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Study of Maritime Traffic Flows in the Mediterranean Sea

Final Report - Unrestricted Version

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0 Executive Summary

The Mediterranean Sea is amongst the world's busiest waterways accounting for 15 per cent of global shipping activity by number of calls and 10 per cent by vessel deadweight tonnes (DWT). In 2006, 13,000 merchant ships made 252,000 port calls totalling 3.8bn DWT at Mediterranean ports. Around 80 per cent of Mediterranean ports are located in the west and central Mediterranean region.

Littoral States with coastlines bordering the Mediterranean account for around 19 per cent of world seaborne trade by volume. However, seaborne trade between Mediterranean littoral States is relatively underdeveloped and represents only 18 per cent of the total Mediterranean littoral States' trade. Trade carried in tankers represents the largest portion of Mediterranean littoral States' trade and dominates intra Mediterranean trade. Tanker trades represent just under 60 per cent of all seaborne trade between littoral Mediterranean States

The Mediterranean is a major transit route. In 2006 around 10,000, mainly large, vessels transited the area en-route between non Mediterranean ports. Merchant vessels operating within and through the Mediterranean are getting larger and carrying more trade in larger parcels. Vessels transiting the Mediterranean average 50,000 DWT and are, on average, over three times larger than those operating within the Mediterranean.

Overall vessel activity within the Mediterranean has been rising steadily over the past 10 years and is projected to increase by a further 18 per cent over the next 10 years. Transits through the Mediterranean are expected to rise by 23 per cent. Increases in vessel activity will be coupled with the deployment of ever larger vessels. Chemical tanker and container vessels will show the highest rates of growth in respect of port callings within the Mediterranean over the next ten years whilst increases in transits will be most pronounced in the product and crude tanker sector

Transit densities measured in terms of ship voyages are dominated by high frequency small size Intra-Mediterranean passenger traffic. In 2006, vessels operating in or through the Mediterranean Sea were deployed across 31,000 unique port to port routes including 16,000 unique intra-Mediterranean port to port links. However, the majority of trade, including petroleum oils and gases, is concentrated in larger vessels deployed at lower levels of frequency. The top 20 ports within the Mediterranean account for 37 per cent of all Mediterranean calls and 43 per cent of DWT capacity. With a few exceptions most of the top ports are located in the western Mediterranean

Crude Oil and LNG trades are concentrated around a relatively small population of load and discharge ports and routes in the western and central Mediterranean. Crude oil shipments from Novorossiysk to Mediterranean destinations and from Sidi Kerir to both Mediterranean destinations and ports west of Gibraltar as well as exports from the Persian Gulf through the Mediterranean via Suez dominate the major traffic lanes. In the LNG sector North African exports to other Mediterranean destinations predominate.

LPG trades are concentrated around a relatively small number of load and discharge ports but intra port activity is highly fragmented; the top 20 laden routes represent only 16% of LPG carried in the Mediterranean.

Over the past ten years, vessels flagged in Mediterranean littoral States have accounted for between 40 to 45 per cent of vessels operating within or through the Mediterranean. Nearly 80 per cent of vessels in transit via the Mediterranean between two non-Mediterranean ports are registered under a non-Mediterranean State flag. Around 57 per cent of vessels operating within or through the Mediterranean in 2006 were owned by companies located in a Mediterranean country.

The average age of vessels calling at ports in the eastern Mediterranean is significantly higher than at western and central Mediterranean ports. The average age of vessels calling Limassol, Alexandria, Valletta and Mersin is over 20 years compared to less than 14 years at the western Mediterranean ports of Algeciras, Augusta, Palma, Barcelona, Genoa, Fos and Gibraltar. In view of the correlation between vessel age and casualty risk, the deployment of older tankers in the eastern Mediterranean potentially exposes this area to greater risk of a casualty related pollution event.

In 2006, 4224 laden oil tanker movements carrying 421 million tonnes of crude oil were observed in the Mediterranean. 457 of these were transits involving tankers carrying 72 million tonnes of crude oil en route between non-Mediterranean ports.

The future development of new export routes for crude oil from the Caspian region, the development of new pipelines bypassing the Bosporus and the expansion of current pipeline capacity is likely to result in a significant increase in the density of tanker deployment in the eastern Mediterranean by over 2000 voyages per annum.

Annual volumes of LNG loaded at Mediterranean ports amount to 31 million tonnes. The top 20 Mediterranean LNG loading ports measured by number of calls account for 71 per cent of all LNG loaded at Mediterranean ports. Annual volumes of LNG discharged at Mediterranean ports amount to 25 million tonnes. The top 16 Mediterranean LNG discharge ports measured by number of calls account for 100 per cent of all LNG discharged in the Mediterranean.

Annual volumes of LPG loaded at Mediterranean ports amount to 19 million tonnes. The top 20 Mediterranean LPG loading ports measured by number of calls account for 75 per cent of all LPG loaded at Mediterranean Ports. Annual volumes of LPG discharged at Mediterranean ports amount to 20 million tonnes. The top 20 Mediterranean LPG discharge ports measured by number of calls account for 72 per cent of all LPG discharged in the Mediterranean.

Economic growth and consequent consumer demand is expected to fuel the expansion of container shipping activity within the Mediterranean. Most of the major ports are developing new container handling infrastructure to compete for a share of this growing market. Both feeder and container vessels are and will continue to get larger, which will also fuel landside infrastructure development. The Eastern Mediterranean will attract an increasing share of larger mainline vessels due to its proximity to emerging Adriatic and Black Sea markets.

In the bulk sector, Adriatic ports are a natural gateway for Central and Eastern European traffic and are well placed take advantage of any hinterland infrastructure improvements to attract cargo currently routed via Northern European ports. In this event maritime traffic through the Strait of Otranto and into the Northern Adriatic is likely to increase.

Strategic considerations aimed at diversifying energy supplies is fuelling plans for developing new LNG receiving terminals, particularly in Italy.

The Mediterranean is both a major load and discharge centre for crude oil. Approximately 18 per cent of global seaborne crude oil shipments take place within or through the Mediterranean. North African ports in Libya, Algeria, Tunisia and Persian Gulf oil shipped via Egypt account for over 90 per cent of all crude oil loaded in the Mediterranean. Italy accounts for nearly half of all crude oil discharged in the Mediterranean. Exports of crude oil from Black Sea ports averaging at over 100 million tonnes a year are expected to continue to rise, resulting in continued seaborne transits via the Bosporus and increased use of eastern Mediterranean ports linked to new pipelines intended to bypass the Bosporus. The resumption of Iraqi crude supplies via Ceyhan in Turkey and via Syrian ports will reverse the trend seen over recent years of declining crude exports from these ports.

Pipeline developments will increase oil exports from Eastern Mediterranean load terminals, but, if Black Sea exports continue to increase, this may not result in a significant fall in oil exported through the Bosporus. The Eastern Mediterranean will see an increase in the density of crude oil tanker deployment.

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

Developments in other shipping sectors are unlikely to have such a profound impact on traffic patterns. It is likely that container ship density will increase but not at the same rate as trade. Container vessels are getting larger, as are other vessel types. North European demand for energy is likely to see an increase in LNG transits via the Mediterranean from gas fields in the Persian Gulf and the Far East. If planned LNG terminal developments actually take place, the density of LNG tanker deployment around the Italian coastline will increase significantly.

Whilst the relative importance of East Mediterranean ports will increase the greatest level of vessel activity will continue to be concentrated around western and central Mediterranean ports

Study of Maritime Traffic Flows in the Mediterranean Sea

1. Introduction

The Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) commissioned Lloyd's Marine Intelligence Unit (Lloyd's MIU) to undertake a full study of maritime traffic flows for the Mediterranean[1]. The analysis is part of the SAFEMED project and aims to identify:

- Major areas of traffic activity broken down by vessel type and size
- Major areas of concentration for vessels which normally carry hazardous cargoes (Crude, Product, Chemical, LPG and LNG Tankers)
- Changes in historical vessel activity profiles within the Mediterranean and projection of future trends taking into account possible changes in the distribution of oil out of the Black Sea, and the impact of any major port development plans within the Mediterranean.
- Identification of major Crude Oil, LNG and LPG routes and ports together with quantification of cargo volumes

Lloyd's Marine Intelligence Unit is the world's largest provider of global maritime data and information services. Lloyd's MIU maintains the only integrated database of global merchant vessel movements, vessel characteristics, vessel ownership, casualties and port state control information. Lloyd's MIU's proprietary ship movements database monitors the deployment of all self propelled sea going merchant vessels over 100 GT engaged in international seaborne trade. The database is updated daily from reports received from Lloyd's agents in major ports world-wide and other trusted sources. Approximately 4 million movements at 4000 locations are processed and cross-checked annually. In addition, Lloyd's MIU owns the world's largest commercial network of AIS receivers which track ships in real time. This network processes over a billion ship position messages a month at over 850 ports. The database also includes ownership and vessel characteristics details on 120,000 commercial vessels and 163,000 ship owners, managers and operators.

The data contained in this report is sourced from Lloyd's MIU's Shipping Information Database and covers ship traffic flows within and through the Mediterranean Sea in respect of merchant vessels over 100 GT. The data includes all recorded ship calls, including those for bunkering purposes (e.g. at Gibraltar). Where a port of call is not known, the call is assigned to the relevant country. In some parts of the report, reference is made to vessel type; these types signify the generic type of cargo the vessel is designed to carry, not what it is actually carrying, unless otherwise indicated.

2. Trends

The Mediterranean Sea, bound by the Straits of Gibraltar on the west side and the Suez Canal and the Bosporus Straits on the east side, is amongst the world's busiest areas for maritime activity. There are 480 ports and terminals in the Mediterranean with recorded ship movements, almost half of which are located in Greece and Italy.

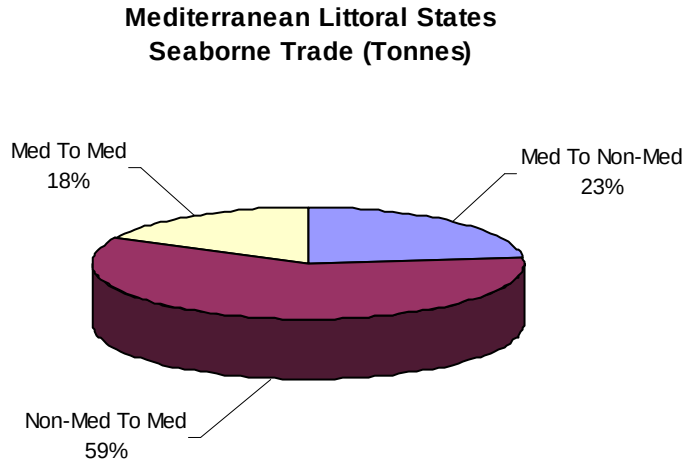
[1] In accordance with the Terms of Reference, the Mediterranean Sea is defined as the area bounded by the Straits of Gibraltar on the west side, the Suez Canal and the Bosporus Strait on the east side of the Mediterranean, and all ports within this area.

Around 20 per cent of Mediterranean ports are in the Eastern Mediterranean east of Greece, compared with 80 per cent in the West and Central Mediterranean.

In 2006 there were 252,000 port calls made by 13,000 merchant vessels over 100 GT at Mediterranean ports representing 3.8 billion deadweight tonnes of shipping capacity. Mediterranean port calls account for 15 per cent of all port calls made globally, which in 2006 amounted to 1.7 million calls and 10 per cent of deployed global shipping DWT capacity, which in 2006 amounted to 35 billion DWT of call capacity. Approximately 10,000 transits were made via the Mediterranean by vessels en route between ports outside the Mediterranean.

Littoral States with coastlines bordering the Mediterranean account for around 19 per cent of world *seaborne* trade by volume, which in 2006 amounted to 7.5 billion tonnes. Seaborne trade between Mediterranean littoral States, which is relatively underdeveloped, represents 18 per cent of the total Mediterranean littoral States' trade, which in 2006 amounted to 1.4 billion tonnes. By contrast, intra north European seaborne trade represents over a third of total North European seaborne trade.

