

## **Seaborne Crude Oil Transportation: Patterns and Trends**

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### **Introduction**

In this paper, Lloyd's MIU presents key facts and figures on the transportation of crude oil by sea. The paper will examine the crude oil carrying fleet, the quantity of crude oil transported, as well as painting a brief picture of changes to main crude oil transportation routes in the last few years.

The first section, below, will introduce the data used, its sources and methods, in order to give some context to the shipping and crude oil transportation analysis included in this paper. The paper will conclude briefly by summarising the main changes in seaborne crude oil transportation over recent years.

### **Data Sources**

#### **Lloyd's MIU**

Lloyd's MIU or Lloyd's Marine Intelligence Unit, started life as the Intelligence arm of the Corporation of Lloyd's, also known as Lloyd's of London – the insurance market. Its mission remains the same, as defined by the Lloyd's Act of 1871 passed by the UK parliament, namely "*The Collection, Publication and Diffusion of Intelligence with Respect to Shipping*". For over 300 years the organisation has been providing the international maritime community with news through the world's oldest daily newspaper Lloyd's List, first published in 1734, and maritime and trade intelligence from a global network of Lloyd's Agents.

The requirement and demand for maritime intelligence remains as relevant today as it was 3 centuries ago, although the technologies have changed somewhat! The hardcopy channels originally used by Edward Lloyd to report on ship arrivals and departures together with details of owners and cargoes from his Coffee House in the City of London at the end of the 17<sup>th</sup> century have given way to relational databases and online services.

Over the years Lloyd's MIU has developed databases detailing the characteristics, ownership and global deployment of the world's merchant fleet covering some 150,000 merchant ships and millions of vessel movements at ports around the globe. Modern technology means that human intelligence on ship movements reported by the global network of Lloyd's Agents is augmented by real time AIS information from Lloyd's MIU's network of AIS receivers - the world's largest AIS network. These resources, particularly our ship tracking capabilities, represent one of the pillars of Lloyd's MIU's analysis of crude oil tanker movements.

#### **Analysis of Petroleum Exports (APEX)**

For crude oil trades Lloyd's MIU has its own seaborne crude oil database, APEX, which monitors the amount of oil carried on individual tankers by port of origin and

destination on a global basis and is updated weekly. APEX monitors laden crude oil shipments in tankers over 10,000 deadweight (dwt) and oil product shipments in tankers over 60,000 dwt. This paper makes use of the crude oil tanker data held in APEX. Although APEX holds data electronically back to 1990, this paper focuses on activity since the year 2000 so that the most recent trends can be identified.

