annual quantity of oil spilt (tonnes)	67,000	42,000	15,000	17,000	13,000	18,000	2,000	100
Annual seaborne trade - crude oil (million tonnes)	2,210	2,345	2,470	2,556	2,644	2,719	2,798	2,805
Ratio	3.3E-05	2.0E-05	7.0E-06	7.0E-06	6.0E-06	6.6E-06	7.1E-07	3.6E-08

Source: ITOPF Annual Statistics[3] and Clarksons Shipping Intelligence Network

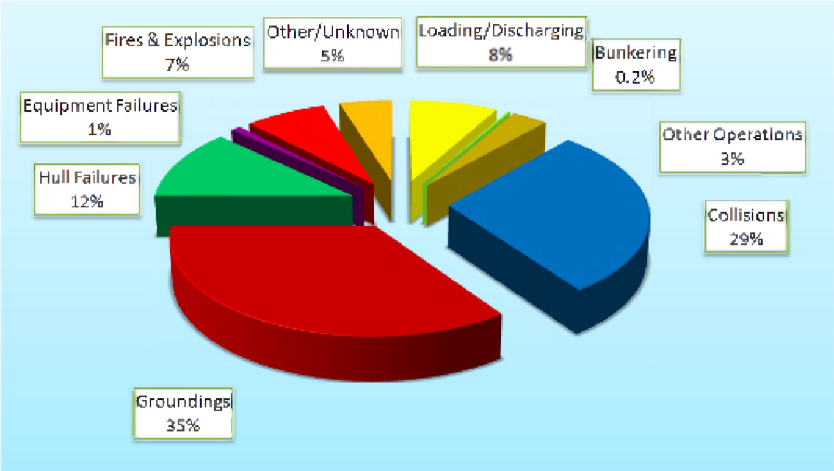
7.4.2. Causes of spills

Most spills from tankers result from routine operations such as loading, discharging and bunkering which normally occur in ports or at oil terminals; the majority of these operational spills are small, with some 91% involving quantities of less than 7 tonnes; accidental causes such as collisions and groundings

3 Note: the higher incidence of oil spilt in 2002 may be ascribed to one casualty, namely, the oil tanker **Prestige**, which sank off Spain spilling 63,000 tonnes.

generally give rise to much larger spills, with at least 84% of incidents involving quantities in excess of 700 tonnes being attributed to such factors.

Figure 15 - Incidence of spills >700 tonnes by cause, 1970-2010



Source: ITOPF Annual Statistics

7.4.3. Cost of oil spills

The cost of major oil spills varies considerably from one incident to another, depending on a number of factors: the type of oil, location of the spill and the characteristics of the affected area. Also crucial is the quality of the contingency plan and of the management and control of the actual response.

Cost data is published in the Annual Report of the International Oil Pollution Compensation Funds but this only concerns spills in States that are party to the Fund Conventions. Because the IOPC Fund only becomes involved in paying compensation once the total value of claims has exceeded the tanker owner's limit of liability under the Civil Liability Conventions, the IOPC data set tends to concern only the larger and more expensive spills. No spills in US waters are included in this data set, as the United States is not party to the Fund Conventions. American spill cost data is generally in the public domain and published on the internet, but such data is not representative of costs in other countries because of the uniqueness of the US response and damage assessment systems.

It is clear that there is no linear relationship between spill cost and size of tanker. ITOPF indicates that some of the most expensive spills have been caused by relatively small tankers. In these cases the most important factor has been the type of oil spilled. For example, both the *NAKHODKA (Japan, 1997)* and *ERIKA (France 1999)* spilled heavy fuel oil, which is highly persistent and covered a large area of coastline. The *NAKHODKA* compensation was settled at approximately US$219 million. Claims are still being processed for the *ERIKA* as at October 2010 payments had been made in respect of 5939 claims for a total of 129.7 million Euros.

7.4.4. Spills Response

When a spill occurs, it is necessary to ensure that effective and co-ordinated response mechanisms are in place and an adequate liability and compensation regime is available to recompense those affected. IMO's International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (OPRC1990) provides the framework for facilitating international co-operation and mutual assistance in preparing for and responding to major oil pollution incidents.

Some eighteen years on, with 102 contracting parties representing 68.74% of the world's tonnage, OPRC 1990 is widely considered to be a great success. Under the provisions of the HNS Protocol, which entered into force in June 2007, this regulatory framework has been extended to cover releases of hazardous and noxious substances.

7.4.5. Hazardous and noxious substances (HNS) spills

The wrecking of the chemical tanker the *Ievoli Sun* in the Channel in 2000 highlighted the danger involved in chemical tanker accidents. From 14 June 2007, ships flying the flag of a Party to the OPRC-HNS Protocol must carry a pollution emergency plan to deal specifically with incidents involving hazardous and noxious substances, such as chemicals.

This requirement is one of a list of measures included in the *Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances* *(OPRC-HNS Protocol).* of 2000, which entered into force on 14 June 2007.

The Protocol defines HNS as substances other than oil, which, if introduced into the marine environment, have the potential to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

States which are party to the OPRC-HNS Protocol are required to establish a national system for responding to HNS, including a designated national authority, a national operational contact point and a national contingency plan. This needs to be backstopped by a minimum level of response equipment, communications plans, regular training and exercises.

States must also provide assistance, to the extent possible and feasible, to other States in the event of a pollution emergency. There is a provision for the reimbursement of any assistance provided. States should also try to conclude bilateral or multilateral agreements on preparedness for, and response to, pollution incidents involving HNS.
IMO has developed a wide array of tools including model training courses, manuals and guidance documents to assist countries in developing their capacity for dealing with incidents involving HNS and meeting their obligations under the Protocol. States may also request assistance from IMO, through its Integrated Technical Co-operation Programme, in meeting these obligations and in implementing the provisions of the Protocol. Statistical information on releases of HNS goods is scarce.

Examination of the data for the period from January 2006 to March 2011 indicates that of the 220 incidents involving 234 HNS products that cause or have the potential to cause pollution, 119 of these involved products in bulk. An additional 78 involved products in packaged form, while 35 could not be determined due to insufficient data. Figure 16 displays the percentage of incidents by package type.