*Figure 2.1 Mediterranean Littoral States – Seaborne Trade**

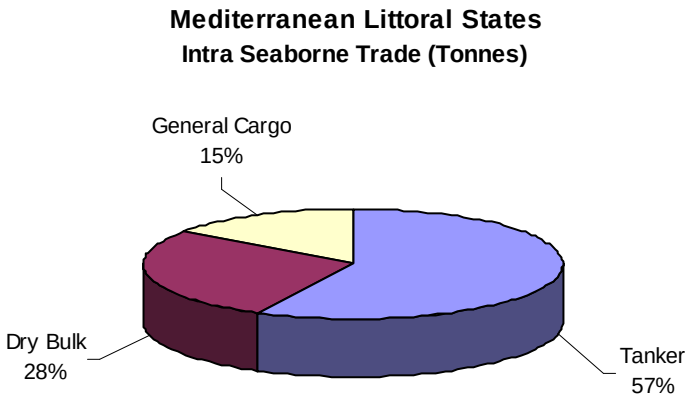


Source UN/Lloyd's MIU Analysis

**Includes all French, Spanish, Moroccan and Turkish Trade*

Trade carried in tankers represents the largest portion of Mediterranean littoral States' trade and dominates intra Mediterranean trade. Tanker trades represent just under 60 per cent of all seaborne trade between littoral Mediterranean States.

*Figure 2.2 Intra Seaborne Trade between Mediterranean Littoral States**



Source UN/Lloyd's MIU Analysis

* *Includes all French, Spanish, Moroccan and Turkish Trade*

Vessel activity in the Mediterranean has been rising steadily over the past 10 years. Port callings in the Mediterranean have increased by 14 per cent and transits by 20 per cent between 1997 and 2006. In terms of deployed capacity, total calls measured by vessel DWT have risen by 50 per cent whilst transit capacity has risen by 58 per cent. This reflects the increased size of vessels operating in the Mediterranean which have risen, on average, by 30 per cent since 1997.

Table 2.1 Mediterranean Port Calls and Transits

Year	Med Port Calls	DWT (Mil)	Average DWT	Med Transits	DWT (Mil)	Average DWT
1997	220,665	2,565	11,628	8,169	312	38,262
1998	223,097	2,773	12,431	7,732	323	41,839
1999	230,273	2,854	12,398	8,104	320	39,558
2000	241,463	3,007	12,455	8,336	369	44,350
2001	244,287	3,094	12,669	8,568	381	44,552
2002	246,692	3,195	12,953	7,856	332	42,293
2003	240,728	3,239	13,458	8,759	401	45,827
2004	247,338	3,360	13,588	8,862	399	45,102
2005	250,030	3,576	14,305	10,365	498	48,048
2006	252,538	3,815	15,109	9,812	492	50,174

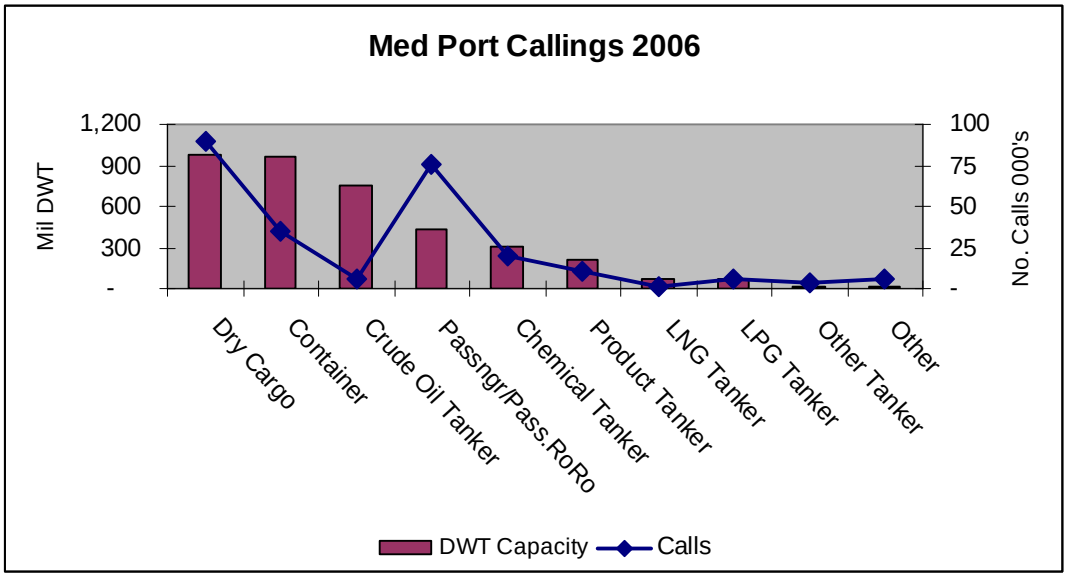
Source: ©Lloyd's MIU

The average size of vessels calling at Mediterranean ports is 15,000 DWT compared to 50,000 DWT for vessels in transit between non Mediterranean ports.

The largest vessels observed operating in the Mediterranean are crude oil tankers. Crude oil tankers calling at Mediterranean ports average 125,000 DWT - an increase in size of 26 per cent over the past 10 years. During the same period the number of crude oil tanker port calls within the Mediterranean has increased by 41 per cent. Conversely, average crude oil tanker sizes for vessels transiting the Mediterranean have fallen by 31 per cent to 160,000 DWT whilst the level of transit activity has risen significantly by 147 per cent.

For certain vessel categories, particularly crude oil tankers, container vessels and passenger vessels, vessel activity measured in terms of number of calls or voyages/transits is not a good indicator of observed shipping capacity. Because of their size, crude tankers and container vessels account for a higher proportion of shipping capacity relative to the number of voyages/transits whilst the reverse applies to passenger vessels.

Figure 2.3 Mediterranean Calls vs Deployed Capacity



Source: ©Lloyd's MIU

Other significant trends since 1997 include:

- Average chemical tanker sizes in respect of vessels operating within the Mediterranean have more than doubled in the past 10 years and have increased activity by 65 per cent. The number of chemical tankers transiting the Mediterranean, which are significantly larger than those operating within the Mediterranean, has risen by 98 per cent.

- Container activity within and through the Mediterranean has increased significantly. Container vessel port calls in the Mediterranean are up 71 per cent whilst container vessel transits have increased by 85 per cent. The size of container vessels calling at Mediterranean ports has grown by 55 per cent. Container vessels transiting are more than twice the size of those calling at Mediterranean ports and have increased in size by a third since 1997.

- LNG tankers operating within the Mediterranean have become larger by 61 per cent whilst activity has increased by 33 per cent. Although the number of LNG vessels transiting the Mediterranean is relatively small, the trend is sharply upwards.

- Product vessel activity within the Mediterranean has declined by nearly a quarter whilst the average size of product tankers has increased by over 50 per cent. At the same time there has been a trend towards larger product tanker transits through the Mediterranean.

- Modest declines in LPG tanker activity within the Mediterranean have been coupled with a 33 per cent increase in average LPG tanker sizes.

- Dry cargo vessel activity, which accounts for around 35 per cent of all shipping activity within the Mediterranean, has remained relatively static.

Table 2.2 Mediterranean Port Calls and Transits - Vessel Type & Size

	Mediterranean Port Calls				Mediterranean Transits			
Vessel Type	Med Port Calls	% Incr 1997 - 2006	Average DWT	% Incr 1997 - 2006	Med Transits	% Incr 1997 - 2006	Average DWT	% Incr 1997 -2006
Chemical Tanker	20,038	65%	15,643	107%	745	98%	28,179	15%
Container	34,666	71%	27,604	55%	2522	85%	69,135	34%
Crude Oil Tanker	6,045	41%	125,618	26%	508	147%	160,050	-31%
Dry Cargo	89,645	1%	10,842	16%	4534	-8%	38,860	31%
LNG Tanker	1,199	33%	59,713	61%	55	1733%	72,382	27%
LPG Tanker	6,291	-4%	11,291	33%	197	9%	30,037	2%
Other	5,694	30%	1,501	-35%	252	70%	5,028	-25%
Other Tanker	3,011	-63%	6,924	-79%	35	-81%	36,796	-65%
Passngr/Pass. RoRo	75,350	23%	5,677	31%	592	-5%	15,078	9%
Product Tanker	10,599	-24%	20,197	51%	372	102%	48,585	69%

Source: ©Lloyd's MIU

Based on current trends, vessel activity within the Mediterranean is expected to increase by 18 per cent whilst through transits are projected to rise by 23 per cent. The most significant increases will occur in the chemical, crude and LNG tanker sectors and also in container vessel movements. Increased vessel activity should be viewed against a trend in the deployment of ever larger vessels, which is expected to continue.

Table 2.3 Projected Mediterranean Port Calls & Transits – 2006-2016

	Mediterranean Port Calls			Mediterranean Transits		
Vessel Type	*2006*	*2016*	% Increase	*2006*	*2016*	% Increase
Chemical Tanker	20,038	29,018	45%	745	1,149	54%
Container	34,666	49,109	42%	2,522	3,467	37%
Crude Oil Tanker	6,045	7,671*	27%	508	863	70%
Dry Cargo	89,645	86,685	-3%	4,534	4,758	5%
LNG Tanker	1,199	1,613	35%	55	73	33%
LPG Tanker	6,291	6,050	-4%	197	212	7%
Other	5,694	7,682	35%	252	436	73%
Other Tanker	3,011	3,000	0%	35	15	-57%
Passenger/Pass.RoRo	75,350	100,423	33%	592	389	-34%
Product Tanker	10,599	8,000	-25%	372	724	95%
Total	252,538	299,251	18%	9,812	12,087	23%

Source: ©Lloyd's MIU

**Excludes approx 2500 potential transits resulting from extra capacity required to ship Black Sea and Caspian oil (see Para 9.6)*

Changes in maritime traffic patterns and densities are the result of a complex interaction between global and national economic variables and cycles; vessel size and utilization; national and inter port competition; and the correlation between commodity flows and vessel types by trade route. The construction of models which capture all these interactions, even if feasible, falls outside the scope of the present

analysis. However, the results of these interactions are reflected in the empirical observation of current and historical vessel traffic flows by ship type and trade route. The trends projected throughout this study are the result of extrapolating from detailed observations of individual port to port deployments of all vessels transiting or operating within the Mediterranean over a ten year period. Some allowance has been made to smooth some of the more extreme trend projections to allow for the fact that ports will in practice adapt to declining market shares in order to make use of under-utilised infrastructure. Previous analysis employing this approach by Lloyd's MIU has produced good correlations between projections and actual densities.

3. Vessel Calls at Mediterranean Ports

In 2006 Lloyd's MIU recorded over 252,000 port calls at 480 ports and locations within the Mediterranean by over 13,000 individual vessels. The top 20 ports within the Mediterranean account for 37 per cent of all Mediterranean calls and 43 per cent of DWT capacity.