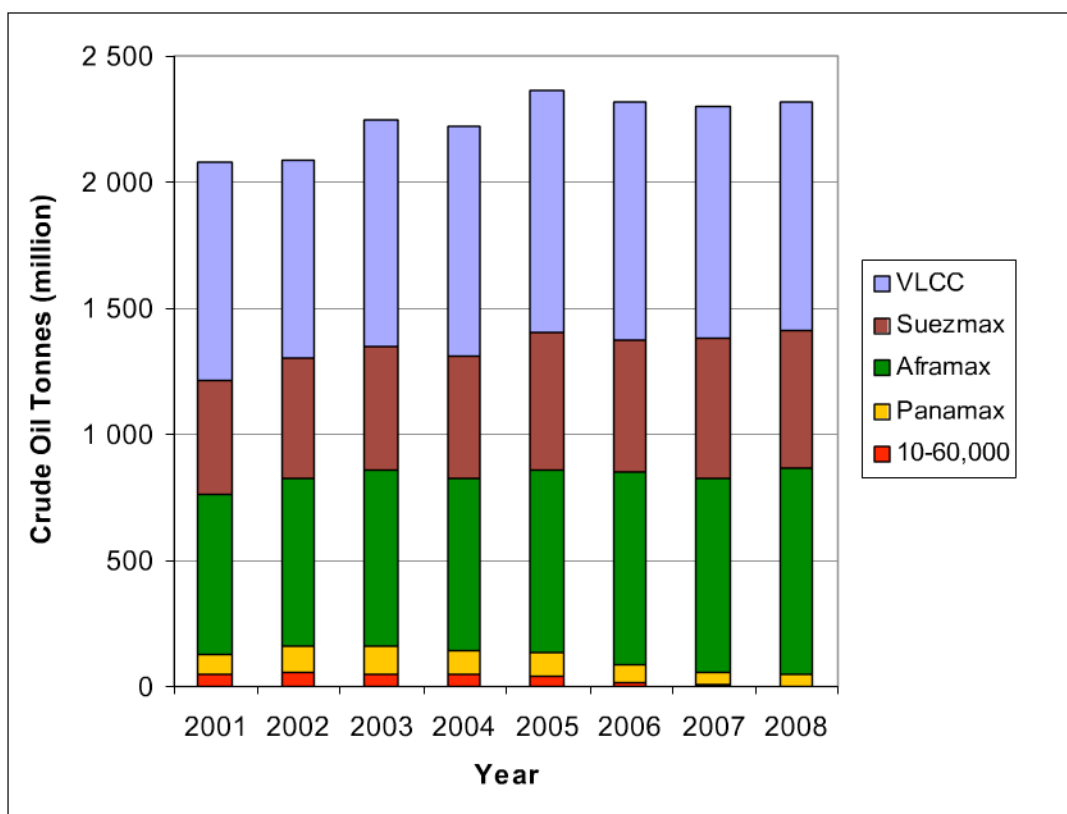
## Presentation and Discussion of Data

### The Tanker Fleet

The crude oil carrying tanker fleet of vessels over 10,000 dwt amounted to 1,730 vessels in 2008, an increase of 7% on the 2001 figure of 1,616 vessels. By dwt the size of the fleet increased by 18% over the same period, suggesting that newer vessels have tended to become larger over time.

In 2008, the crude oil carrying tanker fleet transported 2,318 million tonnes (mt) of crude oil, an increase of 12% since 2001. Figure 1, below, shows the quantity of crude oil transported by sea in each year, split by tanker size range. Standard industry vessel size ranges have been used in this paper.<sup>1</sup>

Figure 1: Crude Oil transportation by vessel size range



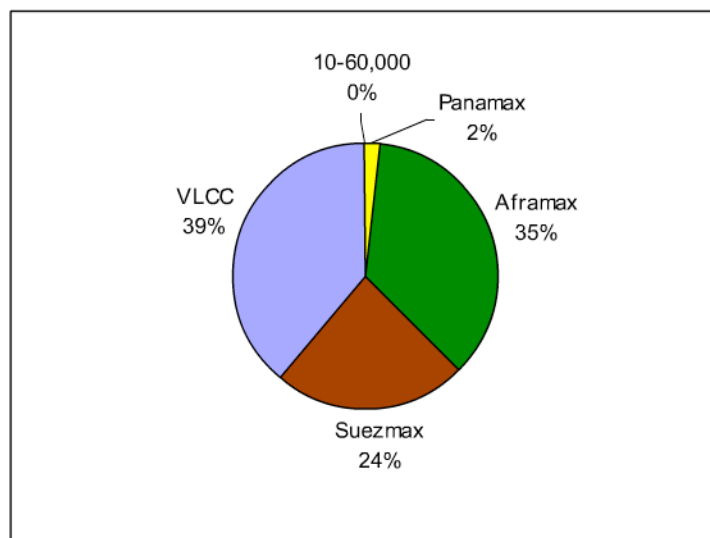
Since 2001 VLCCs have consistently transported around 40% of crude oil shipped by sea. In 2008 VLCCs represented 30% of the fleet by number and 53% by dwt.

<sup>1</sup> 10-60,000 dwt, Panamax: 60-80,000 DWT, Aframax: 80-120,000 DWT, Suezmax 120-200,000 DWT and VLCC >200,000 DWT.

Interestingly, Figure 1 also shows that the amount of crude oil transported by both panamax and, more markedly, by vessels under 60,000 dwt has fallen. In 2001 vessels under 60,000 dwt accounted for 2.2% of crude oil transported, by 2008 this had declined to 0.10%. In 2001, 22% of the crude oil carrying fleet by number was under 80,000 dwt; by 2008 this had fallen to 10%. This suggests that the parcel size of crude oil being transported has increased during this time.

Figure 2, below, shows the percentage of seaborne crude oil transported in 2008 by each tanker size range. VLCCs and aframaxes carried the largest volumes. Vessels under 80,000 dwt, by contrast, accounted for only 2% of crude oil transported.