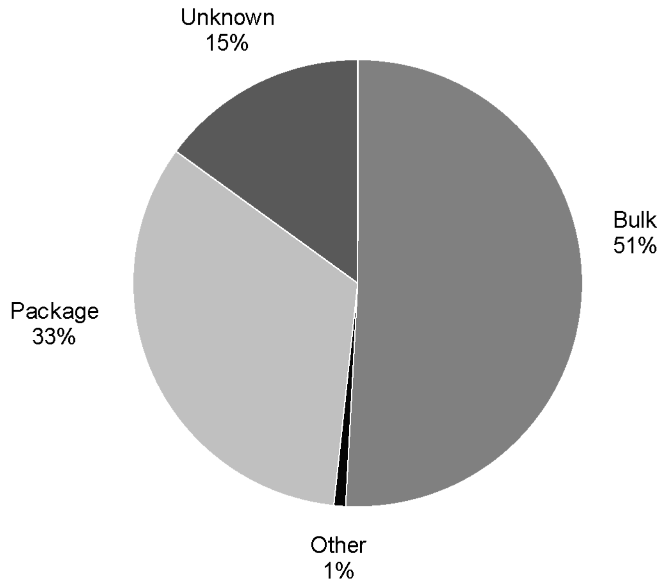
Table 15 below provides a summary analysis of the incidents involving HNS products in bulk, where sufficient information exists to characterize the behaviour of the chemical when spilled at sea, based on the behaviour classification system for bulk chemicals spilled at sea, as outlined in IMO's Manual on chemical pollution: Section I and in the revised GESAMP Hazard evaluation procedure for chemical substances carried by ships (GESAMP Reports and Studies 64).

Table 15 – HNS Incidents by product behaviour category (2006-2011)

Behaviour of Package or Cargo		**Number of incidents by behaviour category**	**% of incidents by behaviour category**
Dissolvers	D	39	17
Dissolver-evaporator	DE	18	8
Evaporator	E	9	4
Floater	F	3	1
Floater dissolver	FD	1	0.4
Floater-evaporator	FE	12	5
Floater-evaporator-dissolver	FED	1	0.4
Persistent floaters	Fp	16	7
Gas	G	16	7
Gas-dissolver	GD	2	1
Sinker	S	8	3
Sinker-dissolver	SD	2	1
Unknown	Unknown	107	46

Source : IMO Document MEPC/OPRC-HNS/TG 12/5

Figure 16 - Percentage of HNS incidents by package type

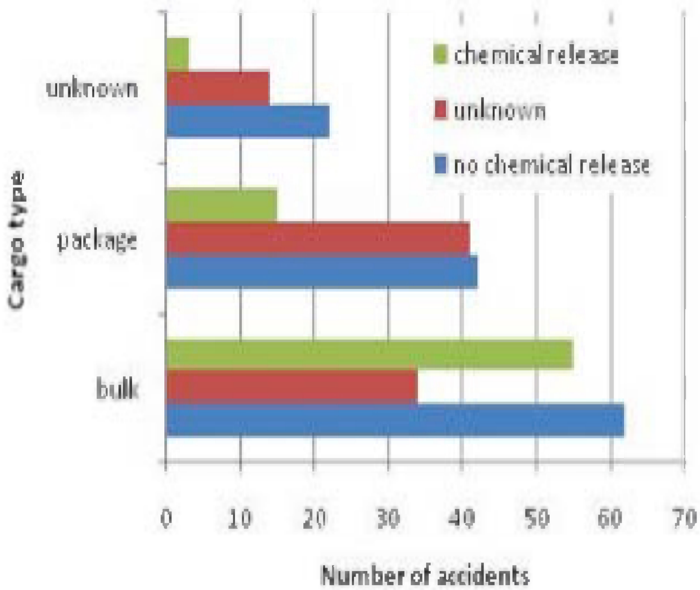


Source : IMO Document MEPC/OPRC-HNS/TG 12/5

The International Spill Control Organization (ISCO) has analysed 291 HNS accidents that have occurred in the past. Of these, 25% led to an actual chemical release and 16% led to loss of packaged goods.

Figure 17 shows the results of the incidents by cargo type. Most of the reported cases involve ships carrying bulk goods (52%).

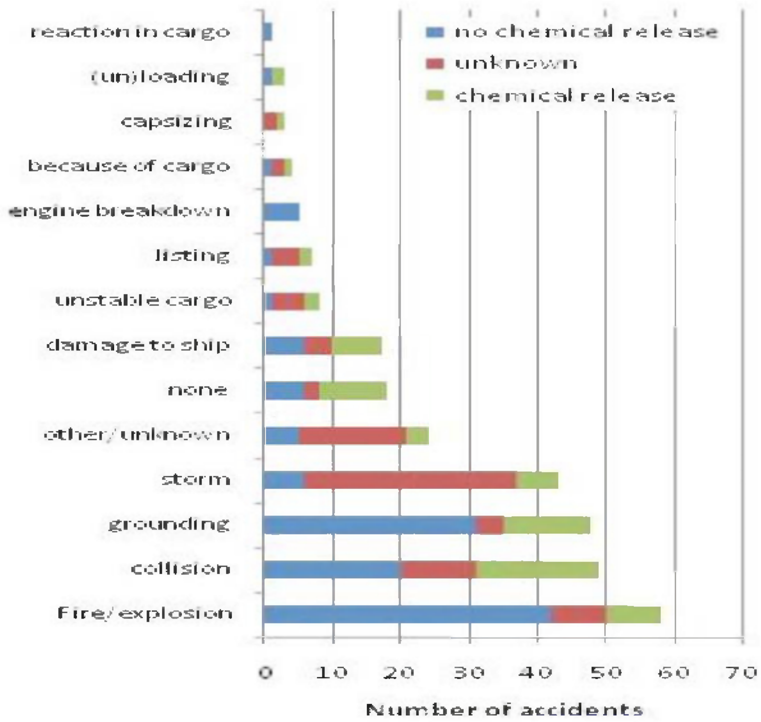
Figure 17 - HNS incidents by cargo type



Source: International Spill Control Organization (ISCO) see MEPC/OPRC-HNS/TG 12/5/6

Figure 18 below shows the main causes of incidents involving HNS. As can be seen, fire/explosion is the most common cause that resulted in distress situation. However, only a small fraction of these cases led to a release of HNS goods (8 of 58 cases led to a spill).