Table 3.1 Top 10 Ports by Number of Calls - 2006

Port	No. Unique Vessels	No. Calls	Total DWT
Barcelona	1,775	9,112	132,272,844
Leghorn	1,278	6,953	79,246,383
Genoa	1,331	6,924	111,939,020
Gibraltar*	3,812	6,822	312,509,938
Valencia	1,066	5,776	109,524,853
Algeciras	1,740	4,844	160,730,519
Alexandria(EGY)	1,880	4,801	58,506,026
Piraeus	1,488	4,712	79,055,659
Algiers	871	4,615	39,810,728
Venice	1,300	4,480	57,910,567

**Mainly Bunkering Calls*

Source: ©Lloyd's MIU

With a few exceptions most of the top ports are located in the western Mediterranean. Major observed trends in Mediterranean port calling profiles since 1997 include:

- Algiers has recorded the largest increase in port callings which have increased by 253 per cent since 1997 raising its position from 51st to 9th in the Mediterranean rankings on the back of increased calls from dry cargo and passenger vessels

- Gioia Tauro's and Algeciras' rise in rankings from 24th and 12th to 15th and 6th respectively since 1997 is the result of the increased importance of container trades at these ports

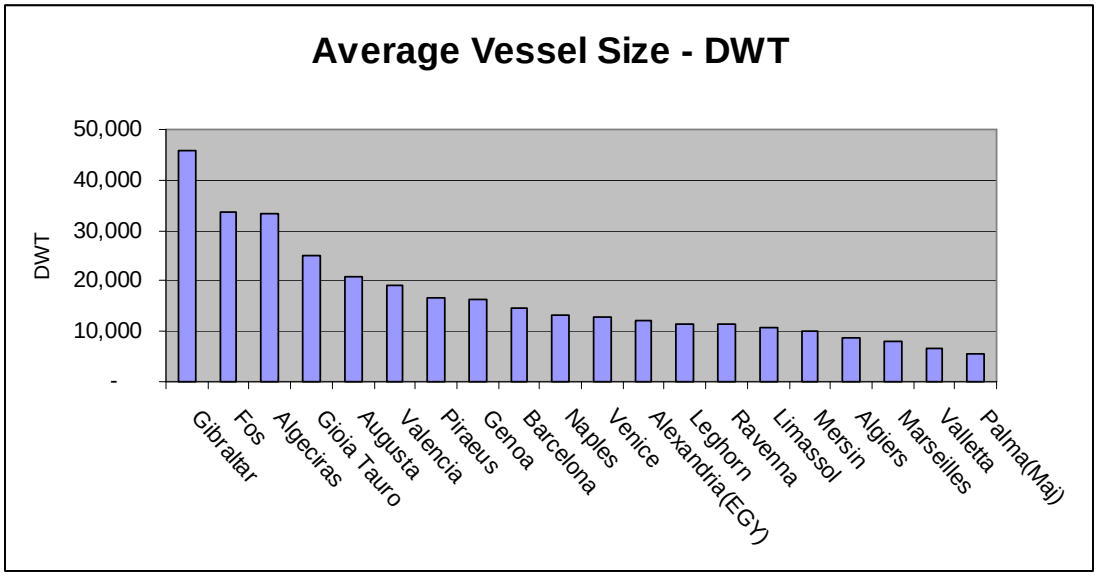
- Palma's rise to 13th from 27th position in 1997 is a reflection of a significant increase in passenger vessel calls at this port

- Following a significant decline in dry cargo vessel callings, Piraeus has dropped from 3rd to 8th place in the port call rankings

- Istanbul's fall from its position amongst the top 20 ports has been mirrored by a corresponding rise in vessel calls at Ambarli, which is currently 21st in the Mediterranean port call rankings

- The largest vessels call at Gibraltar, Fos, Algeciras, Gioia Tauro and Augusta, with the smallest size ranges calling at Palma, Valletta, Marseilles and Algiers

Figure 3.1 Average Vessel Size by DWT – Top 20 Ports



Source: ©Lloyd's MIU

Table 3.2 Top 10 Mediterranean Ports: Number of Calls by Vessel Type - 2006

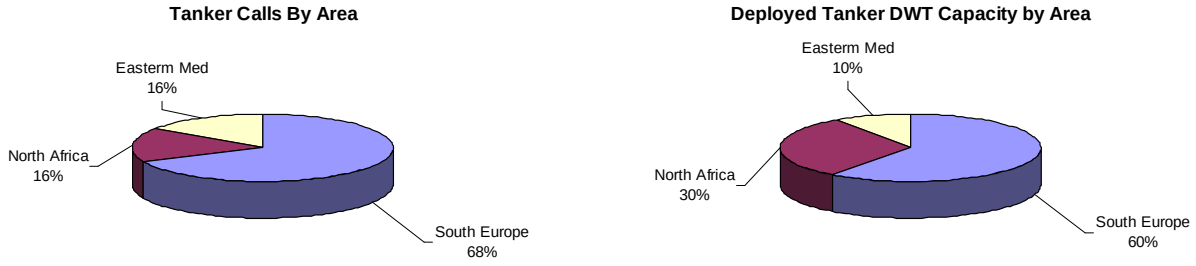
Port	Chemical Tanker	Container	Crude Oil Tanker	Dry Cargo	LNG Tanker	LPG Tanker	Other	Other Tanker	Passenger/Pass RoRo	Product Tanker
Barcelona	542	2,292	3	1,210	89	40	259	10	4,589	78
Leghorn	484	927	56	844		61	57	26	4,394	104
Genoa	467	1,376	172	895		1	146	31	3,640	196
Gibraltar*	615	183	534	3,695	170	344	139	68	337	737
Valencia	160	2,248		1,140		1	217	77	1,883	50
Algeciras	780	1,927	201	1,083	92	253	85	36	139	248
Alexandria(EGY)	190	548	4	2,983	3	108	124	26	699	116
Piraeus	167	1,369	52	825	1	19	47	31	1,981	220
Algiers	252	615	5	1,903	4	119	58	74	1,510	75
Venice	558	412	81	1,943		187	40	29	1,134	96

** Mainly Bunkering Calls*

Source: ©Lloyd's MIU

Amongst the top 20 Mediterranean ports the highest concentration of chemical, oil and gas tanker callings is around the ports of Gibraltar, Augusta, Venice, Fos, Algeciras and Ravenna. In general, tanker activity measured in terms of both number of calls and DWT capacity is predominantly concentrated in the western Mediterranean.

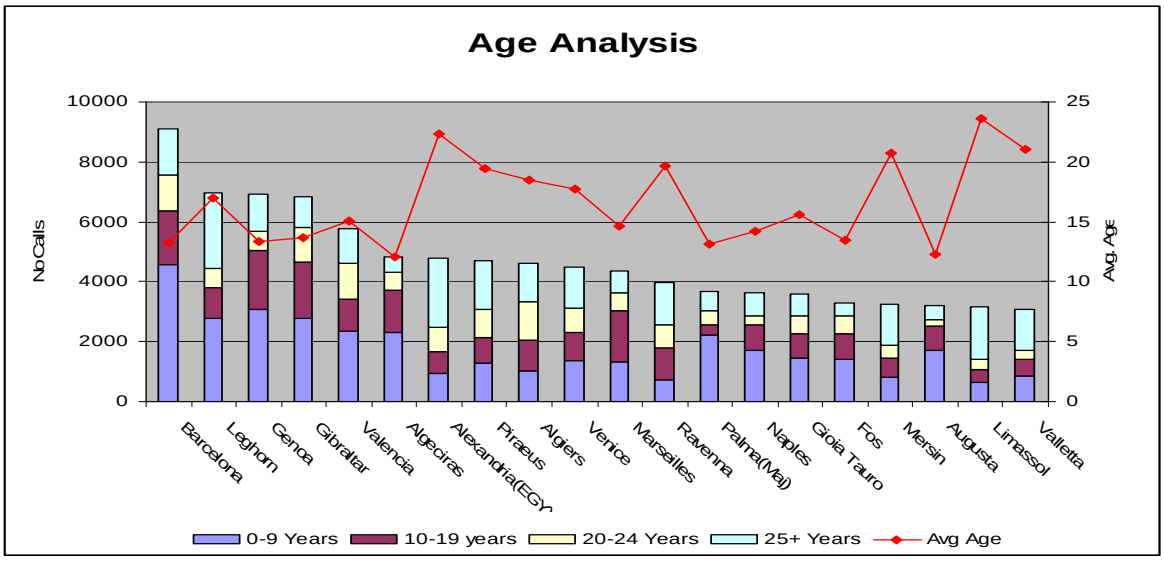
Figure 3.2 Tanker Deployment within the Mediterranean- 2006



Source: ©Lloyd's MIU

In terms of age profile, the average age of vessels calling Limassol, Alexandria, Valletta and Mersin is over 20 years compared to less than 14 years at the western Mediterranean ports of Algeciras, Augusta, Palma, Barcelona, Genoa, Fos and Gibraltar. In view of the correlation between vessel age and casualty risk, the deployment of older tankers in the eastern Mediterranean potentially exposes this area to greater risk of a casualty related pollution event.

Figure 3.3 Average Vessel Age – Top 20 Ports



Source: ©Lloyd's MIU

Based on current trends the profile of the top 20 Mediterranean ports is likely to remain relatively stable over the next 10 years. Assuming the continuation of observed growth rates, the Turkish ports of Ambarli and Diliskelesi together with Ancona and Marsaxlokk are projected to enter the top 20 rankings measured by number of calls. In terms of vessel capacity, which is a good indicator of the volume of trade, the current rankings are not projected to change to any significant extent.

Table 3.3 Projected Top 20 Mediterranean Ports 2016

Rank	Port	No. Calls	Port	Mil DWT
1	Barcelona	12,290	Gibraltar*	472.8
2	Gibraltar*	9,796	Algeciras	197.5
3	Leghorn	9,753	Barcelona	190.7
4	Genoa	9,024	Sidi Kerir Term.	188.5
5	Valencia	7,717	Gioia Tauro	156.0
6	Gioia Tauro	7,365	Valencia	153.7
7	Algiers	7,344	Genoa	128.2
8	Palma(Maj)	6,049	Port Said	122.9
9	Ambarli	5,534	Arzew	115.2
10	Algeciras	5,479	Taranto	104.8
11	Marseilles	5,198	Fos	102.2
12	Diliskelesi	5,010	Leghorn	101.3
13	Venice	4,926	Algiers	84.0
14	Alexandria(EGY)	4,770	Marsaxlokk	77.4
15	Ancona	4,382	Piraeus	75.0
16	Ravenna	4,368	Augusta	74.1
17	Naples	4,264	Venice	72.6
18	Fos	4,203	Tarragona	71.6
19	Marsaxlokk	4,058	Trieste	69.3
20	Piraeus	4,000	Port de Bouc	68.4

**Mainly Bunkering Calls*

Source: ©Lloyd's MIU

The principal access and exit points for vessels entering or leaving the Mediterranean are Gibraltar, the Bosporus and the Suez Canal. In 2006 there were fewer than 70,000 transits via Gibraltar, 55,000 via Bosporus and 16,000 via Suez after excluding ferries, cross waterway traffic, non merchant vessels and merchant vessels under 100 GT.

Tankers account for between 16 and 19 per cent of transits via these waterways measured by number of transits but for a significantly higher proportion of vessel DWT capacity. Tankers sailings via the Bosporus represent 46 per cent of all vessel DWT capacity moving through this waterway, whilst tanker sailings via Suez and Gibraltar represent 24 and 32 per cent respectively of individual waterway transit capacity.

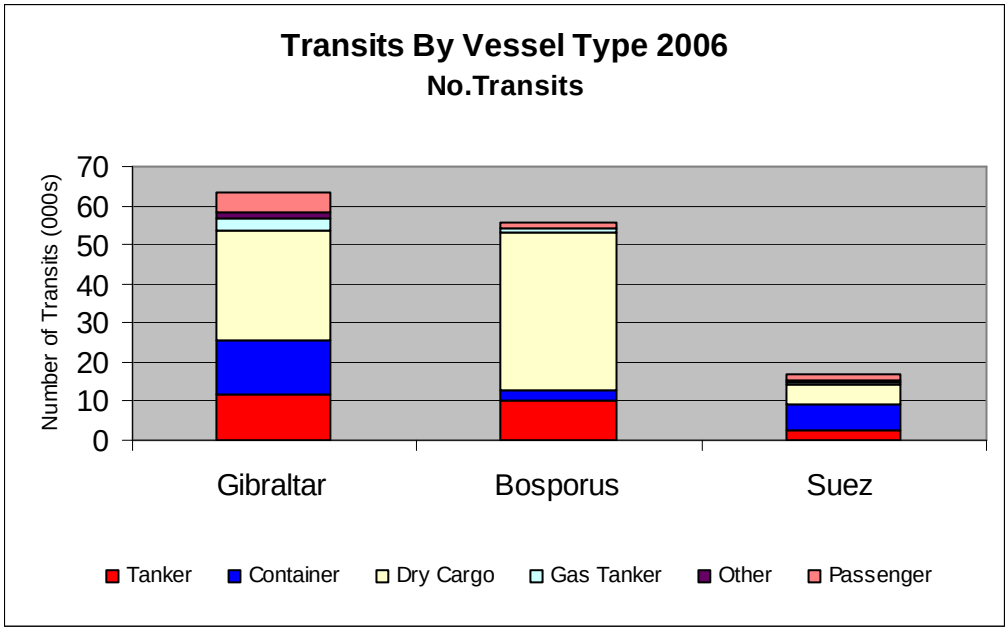
The relative proportion of transits via these waterways by ship type is shown in Table 3.4. A further detailed breakdown of the top 20 port to port routes in respect of vessels transiting the Suez Canal is given in tables 3.5 and 3.6.