**Figure 2: 2008 Seaborne crude oil by vessel size range**



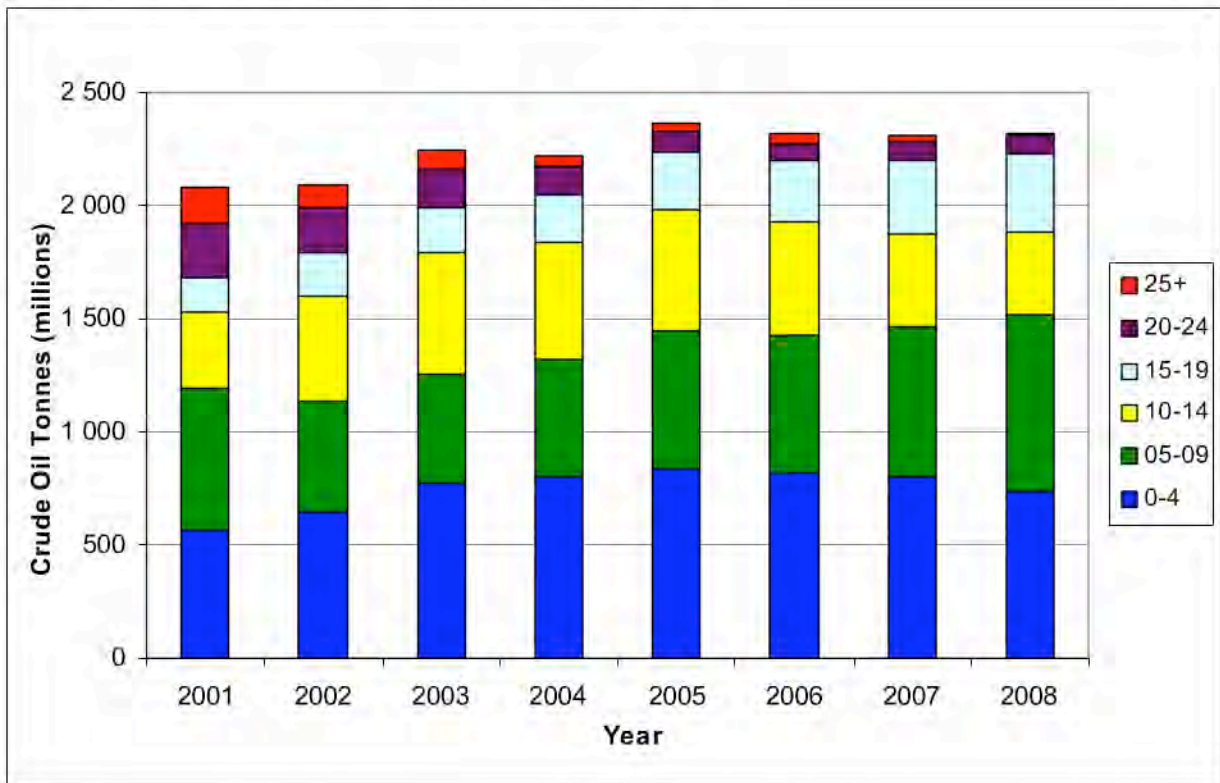
### Age of the Fleet

A noticeable trend over the last decade in the shipping industry has been the desire by regulatory authorities to see a decrease in the use of older vessels in oil transportation.

Figure 3, below, shows crude oil transportation by the fleet in each year since 2001, split by vessel age range. The graph clearly shows that measures to reduce the age of tankers transporting crude oil are having an impact. In 2001 446mt of crude oil was carried in vessels over 20 years old. By 2008, this had dropped to 95mt, a fall of 76%.

