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Chapter 1

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DEVELOPMENTS IN INTERNATIONAL SEABORNE TRADE

In tandem with the world economy and global merchandise trade, international seaborne shipments continued to grow in 2011, albeit at a slower rate than in 2010. Fuelled by strong growth in container and dry bulk trades, world seaborne trade grew by 4 per cent in 2011, taking the total volume of goods loaded worldwide to 8.7 billion tons. In addition to the sovereign debt crisis in Europe and other difficulties facing advanced economies, a number of factors have weighed down on global growth. These include, in particular, heightened global financial risks, political and social unrest in North Africa and Western Asia, natural disasters in Japan and Thailand which have disrupted regional and global supply chains, rising oil prices and volatility, austerity measures, the fading of the stimulus effect of 2010, and geopolitical tensions in the Strait of Hormuz. Many of these factors remained relevant in 2012 and, depending on how they evolve, they could impact dramatically on the global economic and trade outlook.

This chapter covers developments from January 2011 to June 2012, and where possible up to October 2012. Section A reviews the overall performance of the global economy and world merchandise trade. Section B considers developments in world seaborne trade volumes and examines trends unfolding in the economic sectors and activities that generate demand for shipping services, including oil and gas, mining, agriculture and steel production. Section C highlights selected trends that are currently transforming the landscape of international shipping and seaborne trade, focusing mainly on climate change, the current shift in global economic influence and changing trade patterns, and the rising bunker fuel prices and operating costs.

A. WORLD ECONOMIC SITUATION AND PROSPECTS[1]

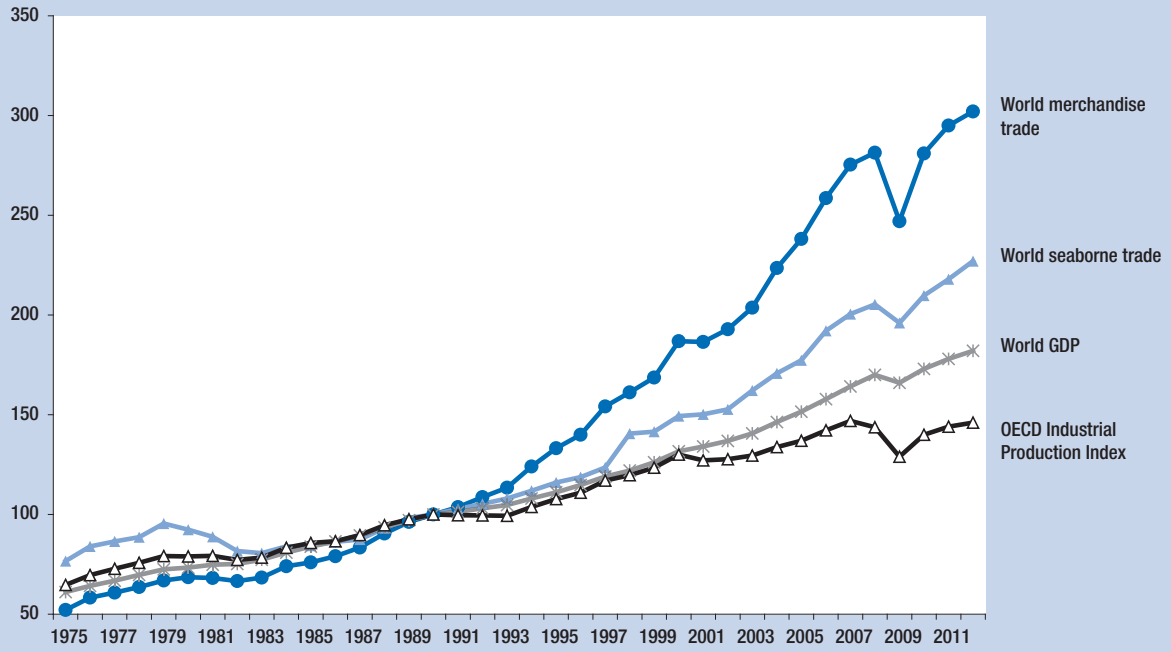
1. World economic growth[2]

The global economy lost steam in 2011, with gross domestic product (GDP) growing by 2.7 per cent compared with 4.1 per cent in 2010. In addition to the sovereign debt crisis in Europe, the slow recovery in the United States of America, and other difficulties facing advanced economies, a number of factors have weighed down on global growth. These include, in particular, heightened global financial risks, political and social unrest in North Africa and Western Asia, natural disasters in Japan and Thailand which have disrupted regional and global supply chains, rising oil prices and volatility, austerity measures, the fading of the stimulus effect of 2010, and geopolitical tensions in the Strait of Hormuz. Many of these factors remained relevant in 2012, and, depending on how they evolve, they could impact dramatically on the global economic outlook.