Table 3.4 Waterway Transits by Vessel Type

	Gibraltar		Bosporus		Suez	
	No. Transits	*DWT*	*No. Transits*	*DWT*	*No. Transits*	*DWT*
Tanker	19%	32%	18%	46%	16%	24%
Container	22%	28%	5%	5%	39%	45%
Dry Cargo	44%	34%	73%	46%	31%	25%
Gas Tanker	4%	4%	2%	2%	3%	3%
Other	3%	0.2%	1%	0.2%	2%	0.3%
Passenger/RoRo	8%	2%	2%	1%	9%	3%

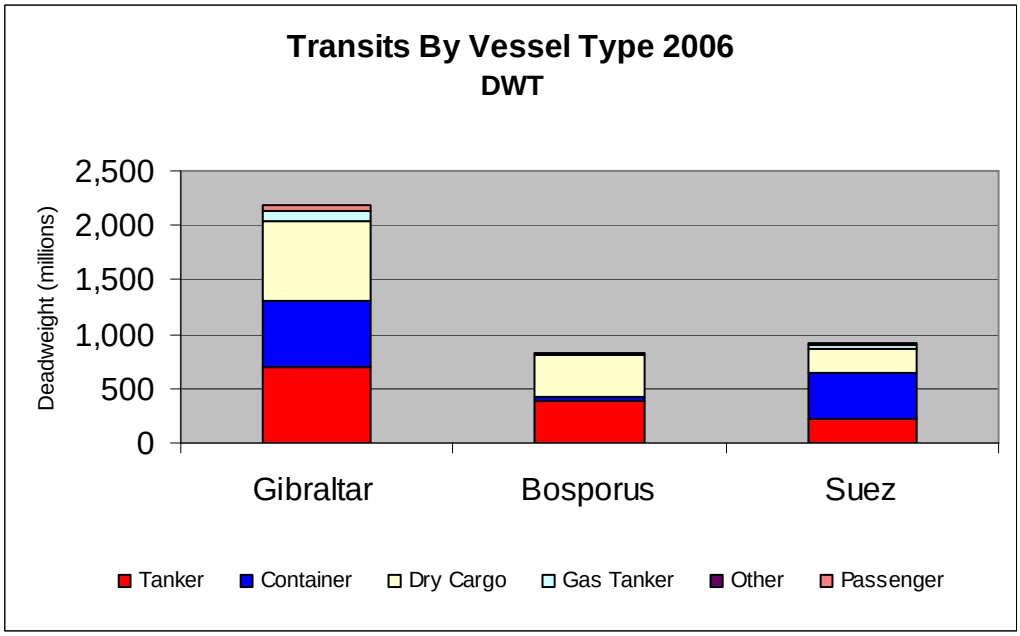
Source: ©Lloyd's MIU

Figure 3.4 Transits from/to the Mediterranean (Number of Transits)



Source: ©Lloyd's MIU

Figure 3.5 Transits from/to the Mediterranean (DWT)



Source: ©Lloyd's MIU

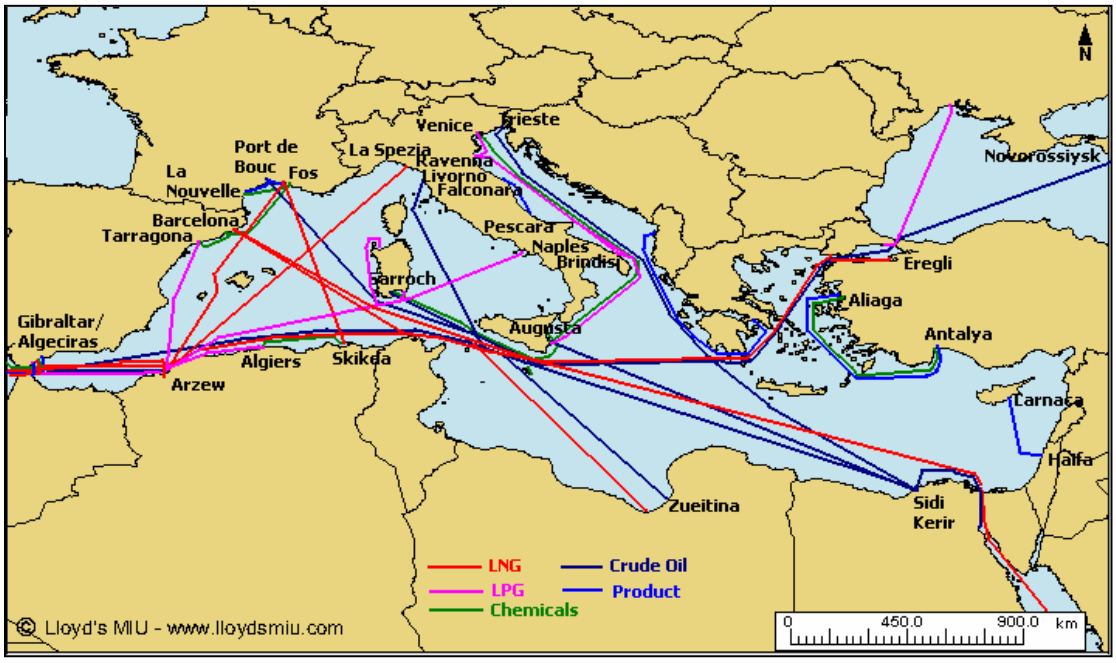
4. Port to Port Links

In 2006, vessels operating in or through the Mediterranean Sea were deployed across 31,000 unique port to port routes including 16,000 unique intra-Mediterranean port to port links.

The top 20 Mediterranean port to port trade routes measured in terms of number of voyages are dominated by high frequency small size Intra Mediterranean passenger traffic (Table 4.2). However, the top 20 transit routes through and voyages within the Mediterranean, measured by vessel capacity and therefore cargo volumes, are dominated by larger tanker, container and dry bulk vessels (Table 4.3). A detailed breakdown of the reported top 20 routes for chemical and product tankers is shown in Appendix 2.

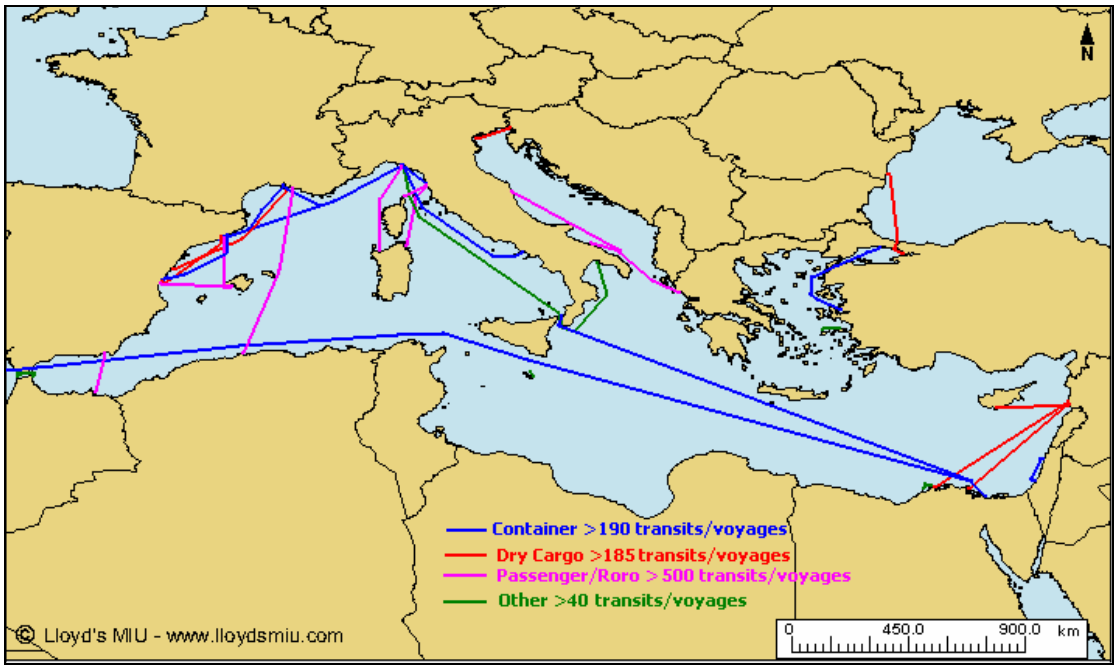
In respect of tanker deployment in the Mediterranean, crude oil shipments from Novorossiysk to Mediterranean destinations and from Sidi Kerir to both Mediterranean destinations and ports west of Gibraltar as well as exports from the Persian Gulf through the Mediterranean via Suez dominate the major traffic lanes. In the LNG sector North African exports to other Mediterranean destinations predominate. The top LPG trades are made up of intra- Mediterranean sailings.

Figure 4.1 Major Tanker Routes - 2006



Deployment of non-tanker vessels operating in the Mediterranean is more fragmented than for tankers. In 2006, dry cargo vessels, for example, were deployed on over 22,000 different port to port routes. The top 20 routes for each of the non-tanker vessel types account for less than 22 per cent of total voyages by individual ship type. The top 20 container routes by number of voyages amounted to just over 5,000 voyages, representing only 13 per cent of container voyages in the Mediterranean in 2006. The top 20 passenger/roro routes amounted to just over 16,000 voyages, representing 21 per cent of the total passenger/roro voyages. A detailed breakdown of the major non tanker routes is shown in Appendix 3.

Figure 4.2 Major non-Tanker Routes – 2006



Over the past ten years, vessels flagged in a Mediterranean littoral State have accounted for between 40 to 45 per cent of vessels operating within or through the Mediterranean. Nearly 80 per cent of vessels in transit via the Mediterranean between two non-Mediterranean ports are registered under a non-Mediterranean State flag. Around 57 per cent of vessels operating within or through the Mediterranean in 2006 were owned by companies located in a Mediterranean country.

Based on current trends voyages between Ancona and Igoumenitsa and between Famagusta and Mersin are likely to fall outside the top 20 port to port rankings. Measured in terms of deployed DWT capacity transits and voyages between Singapore-Rotterdam, Singapore-Port Said, Port Klang-Marsaxlokk and Algeciras-Rotterdam are likely to reach the top 20 rankings at the expense of short haul voyages between Barcelona-Fos, Genoa-Fos, Gioia Tauro–Jeddah and Taranto-Gibraltar. An indication of the top 20 projected routes by vessel type is shown in Table 4.4.

Table 4.1 Projected Top 20 Mediterranean Voyage/Transit Routes 2016

Rank	Origin	Destination	No Transits/Voyages	Origin	Destination	DWT (Mil)
1	Barcelona	Palma(Maj)	1870	Ain Sukhna Term.	Sidi Kerir Term.	90.26
2	Olbia	Leghorn	1815	Sidi Kerir Term.	Rotterdam	75.80
3	Leghorn	Olbia	1795	Singapore	Rotterdam	43.37
4	Palma(Maj)	Barcelona	1758	Barcelona	Valencia	39.24
5	Barcelona	Valencia	1373	Genoa	Barcelona	28.50
6	Nador	Almeria	1330	Trieste	Novorossiysk	26.50
7	Almeria	Nador	1318	Gibraltar	Arzew	23.09
8	Igoumenitsa	Bari	1217	Sidi Kerir Term.	Le Havre	22.04
9	Genoa	Barcelona	1199	Sidi Kerir Term.	LOOP Term.	19.91
10	Bari	Igoumenitsa	1185	Fos	Barcelona	18.69
11	Palma(Maj)	Ibiza	1089	Gibraltar	Ponta da Madeira	18.68
12	Genoa	Porto Torres	1089	Algeciras	Rotterdam	18.57
13	Palma(Maj)	Valencia	1086	Arzew	Gibraltar	17.94
14	Valencia	Palma(Maj)	1076	Gibraltar	Tubarao	17.27
15	Leghorn	Bastia	1049	Singapore	Port Said	16.23
16	Bastia	Leghorn	1030	Port Said	Singapore	16.08
17	Porto Torres	Genoa	1030	Naples	La Spezia	16.03
18	Ibiza	Palma(Maj)	1016	Singapore	Southampton	15.65
19	Valencia	Barcelona	970	Alexandria(EGY)	El Dekheila	15.04
20	Marseilles	Algiers	965	Port Klang	Marsaxlokk	14.99

5. Crude Oil Trades within The Mediterranean

In 2006 crude oil loaded at Mediterranean ports amounted to 220 million tonnes. The top 20 Mediterranean crude oil loading ports measured by number of calls accounted for 99 per cent of all crude oil loaded in the Mediterranean.