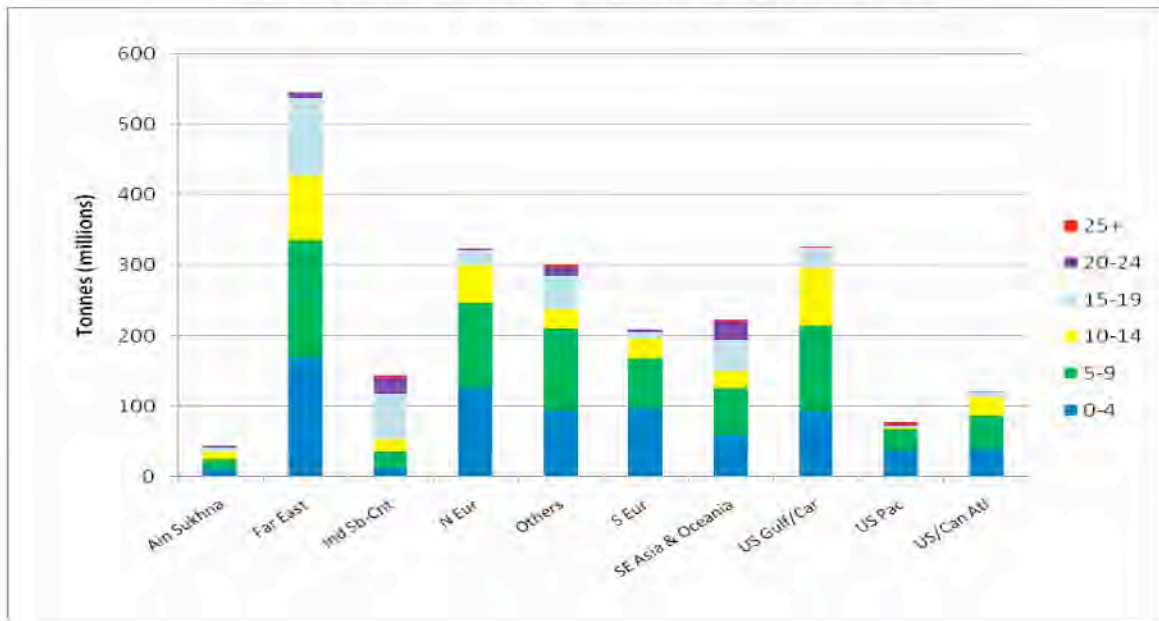
In 2008 only 0.45% of global seaborne crude oil was transported in vessels over 25 years of age. In 2001 7.6% was transported in vessels of this age range.

**Figure 3: Annual crude oil transported by tanker age range**



Action in certain jurisdictions to reduce the quantity of crude oil transported on older vessels has also resulted in a shift in where the remaining vessels of this age operate, though it should be noted that in 2008 the total amount of oil transported by vessels in this age range was just under 10.5mt. Figure 4, below shows imports to major import areas by vessel age range.

**Figure 4: Imports by Age Range and Geographical Area**





In 2008 vessels of 25 years and above were used to export oil from Alaska, the Middle East, the Caribbean and South America Atlantic, SE Asia and a small amount from West Africa. Nearly half was accounted for by exports from the Middle East.

Oil from Alaska in vessels of this age was transported to US Pacific destinations, from the Caribbean/South America Atlantic to other ports in this area, and from the Middle East to other Middle East destinations and to the Indian subcontinent.

No crude oil was carried to Far East, European or US Atlantic coast destinations in vessels of this age range in 2008.

### Crude Oil transported by Single Hulled vessels

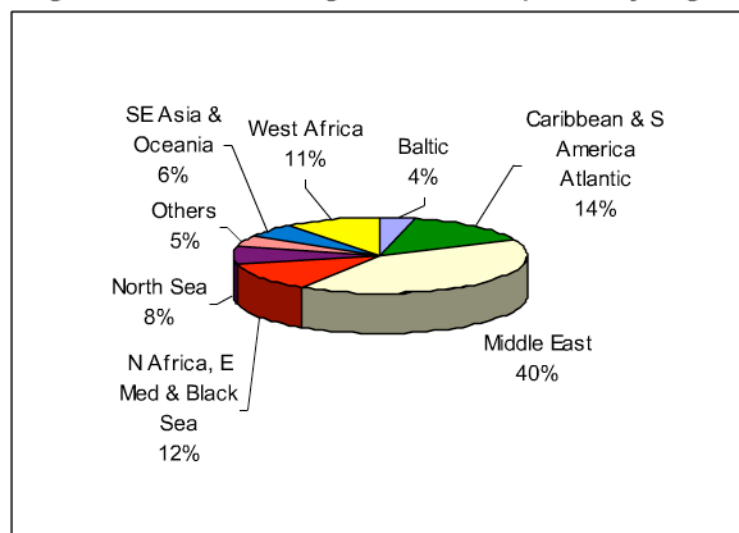
In 2001 1,241mt of crude oil was transported by single hulled vessels. By 2008 this had fallen to 278mt. The majority of this was transported to destinations in the Indian Sub-Continent, South East Asia and the Far East. European Union destinations accounted for only 10mt. All of these ships had segregated ballast tanks and so continue to operate at present.