Figure 18 - HNS incidents by cause

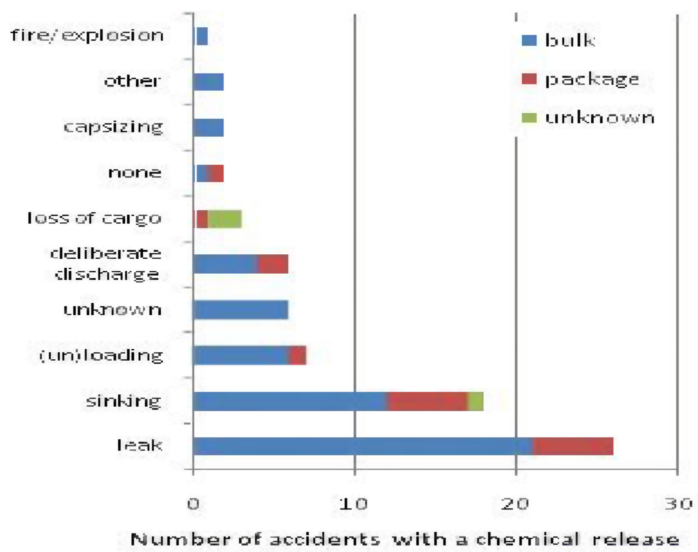


Source: International Spill Control Organization (ISCO) see MEPC/OPRC-HNS/TG 12/5/6

Most cases, in which the distress situation actually led to a spill, resulted from a collision (a chemical release has occurred following a collision in eighteen cases). Groundings are also a frequent cause, with 21 of 106 recorded cases leading to a spill.

The spill causes for the 73 cases that actually led to a release of HNS substances are shown in figure 19. Distinction was made between packaged goods and bulk goods.

Figure 19 - HNS Incidents involving a release of HNS by cause



Source: International Spill Control Organization (ISCO) see MEPC/OPRC-HNS/TG 12/5/6

It is clear that a leak is the most common way for HNS substances to be released into the marine environment, representing 36% of the incidents involving some kind of release of HNS. Sinking of a ship also accounts for a substantial percentage (25%) of the number of spills.

Most of the recorded accidents involved general cargo ships. Most chemical releases are the result of distress situations with chemical tankers.

A study by the European Maritime safety Agency (EMSA) of HNS releases in European countries identified one hundred incidents from 1987 to 2006, almost half of which resulted in an HNS release.

The majority were in the Mediterranean Sea (40%), North Sea (22%) and Channel (20%) probably as a reflection of the volume of HNS trade in these areas.

A recent study conducted by France's Centre of Documentation Research and Experimentation on Accidental Water Pollution (Cedre) on HNS transportation accidents and the risks of chemical spills at sea (1917-2009). The study was based on data from Cedre's own database, as well as data from IMO, the European Maritime Safety Agency (EMSA) and the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC). Analysis of the results showed the number of HNS incidents, after a period of relative stability between 1963 and 2005, has risen sharply over the past several years. This is believed to be mainly due to increased shipping and a better information network, resulting in improved incident reporting and information sharing. Notwithstanding this increase, such accidents are more efficiently managed than in the past, with 50 per cent of accidents occurring today resulting in a spill, compared to practically twice as many in the past. This can partly be explained by the decrease in average ship age, as well as an improvement in spill prevention procedures.

The main causes of HNS accidents were shown to be adverse weather conditions (17%) and structural damage (16%), followed by collisions (14%) and groundings (14%). Often, the latter two categories of navigational errors are the result of not adhering to established shipping routes or a lack of communication. In fifth place, we find explosion and fire (11%), and finally errors during loading and unloading operations (6%).

Table 16- Top ten most spilled HNS substances

The top ten most spilled substances were calculated by weighing the frequency by the quantity spilt, resulting in the following ranking:

1	iron ore
2	sulphuric acid
3	caustic soda
4	fertilisers
5	cereals
6	ammonium nitrate
7	phosphate
8	coal
9	sulphur
10	vegetable oils

Source: MEPC/OPRC-HNS/TG 12/5/3

The statistics showed that 51% of accidents involved bulk substances (solids and liquids), and 47% involved packaged substances (containers, drum, etc.), while the remaining 2% was unknown. In addition to the threat of an HNS spill in the event of an incident, the release of the ship's bunker fuel must also be considered. In this case, two distinct response strategies will be implemented.

7.4.6. Liability and compensation

Over the years, the IMO has put in place a comprehensive set of regulations covering liability and compensation for damage caused by oil transported by ship, through which the shipping industry (in conjunction with oil importers) provides automatic cover of up to US$1.2 billion for any single incident, regardless of fault.

This tiered system of compensation includes the 1992 Civil Liability Convention, the 1992 Fund Convention and the 2003 Supplementary Fund Protocol, which collectively provide more coverage than ever before to those affected by oil spills.

The International Convention on Civil Liability for Bunker Oil Pollution Damage and the HNS Convention (and its 2010 Protocol), once in force, will together serve to complete this framework by respectively establishing liability and compensation regimes for damage caused by spills of oil when carried as fuel in ships' bunkers and from spills involving hazardous and noxious substances.

7.5. Ship-generated air pollution

The shipping industry is a relatively small contributor to the total volume of atmospheric emissions compared to road vehicles and public utilities, such as power stations. Atmospheric pollution from ships has reduced in the last decade mainly due to significant improvements in engine efficiency. Improved hull design and the use of ships with larger cargo carrying capacities have also led to a reduction in emissions and an increase in fuel efficiency.

As a result of technological developments and associated industry initiatives, a modern container ship is using only a quarter of the energy per cargo unit than another container ship did in the 1970s, although the former may well dwarf the latter in size and carrying capacity.

A modern large crude oil tanker (VLCC) for example, is able to transport the same amount of cargo twice the distance as of 20 years ago using the same amount of energy. Marine diesel engines, the prime mover of the world merchant fleet, has undergone similar efficiency improvements and modern engines installed today use about 10 to 15% less fuel per kilowatt-hour as compared with engines installed 20 years ago.

The *Aniara*, one of the world's largest car and truck carriers (LCTC),built at Daewoo Shipbuilding & Marine Engineering in the Republic of Korea for Wallenius Wilhelmsen Logistics (WWL), is considered as the most environmentally friendly vessel of its type. Overall emissions of the *Aniara* are said to have been reduced by more than 20% per transported unit compared with older designs, partly by increasing cargo capacity by using a single-pillar internal design. It is claimed that carbon-dioxide (CO2) emissions have been cut by 15% per transported unit, as well as reductions in sulphur oxide (SOx) and particulate matters. Nitrogen-oxide (NOx) emissions are said to be 35% below current international regulations. The main engine can use bunkers with sulphur content as low as 1%.