In 2011, world GDP, industrial production, merchandise trade and seaborne shipments continued to move in tandem as shown in figure 1.1. During the year, industrial production decelerated in the countries of the Organization for Economic Cooperation and Development (OECD) and grew by a modest 2.1 per cent, down from 8.5 per cent in 2010. The industrial output of Japan was cut by over 2 per cent, reflecting the effects of the combined earthquake, tsunami and nuclear accident that hit the country in March 2011, as well as the interruptions to the supply chains caused by the November 2011 floods in Thailand.

Tighter monetary policies in many developing regions contributed to moderate growth in industrial activity. In China for example, industrial production grew by nearly 14 per cent, down from 16 per cent in 2010. Brazil, India and the Russian Federation also expanded their industrial output, albeit at a slower rate than in 2010. Flooding in Thailand strongly reduced the country's industrial output by 48 per cent in October and November, and drove down outputs in Singapore, Hong Kong (China), Malaysia

Figure 1.1. The OECD Industrial Production Index and indices for world GDP, world merchandise trade and world seaborne trade (1975–2012) (1990 = 100)



Source: UNCTAD secretariat, on the basis of OECD Main Economic Indicators, May 2012; UCTAD, *The Trade and Development Report 2012*; UNCTAD *Review of Maritime Transport*, various issues; World Trade Organization (WTO) (table A1a); the WTO press release 658, April 2012, *World Trade 2011*, Prospects for 2012. The 2012 index for seaborne trade is calculated on the basis of the growth rate forecast by Clarkson Research Services in *Shipping Review & Outlook*, spring 2012.

and Taiwan Province of China, due to the interrupted supply chains.

Table 1.1 provides an overview of annual GDP growth over the 2008-2011 period and a forecast for 2012. While growth in developed economies weakened in 2011, developing countries continued to drive world economic expansion and to account increasingly for a larger share of world GDP. This share is estimated by UNCTAD to have increased from 21.6 per cent in 1980 to 32.6 per cent of world GDP (at constant prices 2005) in 2010.[3] In 2011, growth in China remained robust, although it decelerated to 9.2 per cent. The country continues to be, however, the engine of regional growth: on the one hand, the country's middle class is expanding and the government is adopting policies to encourage growth in private consumption; on the other hand, as China moves up the value chain, lower-value manufacturing companies are relocating to other low-wage countries such as Bangladesh and Viet Nam.[4]

Growth in Latin America slowed in 2011, reflecting the end of the stimulus effect, the sluggish growth in Europe and the hesitant recovery in the United States. Growth in Africa was held back by the unrest in North Africa and remains vulnerable to political instability, volatile commodity prices and potential

Table 1.1. World economic growth, 1991–2012[a] (Annual percentage change)

Region/country	*1991–2004 Average[a]*	*2008*	*2009*	*2010*	*2011[b]*	*2012[b]*
WORLD	2.9	1.5	-2.3	4.1	2.7	2.3
Developed economies	2.6	0.0	-3.9	2.8	1.4	1.1
of which:						
United States	3.4	-0.4	-3.5	3.0	1.7	2.0
Japan	1.0	-1.0	-5.5	4.4	-0.7	2.2
European Union (27)	2.3	0.3	-4.4	2.1	1.5	-0.3
of which:						
Germany	1.5	1.1	-5.1	3.7	3.0	0.9
France	2.0	-0.1	-3.1	1.7	1.7	0.3
Italy	1.6	-1.2	-5.5	1.8	0.4	-1.9
United Kingdom	3.1	-1.1	-4.4	2.1	0.7	-0.6
Developing economies	4.7	5.3	2.4	7.5	5.9	4.9
of which:						
Africa	3.2	4.8	0.9	4.5	2.5	4.1
South Africa	2.5	3.6	-1.7	2.8	3.1	2.7
Asia	5.9	5.9	4.1	8.4	6.8	5.5
Association of Southeast Asian Nations	4.9	4.0	1.3	8.0	4.5	4.9
China	9.9	9.6	9.2	10.4	9.2	7.9
India	5.9	7.5	7.0	9.0	7.0	6.0
Republic of Korea	5.0	2.3	0.3	6.2	3.6	3.3
Latin America and the Caribbean	2.7	4.0	-2.0	6.0	4.3	3.4
Brazil	2.6	5.2	-0.3	7.5	2.7	2.0
Least Developed Countries (LDCs)	5.2	7.7	5.0	5.8	4.0	4.1
Transition economies	..	5.2	-6.5	4.2	4.5	4.3
of which:						
Russian Federation	..	5.2	-7.8	4.0	4.3	4.7

Sources: *UNCTAD Trade and Development Report*, 2012, table 1.1. World Output Growth, 2004-2012.