### Geographical Focus

This paper will now turn to an examination of the geographical patterns of crude oil exports, imports and transport routes. It will also look at how these have changed in recent years.

In terms of exports, it will come as no surprise that the Middle East remains the dominant exporting region of crude oil by sea as Figure 5, below, shows. The region accounted for 40% of global seaborne crude oil exports in 2008.

Figure 5: 2008 Percentage Crude Oil Exported by Region



The greatest change in the years since 2001 has been the rise in exports from the Baltic, which were 35mt in 2001, but had grown to 93mt by 2008, a rise of 163%. This growth is entirely due to the rise in exports from the Russian port of Primorsk. In 2002 exports from this port amounted to only 7mt, by 2008 they had reached 71mt. While some of this crude oil went to the Baltic countries of Finland and

Lithuania, the majority was shipped out of the Baltic via the Kattegat and Skagerrak. In the four years to 2008, the number of crude oil tankers leaving the Baltic via the Skagerrak increased by more than 30%.

Exports from West Africa saw the second highest percentage rise after the Baltic, increasing 39% from 177mt in 2001 to 246mt in 2008.

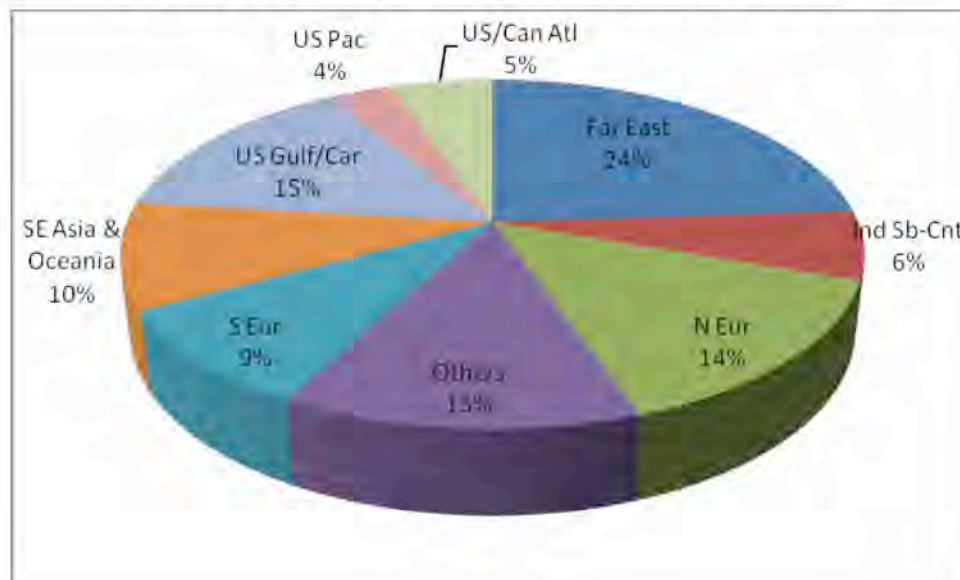
Between 2001 and 2008 exports from the North Sea fell by nearly 30%.

Exports from the Middle East rose 6% between 2001 and 2008 and all this growth was exported to China, India and to a lesser extent, South Korea. Exports from the Middle East to Europe remained relatively static between 2001 and 2008.

The Far East is the single largest importing region of seaborne crude oil as Figure 6, below, shows. Imports to this region grew by 33% to 545mt between 2001 and 2008. The majority of this growth was accounted for by China, whose imports rose almost 250% to reach 165mt in 2008. By contrast Japan's crude oil imports grew by only 3% in the same period.

Imports to the Indian Subcontinent account for only 6% of global seaborne crude oil imports, but grew by 64% between 2001 and 2008 to 145mt. Most of this is accounted for by India, whose imports reached 132mt in 2008, a rise of 85% on the 2001 figure of 72mt.