Annex VI of the MARPOL Convention, which entered into force in 2005, sets limits on SOx and NOx emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances.

In October 2008, the Marine Environment Protection Committee (MEPC) adopted at its 58th session (MEPC 58) amendments to MARPOL Annex VI and the revised Annex VI entered into force on 1 July 2010.

The main changes are a progressive reduction in SOx emissions from ships, with the global sulphur cap reduced initially to 3.50% (from the current 4.50%), effective from 1 January 2012; then progressively to 0.50 %, effective from 1 January 2020, subject to a feasibility review to be completed no later than 2018.

The limits applicable in Sulphur Emission Control Areas (SECAs) have been reduced to 1.00% since 1 July 2010 (from the previous 1.50 %); being further reduced to 0.10 %, effective from 1 January 2015.

Progressive reductions in NOx emissions from marine engines were also agreed, with the most stringent controls on so-called "Tier III" engines, i.e. those installed on ships constructed on or after 1 January 2016, operating in Emission Control Areas (ECA).

The revised MARPOL Annex VI allows for an ECA to be designated for SOx and particulate matter, or NOx, or all three types of emissions from ships, subject to a proposal from a Party or Parties to the Annex, which would be considered for adoption by IMO, if supported by a demonstrated need to prevent, reduce and control one or all three of those emissions from ships.

Next to the Baltic and North Sea areas, the latter also including the English Channel, the East and the West Coast of the United States and Canada, including the inhabited Hawaii Islands, have been designated as ECAs. A new North American ECA, for SOx, nitrogen oxide (NOx) and particulate matter was adopted by IMO in March 2010. The regulations to implement this ECA are expected to enter into force in August 2011, with the ECA becoming effective from August 2012.

The revised measures are expected to have a significant beneficial impact on the atmospheric environment and on human health particularly that of people living in port cities and coastal communities.

7.5.1. Overview of greenhouse gas emissions from ships

In June 2000, the IMO "Study on Greenhouse Gas Emissions from Ships"[4] presented a comprehensive assessment of the contribution made by international shipping to climate change.

A Second IMO GHG Study was published in 2009, which is the most comprehensive and authoritative assessment of the level of greenhouse gas (GHG) emitted by ships, as well as of the potential for GHG reduction. It also evaluates the different policy options for control of GHG emissions from ships currently under consideration within IMO and other organizations.

MEPC 59 noted that the Second IMO GHG Study 2009 came to the following main conclusions, as outlined in its executive summary:

- **International shipping was estimated to have emitted 870 million tonnes, or about 2.7% of the global emissions of CO2 in 2007.**
- Exhaust gases were the primary source of emissions from ships. CO2 was the most important GHG emitted by ships. Both in terms of quantity and of global warming potential, other GHG emissions from ships were less important.
- Mid-range emissions scenarios showed that, by the year 2050, in the absence of regulations, ship emissions could grow by 200% to 300% (compared to the emissions in 2007) as a result of the expected growth in world trade.
- A significant potential for reduction of GHG emissions through technical and operational measures had been identified. Together, if implemented, these measures could increase efficiency and reduce the emissions rate by 25% to 75% below the current levels. Many of these measures appeared to be cost-effective, although non-financial barriers may discourage their implementation.
- A number of policies to reduce GHG emissions from ships were possible. The report analysed options relevant to the current IMO debate. The report found that market-based measures were cost-effective policy instruments with a high environmental effectiveness. Such instruments captured the largest amount of emissions under the scope, allowed both technical and operational measures in the shipping sector to be used, and could offset emissions in other sectors.
- Shipping had been shown, in general, to be an energy-efficient means of transportation as compared to other modes.
- The emissions of CO2 from shipping would lead to positive "radiative forcing" (a metric of climate change) and to long-lasting global warming. In the shorter term, the global mean radiative forcing from shipping was negative and implied cooling; however, regional temperature responses and other manifestations of climate change may nevertheless occur. In the longer term, emissions from shipping would result in a warming response as the long-lasting effect of CO2 would overwhelm any shorter-term cooling effects.

If the climate was to be stabilized at no more than 2°C warming over pre-industrial levels by 2100 and emissions from shipping continue as projected in the scenarios that were given in the report, then they would constitute between 12% and 18% of the global total CO2 emissions in 2050 that would be required to achieve stabilization (by 2100) with a 50% probability of success.

7.5.2. Technical and operational reduction measures

MEPC 59 finalized a package of technical and operational measures to reduce GHG emissions from international shipping, aimed at improving the energy efficiency for new ships through improved design and propulsion technologies and for all ships, new and existing, primarily through improved operational practices. It approved to circulate Interim Guidelines on the Method of Calculation of the Energy Efficiency Design Index for New Ships (EEDI), the Interim Guidelines for Voluntary Verification of Energy Efficiency Design Index, the Guidance for the Development of a Ship Energy Efficiency Management Plan (SEEMP), and the Guidelines for Voluntary Use of the Energy Efficiency Operational Indicator (EEOI). In September/October 2010, MEPC 61 considered amendments to MARPOL Annex VI as a potential manner for introducing mandatory technical and operational measures into IMO's regulatory regime. Nine members, all Parties to MARPOL Annex VI, subsequently requested the Secretary General to circulate

[4] Norwegian Marine Technology Research Institute - Study of Greenhouse Gas Emissions from ships: Final report to the International Maritime Organization. Issue No 2-31 March 2000 / Submitted by the IMO Secretariat. Norway : Norwegian Marine Technology Research Institute, 2000- (IMO DOC. MEPC 45/8)
http://unfccc.int/files/methods_and_science/emissions_from_intl_transport/application/pdf/imoghgmain.pdf

the proposed amendments to MARPOL Annex VI to make mandatory for new ships, the EEDI and, for new and existing ships, the SEEMP. The text of the proposed amendments will be considered for adoption at MEPC 62.