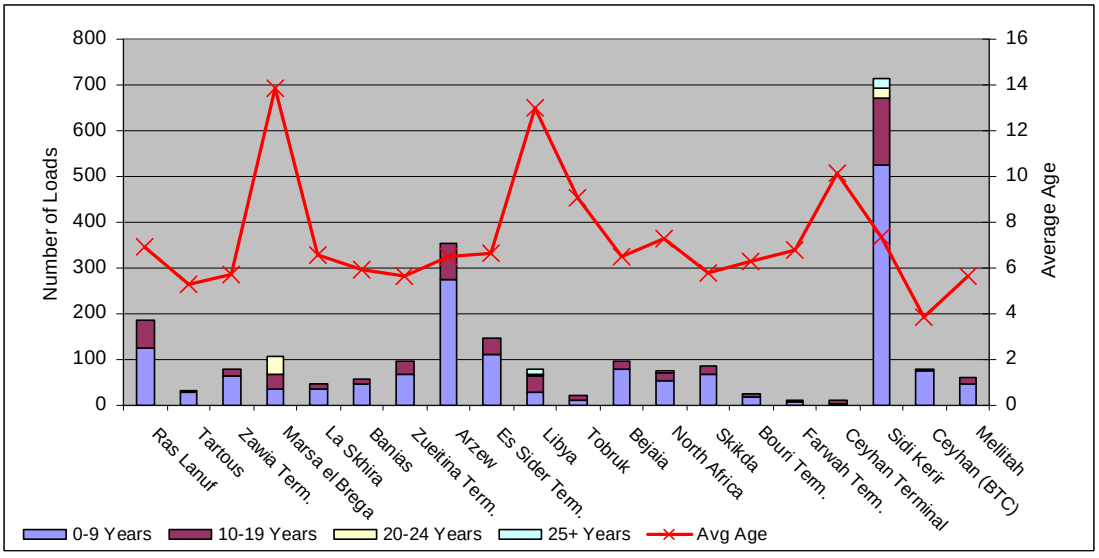
Table 5.1 – Top 10 Crude Oil Load Ports/Places

Load Port/Place	No. Loads	Tonnes
Sidi Kerir	715	74,339,769
Arzew	355	40,240,000
Ras Lanuf	187	14,065,500
Es Sider Term.	148	14,640,000
Marsa el Brega	108	6,136,000
Bejaia	95	6,750,000
Zueitina Term.	95	7,570,000
Skikda	84	6,650,000
Zawia Term.	80	6,800,000
Ceyhan (BTC)	78	6,480,000

Source: ©Lloyd's MIU

Over 70 per cent of crude oil loadings at Mediterranean ports during 2006 were carried out by tankers below 10 years of age. Only 4 per cent of tankers were over 20 years of age. Over half of loads by vessels over 20 years took place at Libyan ports with most of the rest at Sidi Kerir terminal in Egypt. The older vessel profile along this North African coastline potentially exposes the area to higher risk of a casualty incident

Figure 5.1 Average Vessel Age – Top 20 Crude Oil Load Ports



Source: ©Lloyd's MIU

The total volume of crude oil discharged at Mediterranean ports during 2006 amounted to 255 million tonnes. The top 20 Mediterranean crude oil discharge ports measured by number of calls accounted for 85 per cent of all crude oil discharged in the Mediterranean.

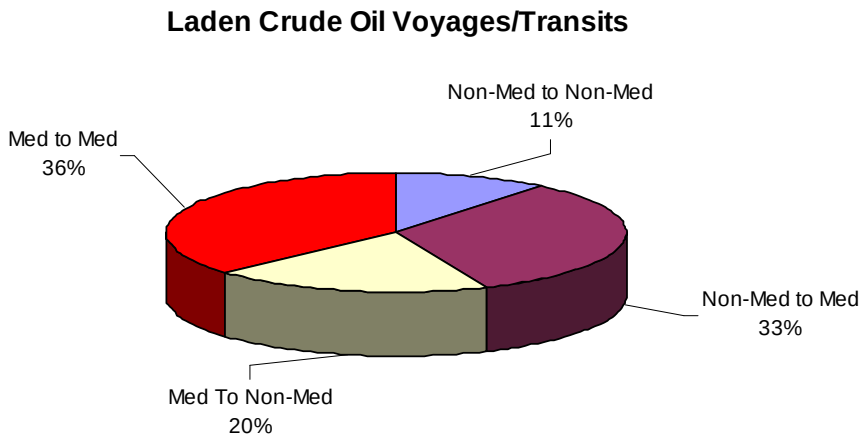
Table 5.2 – Top 10 Crude Oil Discharge Ports

Discharge Port	No. of Discharges	Tonnes
Trieste	395	33,838,000
Fos	373	35,195,000
Augusta	255	20,341,500
Genoa	185	15,189,500
Sarroch	163	12,774,000
Algeciras	102	12,337,500
Savona	97	7,583,000
Venice	96	6,151,000
Tutunciftlik	91	10,541,000
Port de Bouc	91	5,889,000

Source: ©Lloyd's MIU

In 2006, 4224 laden oil tanker movements (*Figure 5.2*) carrying 421 million tonnes of crude oil were observed in the Mediterranean. 457 of these were transits involving tankers carrying 72 million tonnes of crude oil en route between non-Mediterranean ports.

Figure 5.2 Mediterranean Laden Crude Oil Tanker Voyages/Transits



The top 20 laden crude oil tanker routes account for 892 voyages/transits and 101 million tonnes of crude oil. Around 70 per cent of voyages/transits within this group originated in either Sidi Kerir or Novorossiysk.

Table 5.3 Top 10 Laden Crude Oil Routes -2006

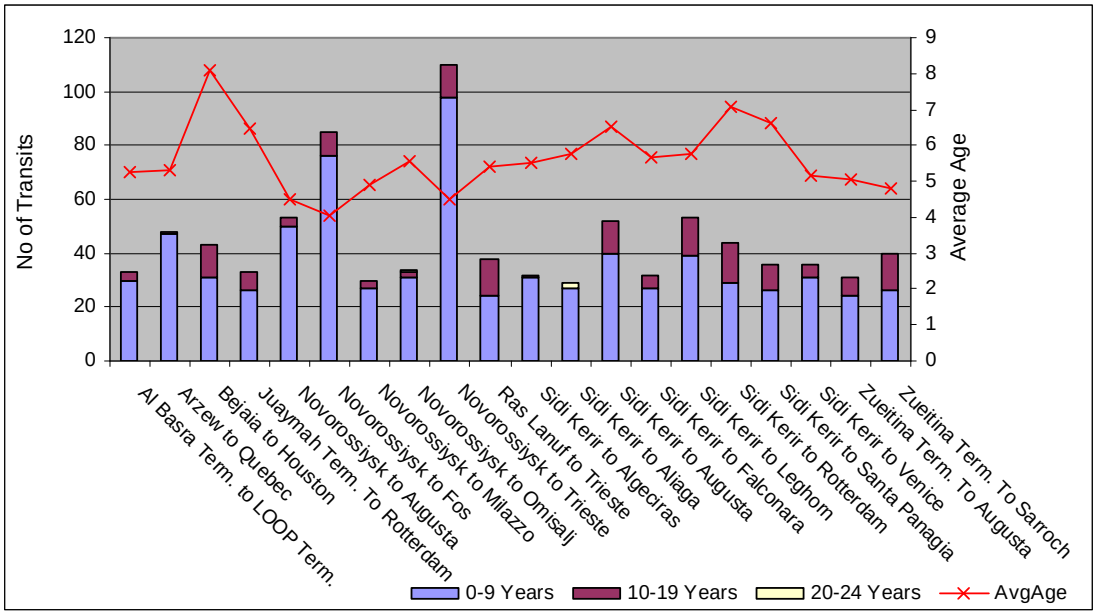
Origin Port	Destination Port	Laden Voyages/Transits	Crude Tonnes
Novorossiysk	Trieste	110	10,797,500
Novorossiysk	Fos	85	8,777,500
Novorossiysk	Augusta	53	5,047,500
Sidi Kerir	Leghorn	53	4,048,333
Sidi Kerir	Augusta	52	3,760,000
Arzew	Quebec	48	6,175,000
Sidi Kerir	Rotterdam	44	10,410,000
Bejaia	Houston	43	3,195,000
Zueitina Term.	Sarroch	40	3,140,000
Ras Lanuf	Trieste	38	2,990,000

Source: ©Lloyd's MIU

There were over 450 laden crude oil tanker transits through the Suez Canal in 2006. The majority of these vessels transited northbound into the Mediterranean Sea from load areas in Persian Gulf destined for non Mediterranean ports in Northern Europe and the US.

The average age of tankers carrying crude oil on the top 20 laden routes in 2006 was less than 10 years. In fact, 83 per cent of laden voyages/transits on these routes were by tankers under 10 years old. Only 0.4 per cent of tankers on the top 20 laden routes were over 20 years of age.

Figure 5.3 Average Vessel Age – Top 20 Laden Crude Oil Routes



Source: ©Lloyd's MIU

6. LNG Trades within the Mediterranean

Annual volumes of LNG loaded at Mediterranean ports amount to 31 million tonnes. The top 20 Mediterranean LNG loading ports measured by number of calls account for 71 per cent of all LNG loaded at Mediterranean ports

Table 6.1 – Top 10 LNG Load Ports/Places

Load Port/Place	No. Loads	Tonnes
Arzew	354	15,033,382
Skikda	40	753,327
Algeciras	37	2,002,524
La Spezia	15	403,428
Escombreras	14	693,774
Idku	12	667,314
Barcelona	11	497,986
Damietta	10	565,582
Eregli(Sea of Marmara)	6	350,461
Marsa el Brega	5	142,800

Source: ©Lloyd's MIU

Annual volumes of LNG discharged at Mediterranean ports amount to 25 million tonnes. The top 16 Mediterranean LNG discharge ports measured by number of calls account for 100 per cent of all LNG discharged in the Mediterranean.

Table 6.2 – Top 10 LNG Discharge Ports/Places

Discharge Port	No. of Discharges	Tonnes
Fos	151	3,648,922
Gibraltar *	133	6,822,423
Barcelona	101	4,929,174
La Spezia	62	1,701,081
Eregli(Sea of Marm)	58	3,312,548
Escombreras	53	2,952,604
Algeciras	15	804,385
Cartagena(ESP)	7	377,421
Port de Bouc	2	56,500
Augusta	1	73,648

** Mainly Bunkering Calls*

Source: ©Lloyd's MIU

The top 20 laden LNG tanker port-to-port routes, accounting for 432 voyages and 18 million tonnes of LNG trade, represent 50 per cent of total laden LNG voyages in the Mediterranean. Over half of laden voyages within this category originate from the Algerian port of Arzew.

Table 6.3 Top 10 Laden LNG Routes

Origin Port	Destination Port	Laden Voyages	Tonnes
Arzew	Fos	104	2,711,334
Arzew	La Spezia	48	1,356,000
Arzew	Eregli(Sea of Mar)	45	2,534,058
Arzew	Zeebrugge	33	2,025,651
Skikda	Fos	33	627,286
Arzew	Montoir	25	1,519,830
Arzew	Barcelona	24	1,017,545
Arzew	Lake Charles	18	1,081,645
Arzew	Huelva	16	631,279
Algeciras	Gibraltar*	12	638,763

** Mainly Bunkering Calls* Source: ©Lloyd's MIU

7. LPG Trades within the Mediterranean

Annual volumes of LPG loaded at Mediterranean ports amount to 19 million tonnes. The top 20 Mediterranean LPG loading ports measured by number of calls account for 75 per cent of all LPG loaded at Mediterranean Ports.