**Figure 6: Percentage 2008 Crude Oil Imported by Region**

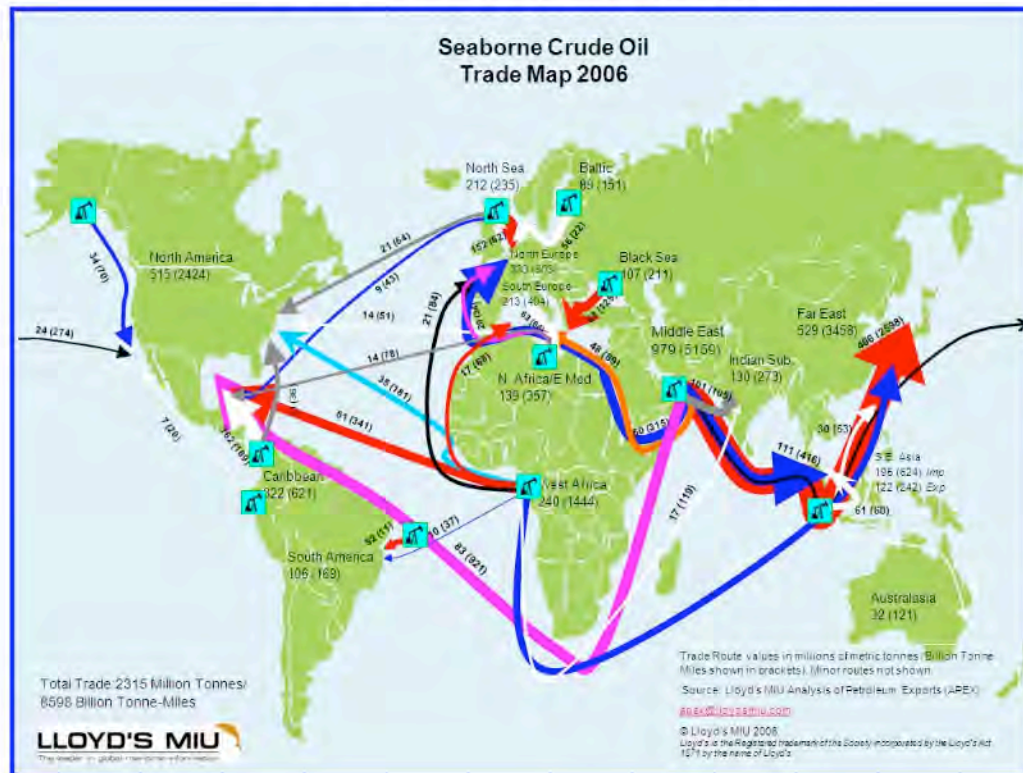




## Crude Oil Transport Routes

Major shipping channels are heavily used by crude oil tankers. Figure 7, below, shows the main routes taken by crude oil transported in 2006.

Figure 7: Seaborne Crude Oil Trade 2006



A detailed breakdown of the traffic through each major waterway is outside the scope of this paper, but can be calculated using Lloyd's MIU data. The map does clearly show heavy concentrations of traffic through certain waterways of the world. The Malacca Strait between Indonesia and Malaysia and the Bab el Mandeb strait into the Red Sea are used by tankers carrying Middle East oil to importing countries in Asia and Europe, respectively.

Middle East oil is also exported through the Mediterranean and Gibraltar Strait, as are exports from the eastern Mediterranean and Black Sea through the Bosphorus.

The Malacca Strait saw 21,000 transits by tankers of all types in 2008, which amounted to half of the deadweight transiting the Strait. In the case of crude oil tankers, these are predominantly laden eastbound and ballast westbound. 33% of global seaborne crude oil shipments use the Malacca Strait.

In 2008, 392mt of crude oil was transported in and through the Mediterranean Sea. 40% of this was crude oil to South European import ports from the Black Sea, North Africa and the Middle East. The majority of crude oil moving through the narrow

Strait of Gibraltar is carried westbound to North European and US destinations and is predominantly from the Middle East, North Africa and the Black Sea.

### **Tanker Casualties**

The presentation given at the Interspill conference will examine tanker casualties in 2008 and look in some detail at causes and the main geographical locations where casualties to crude oil tankers occurred.

In this paper, some brief preliminary statistics will be given. In 2008, there were 310 casualty incidents involving tankers of all types. This represents nearly 11% of the casualty incidents recorded in the year. These incidents varied from 70 incidents involving collision with another vessel to machinery damage or failure (78 incidents). Almost half of all incidents reported took place in Europe.

### **Conclusions**

The transportation of crude oil remains an important and strategic seaborne commodity. Traditional exporting regions, such as the Middle East continue to dominate seaborne crude oil transport, but exports from new areas such as West Africa and the Baltic have risen over the last decade. Importing regions in the US and Europe continue to import crude oil, but new importers such as China and India have grown dramatically. These changes will alter the patterns of vessel movements in specific regions and waterways.