The EEDI for new ships is intended to stimulate innovation and technical development of all elements influencing the energy efficiency of a ship from its design phase. The index would embrace some 72%of emissions from new ships – for larger ships the reduction factor from the reference line is agreed for three phases of five years from 1 January 2015, with the reduction requirements set to 10, 20 and 30% respectively. For smaller ships the reduction factor is to be linearly interpolated between the two percentage values for each phase (i.e. 0-10%, 10-20%, 20-30% respectively) dependent upon vessel size. The lower value of the reduction factor is to be applied to the smaller ship size.Large and small ship size is defined in terms of deadweight for each ship type that the EEDI applies to.

The SEEMP for all ships in operation (new and existing) incorporates best practices for fuel-efficient ship operation, as well as guidelines for voluntary use of the EEOI. The indicator enables operators to measure the fuel efficiency of a ship in operation and to gauge the effect of any changes in operation, e.g. improved voyage planning or more frequent propeller cleaning, or introduction of technical measures such as waste heat recovery systems or a new propeller. The Second IMO GHG Study 2009 indicates that a 20% reduction on a tonne-mile basis by mainly operational measures is possible and would be cost-effective even with the current fuel prices. The SEEMP will assist the shipping industry in achieving this potential.

7.5.3. Market-based mechanisms

The Committee recognized at MEPC 59 that the technical and operational measures would not be sufficient to satisfactorily reduce the amount of GHG emissions from international shipping in view of the growth projections of human population and world trade. The Committee therefore agreed by overwhelming majority that a market-based instrument was needed as part of a comprehensive package of measures for regulation of GHG emissions from international shipping. The Committee further agreed that any regulatory GHG regime applied to international shipping should be developed and enacted by IMO as the sole competent international organization with a global mandate to regulate all aspects of international shipping. As shipping is a global industry and ships are competing in a single global market, it must be regulated at the global level for the regime to be environmentally effective and to maintain a level playing field for all ships, irrespective of flag or ownership.

Also at MEPC 59, the Committee remarked that a market-based measure (MBM) would serve two main purposes: off-setting of growing ship emissions and providing a fiscal incentive for the maritime industry to invest in more fuel efficient ships and technologies and to operate ships in a more energy efficient manner. The Committee further noted that there was a general preference for the greater part of any funds generated by a MBM under the auspices of IMO, to be used for climate change purposes in developing countries through existing or new funding mechanisms under the UNFCCC or other international organizations.

In line with the work plan, Member States, Associate Members and observer organizations proposed possible MBMs to MEPC and, in turn, MEPC 60 established an Expert Group (EG) to undertake a feasibility study and impact assessment on the proposed measures.

The EG concluded in its report that all MBM proposals addressed GHG emission reductions, although the proposed means of doing so differed with some proposals focusing on in-sector reductions and others also utilising reductions in other sectors. Some proposals went beyond mitigation and suggested mechanisms to address the adverse effects of climate change. Moreover, the EG found that all proposals could be implemented notwithstanding the challenges associated with the introduction of new measures and possible negative impacts such as increases in freight costs. Some countries would be more negatively affected than others by these impacts. Some proposals tried to mitigate such negative impacts.

The EG Report was intended to enable the Committee to indicate, preferably at MEPC 61, which MBM should be further evaluated. However, despite the comprehensive and balanced MBM-EG Report no majority view prevailed. The Committee therefore agreed that an intersessional meeting of IMO's Working Group on Greenhouse Gas Emissions (GHG) from Ships should be held in March 2011.

The intersessional meeting made steady progress in considering the development of suitable MBMs. It held an extensive exchange of views on issues related to, inter alia, the desirability of MBMs providing: certainty in emission reductions or carbon price; revenues for mitigation, adaptation and capacity building activities in developing countries; incentives for technological and operational improvements in shipping; and offsetting opportunities. Based on such policy considerations, the Working Group then formulated advice to the MEPC 62, in accordance with its Terms of Reference, related to: the grouping of the MBMs; the strengths and weaknesses of the groups; their relation to relevant international conventions; and the aforementioned possible impacts.

The advice so formulated will now assist MEPC 62 to determine in July 2011, which MBMs to bring forward as a possible mandatory IMO instrument, so that the Committee can, in line with the MEPC 59 work plan, report progress to the twenty-seventh session of the Assembly.

7.6. Ship recycling

When ships reach the end of their working lives, recycling is undoubtedly the most environmentally friendly way to dispose of them. Many of the components and much of the steel is re-used in the countries where the ships are dismantled, in new ships and in other products. However, there are concerns about environmental and working conditions in ship recycling yards and in view of this, IMO took action to develop a realistic and effective solution to some of these concerns.

The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships (the Hong Kong Convention) is aimed at ensuring that ships, when being recycled after reaching the end of their operational lives, do not pose any unnecessary risk to human health and safety or to the environment.

The new Convention addresses all the issues around ship recycling, including the fact that ships sold for scrapping may contain environmentally hazardous substances such as asbestos, heavy metals, hydrocarbons, ozone-depleting substances and others. It addresses concerns raised about the working and environmental conditions at many of the world's ship recycling locations.

Regulations in the new Convention cover: the design, construction, operation and preparation of ships so as to facilitate safe and environmentally sound recycling, without compromising the safety and operational efficiency of ships; the operation of ship recycling facilities in a safe and environmentally sound manner; and the establishment of an appropriate enforcement mechanism for ship recycling, incorporating certification and reporting requirements.

Ships to be sent for recycling are required to carry an inventory of hazardous materials, which are specific to each ship. An appendix to the Convention provides a list of hazardous materials the installation or use of which is prohibited or restricted in shipyards, ship repair yards, and ships of Parties to the Convention. Ships are required to have an initial survey to verify the inventory of hazardous materials, additional surveys during the life of the ship, and a final survey prior to recycling.

Ship recycling yards are required to provide a "Ship Recycling Plan", to specify the manner in which each ship will be recycled, depending on its particulars and its inventory. Parties are required to take effective measures to ensure that ship recycling facilities under their jurisdiction comply with the Convention. A series of guidelines are being developed to assist in the Convention's implementation.

The Convention was open for signature by any State at the Headquarters of the Organization from 1 September 2009 to 31 August 2010 and now is open for accession by any State. It will enter into force 24 months after the date on which 15 States, representing 40 per cent of world merchant shipping by gross tonnage, have either signed it without reservation as to ratification, acceptance or approval or have deposited instruments of ratification, acceptance, approval or accession with the Secretary General.