Table 7.1 – Top 10 LPG Load Ports

Load Port	No. Loads	Tonnes
Augusta	381	934,238
Arzew	334	5,286,248
Port de Bouc	186	827,993
Algeciras	159	1,258,475
Venice	151	329,407
Gela	110	230,408
Algiers	104	937,695
Brindisi	95	271,448
Gibraltar*	86	1,488,480
Ras Lanuf	86	326,531

** Mainly Bunkering Calls* Source: ©Lloyd's MIU

Annual volumes of LPG discharged at Mediterranean ports amount to 20 million tonnes. The top 20 Mediterranean LPG discharge ports measured by number of calls account for 72 per cent of all LPG discharged in the Mediterranean.

Table 7.2 – Top 10 LPG Discharge Ports

Discharge Port	No. of Discharges	Tonnes
Ravenna	331	778,757
Brindisi	226	644,548
Tarragona	175	1,643,401
Gibraltar*	148	2,898,450
Augusta	145	512,430
Port de Bouc	115	1,195,801
Naples	102	855,744
Thessaloniki	97	252,145
Yarimca	94	893,842
Porto Torres	85	182,107

** Mainly Bunkering Calls* Source: ©Lloyd's MIU

LPG trade in the Mediterranean is relatively fragmented. The top 20 LPG tanker laden routes represent 23 per cent of all Mediterranean laden LPG routes measured by number of voyages and 16 per cent of all LPG trade carried within or through the Mediterranean.

Table 7.3 Top 10 Laden LPG Routes

Origin Port	Destination Port	Laden Voyages	Tonnes
Augusta	Brindisi	114	247,980
Venice	Ravenna	114	212,185
Augusta	Ravenna	101	216,179
Brindisi	Ravenna	61	156,673
Arzew	Naples	52	676,448
Arzew	Tarragona	41	589,399
Cagliari	Porto Torres	34	70,244
Gela	Brindisi	32	63,457
Port de Bouc	Mohammedia	28	113,742

* *Mainly Bunkering Calls*

Source: ©Lloyd's MIU

8. Port Developments and Growth in the Mediterranean

The main growth areas for ports in the Mediterranean in recent years have been containers and oil. Calls by containerships at Mediterranean ports have increased 71% since 1997. Consequently, most Mediterranean ports' development plans for the next ten to 15 years include scope for expanding container handling or developing new container terminals.

The pattern and volume of crude oil, product and LNG throughput at ports is also changing. Exports from Caspian oil producers via Black Sea ports are increasing, but eastern Mediterranean ports have also become the focus for routes to markets which avoid transiting the Bosporus. Importing countries in the Mediterranean are also developing new terminal facilities to enable greater diversity in sourcing, particularly in natural gas. New oil pipelines feeding into the Black Sea and eastern Mediterranean and the development of new LNG import terminals on the northern coast of the Mediterranean will alter tanker deployment in the region.

8.1. Container Ports

Container handling at the top 20 Mediterranean ports has increased by over 50% in the last five years. By 2015, Ocean Shipping Consultants[2] anticipate that container handling demand in the Mediterranean and Black Sea could reach up to 83 million TEUs a year; an increase of 140% on the 2005 level. Port capacity is expected to expand to meet this demand.

Container ports in the Mediterranean can, broadly speaking, be divided into two categories; gateway ports serving a hinterland, and transhipment hubs used by lines to transhipment containers between mainline east – west services and local feeder services. Gioia Tauro, Algeciras and Marsaxlokk are examples of hubs. Marseilles, Genoa and Barcelona have been used primarily as 'gateway' ports for national trade.

The main determinants of container port growth are the port preferences of container lines and economic growth in the hinterland served by a gateway port. Table 8.1 shows the top container ports in the Mediterranean and their growth over the last five years. It should be noted that, given the trend for the introduction of ever larger container vessels, growth in traffic volumes does not necessarily result in a corresponding increase in the number of port calls or vessel voyages/transits.

[2] Ocean Shipping Consultants, *The European and Mediterranean Containerport Markets to 2015*

Table 8.1. Top 20 Mediterranean Container Ports (TEU Throughput)

	Port Name	Port Type	1991	1996	2001	2006	% Growth 2001-06
1	Algeciras	Hub	761,795	1,306,825	2,151,770	3,244,641	51%
2	Gioia Tauro	Hub		571,951	2,488,332	2,900,000	17%
3	Valencia	Gateway	364,445	708,332	1,506,805	2,612,139	73%
4	Barcelona	Gateway	488,917	767,236	1,411,054	2,317,363	64%
5	Genoa	Gateway	344,353	825,752	1,526,526	1,657,113	9%
6	Marsaxlokk	Hub	157,636	593,013	1,165,070	1,600,000	37%
7	Ambarli	Hub				1,446,269	
8	Piraeus	Both	462,682	575,256	1,165,797	1,403,408	20%
9	La Spezia	Both	463,470	871,100	974,646	1,137,000	17%
10	Marseilles	Gateway	175,396	544,449	742,000	941,400	27%
11	Taranto	Hub			197,755	892,303	351%
12	Izmir	Both		345,924	491,377	847,926	73%
13	Cagliari	Hub				690,392	
14	Mersin	Both	102,491	181,527	290,354	643,749	122%
15	Beirut	Gateway	131,175	290,681	299,400	594,601	99%
16	Port Said	Hub	60,801	362,311	569,436	518,890	-9%
17	Malaga	Hub		4,776	2,987	450,694	14989%
18	Damietta	Gateway	212,918	808,608	639,325	445,634	-30%
19	Haydarpasa	Gateway	146046	329,160	224,544	400,067	78%
20	Thessaloniki	Gateway	85944	239,098	233,909	376,940	61%

Source: Containerisation International

The port of Malaga, in 17th place in the rankings, is a clear example of how one containership operator's transhipment plans can radically change throughput at a port and, as a result, the deployment of container vessels in an area. The table above shows that in 2001 Malaga handled fewer than 3,000 TEU, but by 2006 this had increased to 450,000 TEU. Maersk started using the port in 2004, making use of a newly constructed terminal.

The Turkish ports of Ambarli, Izmir and Mersin handle some hinterland traffic, but are positioning themselves to handle transhipment traffic for countries in the Black Sea and Balkan areas. A likely future trend is for large containerships on mainline east-west routes to call directly at ports in the eastern Mediterranean whose trade was previously transhipped from a central or western Mediterranean port. These ports will then handle transhipment for other ports in the region and the Black Sea.

The majority of the top 20 Mediterranean container ports in 2006 measured by TEU throughput were in the central or western Mediterranean. It is not likely that this will change significantly, though ports such as Port Said, Ambarli and Mersin may rise in the rankings as they develop their roles as transhipment hubs.

8.2. Planned Container Port Developments

Most of the main container ports in the Mediterranean have development or expansion plans in place to keep pace with containership growth and operator requirements. Many of the larger container ports in the area are planning to, at a minimum, double their handling capacity in the next ten years. The sections below show some of the plans underway in the western and eastern Mediterranean. It should be noted that ports will to some degree be competing for the same traffic, particularly in the transhipment sector. Due to competitive pressures, development of port infrastructure

does not necessarily guarantee that additional capacity will be fully utilised at all ports.

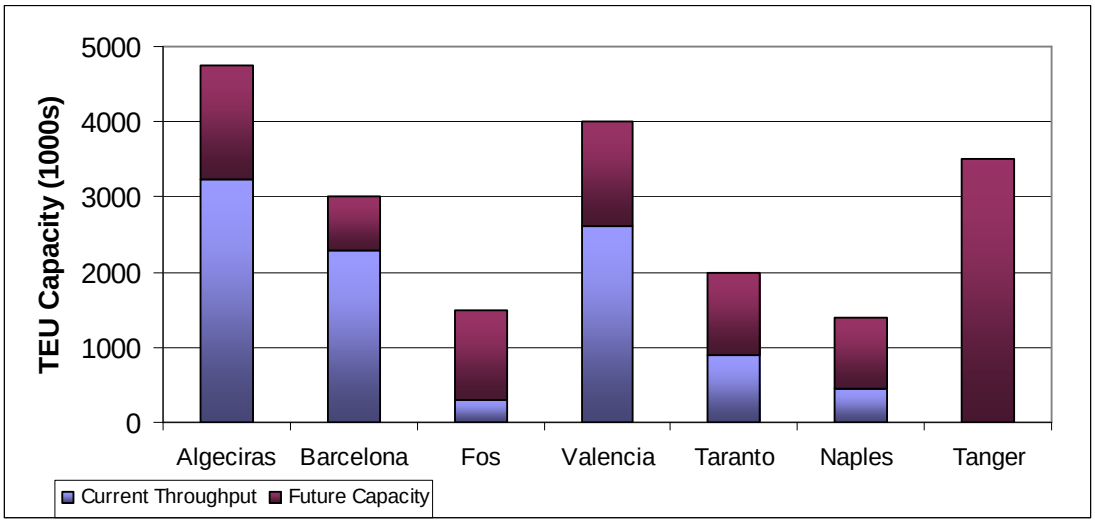
Western Mediterranean

Container terminal developments in the Mediterranean have traditionally been focused in the west, particularly at those ports which handle large transhipment volumes. The list below gives an indication of the main expansion plans known about at the time of writing.

- Barcelona plans to increase container handling from 2.3 million TEU in 2006 to 3 million TEU in 2011.
- Fos, which doesn't currently feature in the Top 20 as it handled only 0.3 million TEU in 2006, has two new terminals entering into service in 2008, which will be able to handle 1.5 million TEU a year.
- Valencia plans to be able to handle 4 million TEU by 2015, up from 2.6 million TEU in 2006.
- Taranto expects to handle 2 million TEU by the end of 2009. This compares with 892,000 TEU in 2006. One of Taranto's main customers is Evergreen, a line which has not previously operated vessels over 8,000 TEU, but which was reported in December 2007 to be negotiating an order for such ships.
- The port of Naples, which handled 0.44 million TEU in 2006, plans to develop its Eastern dock to increase container traffic in the port to 1.4 million TEU by 2020.
- Algeciras plans to develop a new terminal on reclaimed land. This will increase capacity in the port by 1.5 million TEU.
- Two new terminals are being developed east of the port of Tangier in Morocco with the name Tanger-Mediterranée. The plan is to handle 3.5 million TEU by 2015 and accommodate vessels up to 450 metres in length with a draft of 16-18 metres. This will primarily be transhipment traffic.

Figure 8.1, shows current throughput and future total capacity at each port.

Figure 8.1: Current and Future Container Port Capacity



Capacity at these nine ports will increase from 9.8 million TEU now to 16.9 million TEU in the next ten years, an increase of over 70%.

Eastern Mediterranean

The eastern Mediterranean has been a growing focus for port operators and container lines in the last few years due to its proximity to Adriatic and Black Sea markets, as well as the Suez Canal.

- The Suez Canal Container Terminal at Port Said in Egypt plans to be able to handle 5.1 million TEU and accommodate vessels carrying 22 rows across by 2011.
- Piraeus plans to triple capacity by 2011. This would mean a handling capacity of around 4.2 million TEU.
- Construction of a new container terminal at Yarimca in Turkey began in 2006 for DP World (port operator). The terminal is expected to enter operation in 2008 with a capacity of more than 1 million TEU.
- Mersin currently handles 0.64 million TEU and plans are in place to increase this to 1.7 million TEU over the next ten years.
- Ravenna has a new container terminal due to be completed in 2011.

The Greek Shipping Ministry has held discussions with China Shipping Container Lines (CSCL) regarding the latter possibly choosing to site a transhipment terminal on Crete[3]. This terminal would have a capacity of 2 million TEU a year, but in autumn 2007 was still at the planning stage and the subject of local opposition. This example demonstrates that, although port development plans can be used to predict future handling at a port, completely new developments are harder to forecast and could have a significant local impact on ship densities and deployment patterns in an area.