Furthermore, the combined maximum annual ship recycling volume of those States must, during the preceding 10 years, constitute not less than 3 per cent of their combined merchant shipping tonnage.

7.7. Ballast water management

Shipping transfers approximately 3 to 5 billion tonnes of ballast water internationally each year. A similar volume may also be transferred domestically within countries and regions each year.

All ships need to carry ballast water to keep them stable in the water. Taking on ballast water and discharging it must be carefully controlled to ensure the safety of the vessel and the seafarers on board. But there is another challenge – the taking up of ballast water from one part of the world and discharging it elsewhere can introduce invasive aquatic species, such as zebra mussels, into an environment where they can overrun natural local species. It is estimated that at least 7,000 different species are being carried in ships' ballast tanks around the world. *(Source: IMO Globallast Management Programme)*

IMO has developed and adopted *the International Convention for the Control and Management of Ships' Ballast Water and Sediments* which, when in force, will require all ships to carry out ballast water management procedures to a given standard. It is important to ensure that the procedures will not have an adverse effect on the safety of the vessel, and will not solve one environmental problem by creating another. The Marine Environment Protection Committee at its 58th session in October 2008 *adopted Guidelines for ballast water sampling and Revised guidelines for approval of ballast water management systems,* intended to assist in the effective implementation of the Convention), bringing to 14 the package of finalized guidelines required by the Convention.

The Committee also approved the Guidance document on arrangements for responding to emergency situations involving ballast water.
To date, 28 States have ratified the BWM Convention, adopted in February 2004, representing about 25.43%.of the world's merchant shipping. In accordance with article 18 of the Convention, the treaty will enter into force twelve months after the date on which not less than thirty States, the combined merchant fleets of which constitute not less than thirty-five percent of the gross tonnage of the world's merchant shipping, have become Parties to it.

7.8. Garbage and marine litter

In the past few decades, the enforcement of when and where to dispose of all types of wastes produced on a ship's voyage has become better regulated through MARPOL Annex V (Garbage).

The requirements are much stricter in a number of "Special Areas" (see below) but perhaps the most important feature of the Annex is the complete ban imposed on the dumping into the sea of all forms of plastic. However, although the Annex obliges Governments to ensure adequate provision of facilities at all ports and terminals for the reception of garbage, more work needs to be done to ensure availability in every port. IMO has also embarked on a process to review Annex V and the associated guidelines for its implementation, bringing in new technological developments made by the shipping industry.

Despite actions taken nationally and internationally, the situation with regard to marine litter is continuously getting worse according to the United Nations Environment Programme (UNEP).

Globally: There are no recent and certain figures on the amounts of marine litter worldwide. Nor are there any such global figures on the annual input of marine litter to the marine and coastal environment. In 1997, the US Academy of Sciences estimated the total input of marine litter into the oceans, worldwide, at approximately 6.4 million tonnes per year. According to other calculations, some 8 million items of marine litter have been estimated to enter oceans and seas every day, about 5 million of which are thrown overboard or lost from ships. Furthermore, it has been estimated that over 13,000 pieces of plastic litter are floating on every square kilometre of ocean surface.

In 2009, 498,818 volunteers picked up 7.4 million pounds of marine debris in 108 countries around the world. They removed marine litter from more than 21,000 kilometres of coastline and waterways collecting more than 6.2 million pieces of marine litter, weighing over 4,000 tonnes. Almost 58 per cent of the marine litter found could be attributed to shoreline and recreational activities, such as beach-picnicking and general littering. Many other such cleanup operations are carried out every year by thousands of school children, volunteers and local authorities in a large number of countries in all parts of the world.

Regionally: In contrast, various regional figures on quantities and distribution of marine litter are available. In a 1998 survey, 89 per cent of the litter observed floating on ocean surface in the North Pacific was plastic. The Algalita Marine Research Foundation (AMRF) has conducted surveys to compare the quantities of plastic fragments floating on the ocean surface to the availability of food with which they are mixed. In the central Pacific gyre, the AMRF in 2002 found 6 kilos of plastic for every kilo of plankton near the surface.

About 3,500 plastic resin pellets per km2 have been reported floating on the surface in the Sargasso Sea. Near industrial centres in New Zealand, concentrations of up to 100,000 pellets were observed in one km2 of beach. In 1990, American scientists reported a 200–400 per cent increase from 1972 to 1987 in the number of pellets present in the North Atlantic Ocean.
During one decade (1992–2002), over 73,000 m3 of marine litter have been gathered on some 300 kilometres of rocky beach on the Swedish west coasts (including thousands of islands, islets and skerries), which is the easternmost part of the North Sea. The average annual amount of litter cleaned up on those beaches is 6,000–8,000 m3.

According to figures from the North Sea, as well as from the water around Australia, it has been estimated that up to 70 per cent of the marine litter that enters the sea ends up on the seabed, whereas half of the remaining amount is found on beaches and half floating on the water surface.
In 2002, the United States National Oceanic and Atmospheric Administration (NOAA) collected 107 tonnes of nets and lines and other fishing gear on the Pearl and Hermes Atoll (northern Hawaiian Islands) alone. In 2003, another 90 tonnes were found near the Pearl and Hermes, and Midway Islands. Heavy fishing gear litters the beaches, but probably much more serious is the fact that the gear gets snagged in the coral reefs, tearing the corals apart. It also traps endangered monk seals and threatens green sea turtles.

There are strong indications from many regions, e.g., the North Sea, that the quantities of marine litter are increasing. Consequently, the resulting environmental and socio-economic problems are worsening.
Despite international and national efforts made during the last two decades, there are no clear indications that the quantities and distribution of marine litter are decreasing, either globally or regionally. (Source: UNEP).

7.9. Control of harmful anti-fouling systems

Ships' hulls need to be kept smooth from marine growth to ensure maximum performance and full efficiency. In the past, many of the coatings that were used were themselves harmful to the marine environment and more benign coatings needed to be developed to replace them. IMO's *International Convention on the Control of Harmful Anti-fouling Systems on Ships*, came into force in 2008; the convention prohibits the use of harmful organotins in anti-fouling paints used on ships and will establish a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems.

Manufacturers and most shipbuilders and ship repair yards ban the damaging tributyltin (TBT) paints and many responsible ship owners have already been abiding by the Convention's requirements since 2003.

7.10. Geographical areas needing special attention

While always advocating a global approach, the IMO nevertheless recognizes that some areas need additional protection. To this end, the MARPOL Convention defines certain sea areas as "Special Areas" in which the adoption of enhanced special mandatory measures for the prevention of pollution is required.

Outside the MARPOL regulations, the IMO Assembly has adopted *Guidelines for the designation of Particularly Sensitive Sea Areas (PSSAs),* which are deemed to require a higher degree of protection because of their particular significance for ecological, socio-economic or scientific reasons, and because they may be vulnerable to damage by international maritime activities. To date, twelve PSSAs have been declared by IMO.

8. The human element

It is important to celebrate not only the vital contribution that ships and shipping make to the prosperity and well-being of us all but also the men and women who take on the onerous task of operating them. The International Labour Organization's Maritime Labour Convention, 2006 provides comprehensive rights and protection at work for the world's more than 1.2 million seafarers. The new labour standard (1996) consolidates and updates more than 65 international labour standards related to seafarers adopted over the last 80 years.
2010 has been a special year in the world of maritime training, one which will always be associated with the adoption of historic amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers STCW Convention and Code – instruments that together set the international benchmark for the training and education of seafarers. "The Manila Amendments" are set to enter into force on 1 January 2012 under the tacit acceptance procedure enshrined in the STCW Convention. The amendments are of supreme relevance to seafarers, covering, as they do, not only their training and certification but also having an impact on how they undertake a broad range of professional duties on board – both at sea and in ports.

8.1 Supply of seafarers

Manpower surveys are still predicting officer shortages and this is something the industry cannot afford to ignore. If the global pool of competent, properly qualified and certified seafarers is to meet the predicted demand, then seafaring must be seen as a viable career choice for young people of the right calibre.
The worldwide supply of seafarers in 2010 is estimated to be 624,000 officers and 747,000 ratings and the current estimate of worldwide demand for seafarers in 2010 is 637,000 officers and 747,000 ratings. The results from the company survey do indicate that there are problems for particular types of seafarers in some global regions. There is some evidence of continuing recruitment and retention problems, but not as severe as some have feared. There is underlying concern over the current and future availability of Senior management level officers, especially engineers in the Far East and Indian Sub-Continent groups. Generally, there are few difficulties reported for ratings.

Table 17 - Global Seafarer Supply by Broad Geographical Area 2010 (000s)

Officers		**%**	**Ratings**	**%**
OECD Countries	184	29.4	143	19.2
Eastern Europe	127	20.3	109	14.6
Africa / Latin America	50	8.0	112	15.0
Far East	184	29.5	275	36.7
Indian Sub-Continent	80	12.8	108	14.5
All National Groups	624	100.0	747	100.0

Source: BIMCO/ISF Manpower 2010 update

According to the International Transport Workers Federation Women make up only an estimated 2% of the world's maritime workforce. Women seafarers work mainly in the cruise and ferries sector.

8.2. IMO events and Day of the Seafarer

Various initiatives are being taken to give IMO and the international maritime community the opportunity to pay tribute to the world's seafarers for their unique contribution to society and in recognition of the risks they shoulder in the execution of their duties in an often hostile environment:

With the **"Go to Sea!" campaign** IMO has opened an umbrella under which industry and Governments can mount their own campaigns to improve seafarer recruitment.

The IMO Council chose the theme for World Maritime Day to be "**2010: Year of the Seafarer".**

In addition, it was agreed in 2010 that the unique contribution made by seafarers should be marked annually with a **'Day of the Seafarer'** to be celebrated on June 25th each year
.
IMO has also established the '**IMO Bravery Award'** to recognize those who, at the risk of losing their own life, commit acts of extreme bravery to rescue persons in distress at sea or to prevent catastrophic pollution of the environment thus exhibiting virtues of self-sacrifice in line with the highest traditions at sea and the humanitarian aspect of shipping.

9. The work of IMO

9.1. IMO Conventions

The direct output of IMO's regulatory work is a comprehensive body of international conventions, supported by literally hundreds of guidelines and recommendations that, between them, govern just about every facet of the shipping industry.

It is impossible to generalize with complete accuracy but, broadly speaking, IMO measures fall into three categories:

- Measures aimed primarily at the prevention of accidents, casualties and environmental damage from ships in the first place. This group comprises conventions setting standards for ship design, construction, equipment, operation and manning.
- Measures which recognize that accidents do happen, despite the best efforts of all concerned and which, therefore, try to mitigate their negative effects. Rules concerning distress and safety communications, the provision of search and rescue facilities and oil spill clean-up and response mechanisms, all fall into this category
- Measures concerned with the aftermath of accidents and, in particular, with establishing a mechanism for ensuring that those who suffer the consequences of an accident – and this refers, in particular, although not exclusively, to pollution victims – can be adequately compensated.

To a considerable extent, this success story of shipping in terms of its improving safety and environmental record can be attributed to the comprehensive framework of rules, regulations and standards developed over many years by IMO, through international collaboration among its Members and with full industry participation. It is thanks in no small measure to the Organization's outcomes that all those millions of trouble-free tonne-miles referred to earlier are possible. Just about every technical aspect of shipping is covered by an IMO measure, from the drawing board to scrap yard. Every single piece of this all-embracing regulatory structure makes a contribution towards the overall sustainability of shipping and is a testimony to the highly responsible attitude that pervades the activity of shipping and the industry of shipping at all levels.

IMO's conventions are regularly amended and revised while new instruments/protocols are adopted. For dates of entry into force of amendments/instruments already adopted - see Status of Conventions

Most important IMO Conventions

International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended

International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997(MARPOL)

International Convention on Standards of Training, Certification and Watchkeeping for Seafarers STCW as amended, including the 1995 and 2010 Manila Amendments

Other conventions relating to maritime safety and security and ship/port interface

Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972
Convention on Facilitation of International Maritime Traffic (FAL), 1965
International Convention on Load Lines (LL), 1966
International Convention on Maritime Search and Rescue (SAR), 1979
Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation (SUA), 1988, and Protocol for the Suppression of Unlawful Acts Against the Safety of Fixed Platforms located on the Continental Shelf (and the 2005 Protocols)
International Convention for Safe Containers (CSC), 1972
Convention on the International Maritime Satellite Organization (IMSO C), 1976
The Torremolinos International Convention for the Safety of Fishing Vessels (SFV), 1977
International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F), 1995
Special Trade Passenger Ships Agreement (STP), 1971 and Protocol on Space Requirements for Special Trade Passenger Ships, 1973