Vessel size increases

Future containership deployment will be increasingly determined by the ability of a port to handle the size of ships operators wish to deploy. The largest containerships serving the Mediterranean at present are the Maersk 'E-class' ships with TEU capacities of between 12,500 and 14,000 and carrying 22 rows across. These vessels are deployed on mainline services between Asia and Northern Europe, calling only at Algeciras in the Mediterranean.

In October 2007, there were 69 ships of more than 10,000 TEU on order. In all, there were over 300 containerships over 4,999 TEU on order at the time of writing. Table 8.2, below, shows these vessels broken down by draft range.

Table 8.2: Vessels on order over 4999 TEU

Draft Range	No of Ships	Total TEU
12-13m	50	309,142
13-14m	40	291,834
14-15m	148	1,186,001
15-16m	64	728,351
16-17m	2	25,016

The largest ship on order at the end of 2007 has a capacity of just over 13,000 TEU, but the potential for ships with a capacity of 18,000 TEU is a subject of continued discussion in the industry.

[3] Lloyd's List, *Newcomers bid to eclipse established players*, 15th May 2006

The growth of Mediterranean container ports, particularly those currently used as hubs for transhipment, will depend partly on their ability to keep pace with the equipment and depth at berth required to handle such large ships. For example, in Italy, only Gioia Tauro has the depth and crane capacity to handle 12,000 TEU ships with boxes 22 rows across[4]. Two other ports in the country could handle 9,500 TEU ships. Other ports are restricted to vessels below this size.

Increased deployment of these very large ships is likely to reinforce the hub and spoke operations of the major operators. Vessels over 7,000 or 8,000 TEU will be deployed exclusively on east-west routes between Asia and Northern Europe, calling at one or two ports in the Mediterranean on the way. If fuel prices continue to increase and/or shipping is included in some form of emissions trading scheme there could be a cost incentive for operators to minimise deviation of their large vessels from the main east-west navigation route between the Suez Canal and Gibraltar.

These larger ships will displace vessels of 4,000 to 6,000 TEU that were previously used on such routes. These could then be redeployed on large volume short-haul routes, north-south routes or routes with vessel size restrictions (e.g. Panama Canal). One consequence is likely to be increased individual vessel size on feeder routes within the Mediterranean with the potential to slow down the rate of growth in container traffic densities.

8.3. Dry Bulk Ports

Bulk ports and terminals in the Mediterranean have not experienced the same high levels of growth as their container counterparts. The busiest port for bulk vessels in 2006 was Gibraltar, which is used primarily for bunkering.

Table 8.3: Mediterranean Callings by Dry Bulk Vessels in 2006

Rank	NAME	Country	No Calls	Total DWT
1	Gibraltar*	Gibraltar	2042	127,922,896
2	Venice	Italy	705	14,991,554
3	Ravenna	Italy	634	18,245,819
4	Alexandria(EGY)	Egypt	508	19,856,548
5	Volos	Greece	448	3,279,905
6	Taranto	Italy	408	26,618,485
7	Koper	Slovenia	369	11,899,681
8	Algeciras	Spain	364	17,718,151
9	San Carlos de la Rapita	Spain	339	1,938,277
10	Split	Croatia	313	529,893

**Mainly Bunkering Calls*

Source: ©Lloyd's MIU

As Table 8.3 shows, the northern Adriatic hosts three of the busiest dry bulk ports in the Mediterranean; Venice (2), Ravenna (3) and Koper (8). The ports in this area see themselves as the natural trade gateway for Central and Eastern Europe. This aspiration has been hindered by the lack of hinterland transport infrastructure, which has meant that cargo for Central Europe is often routed through North European ports;

[4] Lloyd's List, *Difficulties could become a deep-rooted problem*, 7th June 2007

this may change as infrastructure improves. The northern Adriatic is at the crossroads of the European Union transport Corridor V between Lisbon and Kiev and the new Baltic-Adriatic corridor. Hinterland infrastructure improvements can be expected to result in an increase in maritime traffic through the Strait of Otranto and into the northern Adriatic. None of the ports appear to have publicised plans to construct new terminals. Venice plans to improve port accessibility, while Koper plans to improve port efficiencies to provide scope for more growth and also has plans to build an inland industrial zone.

The port of Alexandria in Egypt is remodelling its handling capacity as part of ongoing developments. It has converted two cargo storage areas into container terminals, but there are plans for dedicated terminals for grain and coal in nearby El Dekheila.

8.4. LNG Ports

The majority of liquefied natural gas (LNG) consumed by Mediterranean countries is transported by pipeline. Spain is currently an exception in transporting a large portion of its LNG supplies by ship to its six terminals (three of which are in the Mediterranean). Several Mediterranean countries have plans underway to develop LNG terminals in order to lessen dependence on a small set of supplier countries.

Table 8.4: Current and Planned LNG Import Terminals[5]

Country	Terminals	Ship Capacity (cbm)
Cyprus	Vassiliko (2009)	
France	Fos (x2)	130,000 and 160,000
Greece	Revithoussa	130,000
Italy	La Spezia Rovigo (End-2007) Brindisi (2010) Gioia Tauro Livorno (2008) Muggia San Ferdinando Taranto (x2) Trieste (x2) Vado Ligure	70,000 152,000 140,000 P P P P P P
Spain	Barcelona Cartagena Valencia	140,000 140,000 145,000
Turkey	Ereglisi Aliaga Iskenderun	135,000 135,000 P

Key

P – Proposed
(date) – date terminal enters operation

[5] King & Spalding: *LNG in Europe*

Brindisi terminal in Italy was originally planned to start operations in 2007. Local protests have caused this to be delayed until 2010 and earlier this year the project was threatened with refusal by the Italian authorities[6]. The Slovenian government is reported to have expressed concern about the proposal for two terminals near Trieste.

8.5. Conclusion

Economic growth and consequent consumer demand will continue to fuel the expansion of container shipping activity within the Mediterranean. Most of the major ports are developing new container handling infrastructure to compete for a share of this growing market. Both feeder and container vessels are and will continue to get larger, which will also fuel landside infrastructure development. The Eastern Mediterranean will attract an increasing share of larger mainline vessels due to its proximity to emerging Adriatic and Black Sea markets.

In the bulk sector, Adriatic ports are a natural gateway for Central and Eastern European traffic and are well placed take advantage of any hinterland infrastructure improvements to attract cargo currently routed via Northern European ports. In this event maritime traffic through the Strait of Otranto and into the Northern Adriatic is likely to increase.

Strategic considerations aimed at diversifying energy supplies is fuelling plans for developing new LNG receiving terminals, particularly in Italy.

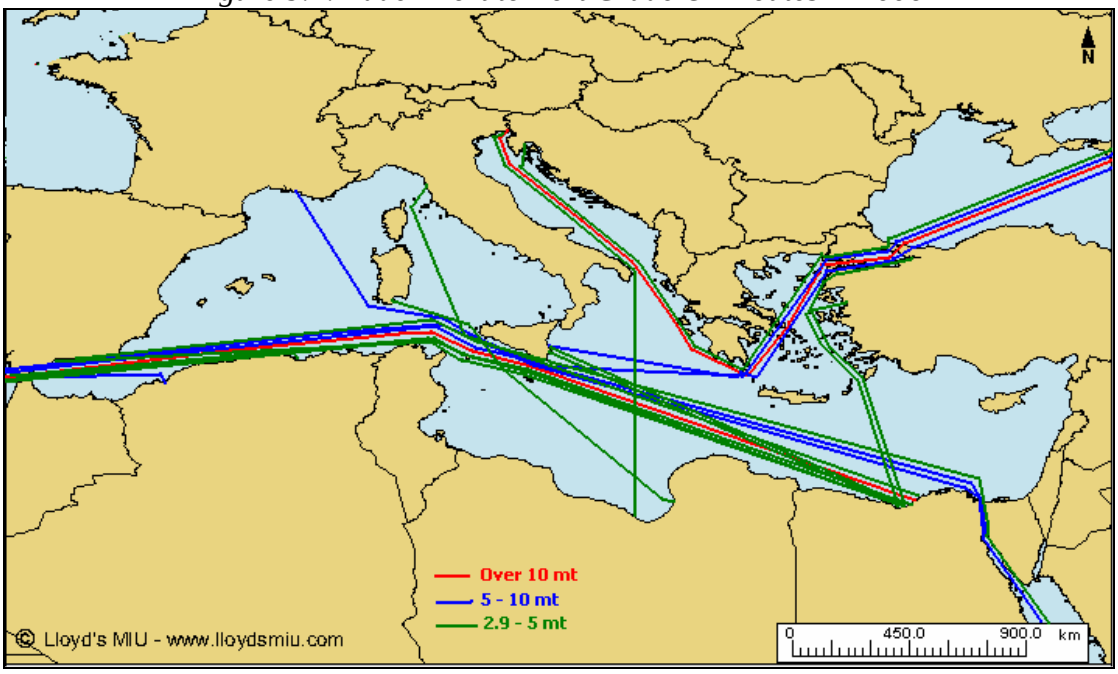
[6] Lloyd's List, *Italian government turns up the heat on BG gas project*, 10/08/07

9. Oil Ports and Shipping

421 million tonnes of crude oil was shipped on the Mediterranean Sea in 2006. The main load areas of this oil were the Persian Gulf, North Africa and the Black Sea. The main discharge areas were south and north Europe and the USA.

Figure 9.1 shows the laden port to port routes in the Mediterranean in 2006 which carried the most crude oil. The routes are colour coded to give an indication of the quantity of oil carried in DWT tonnes. Exports are dominated by shipments from the Persian Gulf through the Suez Canal and via Sidi Kerir in Egypt, and exports from Novorossiysk in the Black Sea.

Figure 9.1: Laden Port to Port Crude Oil Routes in 2006



9.1. North Africa

30% of oil transported in the Mediterranean is accounted for by just two North Africa ports; Sidi Kerir in Egypt and Arzew in Algeria. Table 9.1 shows the top 10 load ports for crude oil in North Africa in 2006 measured in terms of DWT tonnes.

Table 9.1: Top Crude Oil Load Ports in North Africa in 2006

Port/Place	Country	Tonnes	Laden Calls
Sidi Kerir	Egypt	74,339,769	715
Arzew	Algeria	40,240,000	355
Es Sider Term.	Libya	14,640,000	148
Ras Lanuf	Libya	14,065,500	187
Zueitina Term.	Libya	7,570,000	95
Zawia Term.	Libya	6,800,000	80
Bejaia	Algeria	6,750,000	95
Skikda	Algeria	6,650,000	84
Libya	Libya	6,220,500	77
Marsa el Brega	Libya	6,136,000	108

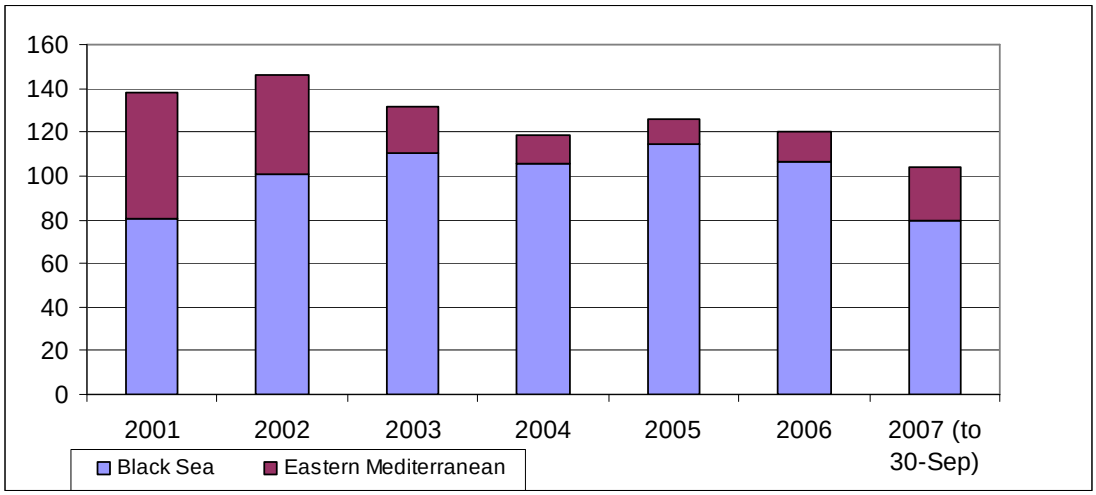
Source: ©Lloyd's MIU

Sidi Kerir exports Persian Gulf oil transported to the port through the Sumed pipeline from Ain Sukhna in the Red Sea. The pipeline has a capacity of 2.5 million barrels per day (bpd), which equates to around 125 million tonnes a year.[7]

9.2. Eastern Mediterranean and Black Sea

106 million tonnes of crude oil was loaded into ships at Black Sea ports in 2006. Exports have been consistently at or above 100 million tonnes since 2002. In this same period, Eastern Mediterranean loadings fell due to disruption to the Kirkuk-Ceyhan pipeline, but have been increasing since the opening of the Baku-Tbilisi-Ceyhan (BTC) pipeline in 2006. Figure 9.2 shows the changes in crude oil loadings in both areas since 2001.