Other conventions relating to prevention of marine pollution

International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (INTERVENTION), 1969
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (LC), 1972 (and the 1996 London Protocol)
International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), 1990
Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances, 2000 (OPRC-HNS Protocol)
International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS), 2001
International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004
The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009

Conventions covering liability and compensation

International Convention on Civil Liability for Oil Pollution Damage (CLC), 1969
1992 Protocol to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND 1992)

Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material (NUCLEAR), 1971
Athens Convention relating to the Carriage of Passengers and their Luggage by Sea (PAL), 1974
Convention on Limitation of Liability for Maritime Claims (LLMC), 1976
International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (HNS), 1996 (and its 2010 Protocol)
International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001
Nairobi International Convention on the Removal of Wrecks, 2007

Other subjects
International Convention on Tonnage Measurement of Ships (TONNAGE), 1969
International Convention on Salvage (SALVAGE), 1989

9.2 Technical assistance and implementation

The purpose of IMO's technical assistance programme is to help States, many of them developing countries, to ratify IMO conventions and to reach the standards contained in the IMO instruments.
For example, IMO delivered in 2010 under the International Technical Co-operation Programme (ITCP):
24 advisory missions, 4o national training events, 42 regional training events, trained 2,361 trainees, awarder 73 fellowships and at least 1,000 persons worldwide attended events aimed at developing and harmonizing regional strategies on a maritime technical issue in addition to the number of persons trained above. (Source: IMO Document TC 61/3)

The most ambitious of all IMO's technical assistance projects is the World Maritime University in Malmö, Sweden, which opened in 1983. Its objective is to provide high-level training facilities for people from developing countries who have already reached a relatively high standard in their own countries but who would benefit from further intensive training.
IMO has also established the International Maritime Law Institute, in Malta, to help ensure that sufficient maritime law experts, with appropriate knowledge and skills, are available to assist in the implementation and enforcement of international maritime law and, more particularly, the vast body of rules and regulations developed under the aegis of IMO – especially within developing countries.
A Voluntary IMO Member State Audit Scheme to be made mandatory in the next few years was adopted in 2005 and is intended to provide Member States with a comprehensive and objective assessment of how effectively they administer and implement those mandatory IMO instruments which are covered by the scheme. Since the commencement of audits in September 2006, 48 audits of 42 Member States, one Associate Member and five dependent territories have been successfully carried out. Eight further audits are scheduled for the rest of 2011, which would leave 12 Member States to be audited of the 62 that have volunteered since the commencement of the Scheme

10. Other Regional and Global Conventions and Agreements

The list of shipping-related topics that fall under the aegis of IMO is very extensive. But there are, of course, some things that the Organization is not. It is not, for example, a police force; it does not have the mandate or the capacity to put teams of inspectors aboard ships and check their compliance with international standards. It is not "operational" in the sense that it does not follow incidents and accidents at sea, such as groundings, collisions, explosions etc. on a 24-hour basis, and it is not a court; there is an International Tribunal for the Law of the Sea, in Hamburg, but this is established under the United Nations Convention on the Law of the Sea (UNCLOS) which is not an IMO Convention. IMO does not get involved with issues such as territorial waters, EEZs or fishing rights but some provisions in UNCLOS are relevant to the instruments and work of IMO. (see Implications of UNCLOS for IMO)

There are many other Conventions regulating maritime transport, the main ones being the:

United Nations Convention on a Code of Conduct for Liner Conferences, 1974
United Nations Convention on the Carriage of Goods by Sea, 1978 (Hamburg Rules)
International Convention on Maritime Liens and Mortgages, 1993
United Nations Convention on International Multimodal Transport of Goods, 1980
United Nations Convention on Conditions for Registration of Ships, 1986
International Convention on Arrest of Ships, 1999
United Nations Convention on Contracts for the International Carrying of Goods Wholly or Partly by Sea (Rotterdam Rules), 2008.

11. Information Sources on Shipping Facts and Figures

BIMCO: Seascapes
BIMCO/ISF Manpower 2010 update- The worldwide demand for and supply of seafarers. Main report. 2011. Executive summary

CLARKSON Research Services Limited – Shipping Intelligence Network (SIN)

Fearnleys Annual Review

IHS Fairplay World Fleet Statistics- Annual

IHS/Fairplay World Casualty Statistics – Annual

Institute of Shipping Economics and Statistics Yearbook. Bremen.

INTERCARGO: Twenty Ships you didn't realise you used today

International Chamber of Shipping (ICS): International Shipping - Lifeblood of World trade (DVD)
International Chamber of Shipping (ICS) – Careers in International Shipping (DVD)
The International Chamber of Shipping (ICS) shipping and CO2 - www.shippingandco2.org

International Maritime Organization (IMO). Strategy and planning – monitoring of performance. Review of data measured against the performance indicators. Note by the Secretary-General. IMO Document C 105/3 (a)/1 of 30 September 2010

International Maritime Organization. International Shipping - carrier of World Trade. World Maritime Day 2005. 4-page flyer Background document. Secretary-General Speech - World Maritime Day 2005

International Maritime Organization : GISIS (Global Integrated Shipping Information System)

International Maritime Organization : Reports on Piracy and armed robbery against ships

International Maritime Organization : Directory of Maritime Links

IMO Maritime Knowledge Centre: Shipping Facts and News

International Shipping Federation(ISF): A career in International Shipping?

International Tanker Owners Pollution Federation (ITOPF)- Annual statistics

The Maritime Industry Foundation

The Maritime Industry Foundation Knowledge Center (MIKC)

Sea Vision UK Over 190 organizations from across the wider maritime sector, at sea and ashore, have joined together in Sea Vision UK.

Shipping Facts - published by the Round Table of International Shipping Association.

United Nations initiatives:

Division of Ocean Affairs and the Law of the Sea (DOALOS)

IMO contribution to UN Secretary-General's annual reports on Oceans and the Law of the Sea

Global Marine Oil Pollution Information Gateway

Global Marine Litter Pollution Information Gateway

UN Atlas of the Oceans Transport and Telecommunications section

UNCTAD- Review of Maritime Transport published annually since 1968. It reports on the worldwide evolution of shipping, fleet, ports and multimodal transport related to the major traffics of liquid bulk, dry bulk and containers.