Figure 9.2: Crude Oil loaded by year at Black Sea and Eastern Mediterranean Ports



Source: ©Lloyd's MIU

Novorossiysk is the main export port in the Black Sea, accounting for 70% of oil loaded at Black Sea ports. Table 9.2, shows the Top 20 export routes from Black Sea ports into and through the Mediterranean in 2006 measured by volume.

Table 9.2: Top 10 Black Sea export routes using the Mediterranean Sea in 2006

Origin	Destination	Crude Oil (tonnes)	Laden Voyages
Novorossiysk	Trieste	10,797,500	110
Novorossiysk	Fos	8,777,500	85
Novorossiysk	Augusta	5,047,500	53
Novorossiysk	Omisalj	4,027,000	34
Novorossiysk	Milazzo	2,849,500	30
Novorossiysk	Santa Panagia	2,692,500	27
Novorossiysk	Genoa	2,312,500	27
Novorossiysk	Port de Bouc	1,782,500	26
Novorossiysk	Ashkelon	1,525,000	13
Novorossiysk	Thessaloniki	1,520,000	13
Batumi	Trieste	1,480,000	19

Source: ©Lloyd's MIU

[7] One barrel per day is approximately 50 tonnes per year

Crude oil loadings at eastern Mediterranean ports have fallen significantly in the last six years, from 57 million tonnes in 2001 to just over 14 million tonnes in 2006. Banias in Syria and Ceyhan in Turkey have, historically, been the main oil load ports in the Eastern Mediterranean. Both have been affected by disruption to Iraqi crude oil exports.

Table 9.3: Loads at Eastern Mediterranean Ports in 2006

Port	Country	Crude Oil (tonnes)
Banias	Syria	4,365,000
Ceyhan Terminals	Turkey	7,805,000
Dortyol	Turkey	68,000
Tartous	Syria	2,160,000

Source: ©Lloyd's MIU

Loadings at Banias fell from 18 million tonnes in 2001 to 4 million tonnes by 2006 partly due to disruption to the pipeline to Banias from Kirkuk in Iraq in 2003. The Iraqi and Syrian governments reportedly reached agreement in August 2007 to work to reopen it.

Ceyhan has been affected significantly by reduced loadings from the pipeline carrying crude oil from northern Iraq. Loadings at Ceyhan from this pipeline fell from 32 million tonnes in 2001 to just over 1.3 million tonnes in 2006. Exports from Ceyhan began to recover in 2006 due to the opening of the BTC pipeline, which delivers Azerbaijani oil to the port for export. Table 9.4 shows crude oil loadings from Ceyhan Terminals in 2006 by destination.

Table 9.4: Top 5 Destinations of Crude Oil Loaded at Ceyhan Terminals in 2006

Destination Country	Tonnes	Laden Calls
Italy	2,960,000	40
USA	1,875,000	15
France	880,000	12
India	475,000	4
Israel	290,000	3

Source: ©Lloyd's MIU

9.3. Bosporus Export Route

The Bosporus forms the boundary between the Black and Mediterranean Seas and is the only maritime access route between the two. All crude oil shipped by sea out of the Black Sea consequently has to pass through the Bosporus. Tankers up to 165,000 DWT currently transit the Bosporus.

In 2006, nearly 11,000 tankers of all types transited the Bosporus, a 40% increase on the 2002 figure of around 7,700. In 2006, over 2,000 crude oil tankers transited the Bosporus. The rate of increase for crude oil tankers has been highest for vessels over 159,999 DWT (Table 9.5).

Table 9.5: Number of Crude Oil Tanker transits through the Bosporus

Size_Range ('000 DWT)	2006	2002	% Change
0-20	25	14	79%
20-40	2	71	-97%
40-79	49	304	-84%
80-120	1293	936	38%
120-159	565	554	2%
160-169	177	12	1375%
Total	2111	1891	12%

Source: ©Lloyd's MIU

The increase in shipping, particularly large tankers, using the Bosporus in recent years has given rise to safety concerns on the part of the Turkish authorities. During poor weather conditions at certain times of the year navigational restrictions are already imposed for safety reasons. This, coupled with the increased volume of shipping using the Bosporus, has resulted in congestion and delays of up to three weeks for vessels leaving the Black Sea.

Exports of oil from the Black Sea are expected to increase over the coming years, which will increase pressure on existing shipping routes. The EIA estimates proven oil reserves in the Caspian region to be between 17 and 49 billion barrels[8] with current oil growth in the region coming primarily from fields in Kazakhstan and Azerbaijan. By 2010 the EIA anticipates production of between 2.8 and 3.8 million bpd. This roughly equates to 140-190 million tonnes per annum.

[8] http://www.eia.doe.gov/emeu/cabs/Caspian/Oil.html

9.4. Crude Oil Pipelines

Congestion in the Bosporus has focussed attention on pipeline developments that will enable oil to bypass the waterway. New pipeline routes to Black Sea ports are also planned. Figure 9.3 shows the main current and proposed crude oil pipelines leading to Black Sea and eastern Mediterranean load ports, along with the planned capacity of the pipeline in *millions of barrels per day*. These pipelines are described more fully in the sections that follow.

Figure 9.3: Crude Oil Pipelines in the Black Sea and Eastern Mediterranean

9.5. Black Sea Pipelines

The current capacity of the main oil pipelines carrying crude oil to Black Sea ports is in the region of 1.7 million bpd (Table 9.6). This equates to around 82 million tonnes per annum. If all current expansion plans to pipelines feeding Black Sea ports go ahead, this will lead to an increase in capacity of 55 per cent. An increase in the capacity of pipelines feeding Black Sea load ports will have a corresponding impact on the number of tankers transiting the Bosporus.

Table 9.6: Black Sea Pipelines

Route	Current Cap (bpd)	Future Cap (bpd)
Tengiz - Novorossiysk	840,000	1,340,000
Baku-Novorossiysk	120,000	360,000
Samara - Novorossiysk	360,000	360,000
Baku-Sup'sa*	145,000	300,000
Brody - Odessa	200,000	200,000
Total	1,665,000	2,560,000

** Closed*

The Brody – Odessa pipeline was originally designed to deliver Caspian oil to Poland. The flow of the pipeline has been reversed to deliver Russian oil to Odessa for export through the Bosporus. There are plans to extend the pipeline to Plock in Poland (and thence to Gdansk) and reverse its flow once again.

9.6. Eastern Mediterranean Pipelines

The main focus of pipeline development plans has been on routes which enable the Bosporus to be bypassed. The current capacity of pipelines carrying oil to the Eastern Mediterranean is 3.15 million bpd, (Table 9.7). This capacity is not fully utilised at present. The pipeline feeding oil from Iraq's northern fields to the Turkish port of Ceyhan, for example, remains disrupted and so is not running at full capacity.

Table 9.7: Current and potential pipelines to the Eastern Mediterranean

Name	Current Capacity bpd	Future Capacity bpd	Notes	Load Port
Trans-Anatolian Pipeline (TAP)	0	1,000,000	Operational in 2010	Ceyhan
Bulgaria - Greece	0	700,000	Operational in 2011	Alexandroupolis
Pan European Oil Pipeline (PEOP)	0	1,800,000	Operational in 2012	None
Baku-Tblisi-Ceyhan (BTC)	500,000	1,800,000	2009 - full capacity	Ceyhan
Trans-Balkan Pipeline	0	750,000	Construction start 2008	Durres
Batman - Dortyol	900,000	900,000	Open	Dortyol
Kirkuk - Ceyhan	1,100,000	1,100,000	Disrupted	Ceyhan
North East Syria - Tripoli (Lebanon)			Closed	Tripoli
Kirkuk (Iraq) - Banias (Syria)	650,000	650,000	Disrupted	Banias
Total	3,150,000	8,700,000		

If all proposed new pipeline developments take place and all pipelines operate to maximum capacity, throughputs will increase from 3.15 million bpd to 8.7 million bpd. The Pan European Oil Pipeline, from Constantza in Romania to Trieste in Italy, will result in no net increase in ships as it will feed directly into the West European pipeline network at Trieste. The net increase in capacity requiring shipment by sea would, therefore, be 3.75 million bpd at maximum operational capacity. Current pipeline capacities equate to 1,312 tankers of 120,000 DWT, compared with actual utilization levels running at around 300 tanker sailings per annum. If operated at full capacity, expansion would add an extra 1,562 tankers of 120,000 DWT a year, giving a total maximum potential of around 2,500 extra tanker calls/voyages per annum.

9.7. Conclusion

The Mediterranean is both a major load and discharge centre for crude oil. Approximately 18 per cent, or 421 million tonnes[9], of global seaborne crude oil shipments which in 2006 amounted to approximately 2.3 billion tonnes, take place within or through the Mediterranean. North African ports in Libya, Algeria, Tunisia and Persian Gulf shipments via Egypt account for over 90 per cent of all crude oil loaded in the Mediterranean. Italy accounts for nearly half of all crude oil discharged in the Mediterranean. Exports of crude oil from Black Sea ports averaging at over 100 million tonnes a year are expected to continue to rise, resulting in continued seaborne

[9] Source: Analysis of Petroleum Exports, Lloyd's MIU

transits via the Bosporus and increased use of eastern Mediterranean ports linked to new pipelines intended to bypass the Bosporus. The resumption of Iraqi crude supplies via Ceyhan in Turkey and via Syrian ports will reverse the trend seen over recent years of declining crude exports from these ports.

Pipeline developments will increase oil exports from Eastern Mediterranean load terminals, but, if Black Sea exports continue to increase, this may not result in a significant fall in oil exported through the Bosporus. The Eastern Mediterranean will see an increase in the density of crude oil tanker deployment.

Table 9.8 – Extra Ship Voyages Generated by Pipeline Oil

	No. of Ships*
Maximum Utilisation of Current Pipeline Capacity	1312
New Pipeline Capacity	1562
Current Pipeline Utilization	(300)
Total	2574

* *number of ships of 120,000 DWT equivalent*

10. Report Conclusion

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

Developments in other shipping sectors are unlikely to have such a profound impact on traffic patterns. It is likely that container ship density will increase but not at the same rate as trade. Container vessels are getting larger, as are other vessel types. North European demand for energy is likely to see an increase in LNG transits via the Mediterranean from gas fields in the Persian Gulf and the Far East. If planned LNG terminal developments actually take place, the density of LNG tanker deployment around the Italian coastline will increase significantly.

Traffic densities in the Mediterranean will continue to grow over the next ten years by around 18 per cent whilst at the same time vessels operating within and through the Mediterranean will become larger.

Whilst the relative importance of East Mediterranean ports will increase the greatest level of vessel activity will continue to be concentrated around western and central Mediterranean ports.

Small size high frequency Intra-Mediterranean passenger traffic dominates shipping activity in the Mediterranean measured in terms of number of ship voyages. The majority of trade, however, including petroleum oils and gases, is concentrated in larger vessels deployed at lower levels of frequency.