[a] Average percentage change.

[b] Forecast.

droughts. Prospects for the region could, however, improve given large new gas discoveries in Tanzania and Mozambique and promising oil finds in Kenya and West Africa.[5] As to the least developed countries (LDCs), their economies expanded by 4 per cent in 2011, down from 5.8 per cent in 2010, reflecting in part a weaker global demand and a slowing Chinese economy. Economies in transition grew by 4.5 per cent in 2011, with growth being sustained by higher commodity prices, increased public infrastructure spending and strong agricultural output.

World economic developments in 2011 highlighted the continued strong interdependence among economies and to some extent weakened the case for a potential decoupling of growth between developed and developing countries. From the second quarter of 2011, economic growth in most developing countries and economies in transition started to decelerate, suggesting that these countries are not immune to the problems facing advanced economies and that they remain vulnerable to contagion through various channels, including trade, supply chains and the global financial system.

Looking to the future, global economic growth is projected to further decelerate in 2012. This outlook is subject to a high degree of uncertainty, and the risk cannot be excluded that it will be skewed to the downside. A potential escalation of the debt situation in Europe remains a major source of concern, despite ongoing efforts to contain the crisis and avoid contagion, such as, for example, increasing pledges to the International Monetary Fund (IMF) to raise its resources to above $1 trillion.[6] To put this into context, the IMF provided Greece with €30 billion and €28 billion in May 2010 and April 2012, respectively.[7]

Oil price developments constitute another concern as persistent high and volatile oil prices could become a drag on global demand. In 2011, oil prices increased by over 40 per cent and averaged $112 per barrel (pb) despite the release of strategic stocks from the International Energy Agency (IEA) member countries. The $32 increase in the average oil price during 2011 translated into a net transfer of $450 billion from oil-importing to oil-exporting countries.[8] It is estimated by IMF that a cut in oil supply from the Islamic Republic of Iran, due to sanctions, could lead to an initial world price increase of 20 to 30 per cent if other producers do not make up for the shortage.[9] Under relatively weak global economic conditions, an increase of 50 per cent in oil prices sustained over the coming two years could, according to IMF, lower growth by 0.5 to 1 per cent.[10]

2. World merchandise trade

In tandem with the world economy, growth in world merchandise trade by volume (that is, trade in real terms adjusted to account for inflation and exchange-rate fluctuations) progressively lost momentum in 2011 and expanded at an annual rate of 5.9 per cent, a sharp drop from the 13.9 per cent recorded in 2010. In addition to a weaker world economy, trade in 2011 was particularly hampered by natural shocks disrupting supply chains and production processes in Japan and Thailand, civil unrest in North Africa and oil supply disruption in Libya. Meanwhile, supported by high commodity prices, the value of world merchandise exports increased by 19 per cent to reach $18.2 trillion, a relative slowdown from the 22 per cent recorded in 2010.[11]

Developed economies performed better than expected with exports rising by 5.1 per cent due to strong, rapid export growth in the United States (7.2 per cent) and the European Union (6 per cent). Meanwhile, exports from Japan contracted by 0.4 per cent.

Exports of developing countries grew by 7 per cent, driven by Asia (4.5 per cent) and in particular India (13.7 per cent), China (12.8 per cent) and the Republic of Korea (11.2 per cent). Exports in Thailand contracted as a consequence of the floods in November 2011, while exports from Africa slumped by 5.1 per cent, due in particular to the 75 per cent drop of Libyan oil shipments.[12]

The slowdown in demand and the overall weak growth in advanced economies translated into weaker imports in developed regions. In 2011, imports grew at a modest 3.5 per cent, a sharp fall from the 11 per cent recorded in 2010. Japan recorded the slowest growth (1.9 per cent) followed, in ascending order, by the European Union (3.2 per cent) and the United States (3.7).

Imports into developing countries expanded at the much faster rate of 6.2 per cent, with resource-exporting regions benefiting from favourable commodity prices. Imports into Latin America and Africa grew by 7.1 per cent and 3.9 per cent,

respectively. In a separate development, a recent decline in the normally large trade surpluses of Japan and China is changing the trade landscape and constitutes a welcome development, as it could imply a rebalancing of the world economy (see table 1.2).[13]

Looking to the future, WTO projects a further deceleration in trade growth with global merchandise trade volumes expected to grow by just 2.5 per cent in 2012, a rate below the 6 per cent average recorded over the period 1990–2008.

Apart from current global economic uncertainties, the outlook for merchandise trade is also clouded by the risk of a lack of trade finance.[14] A report by the International Chamber of Commerce (ICC) and IMF revealed a pessimistic outlook for trade finance in 2012.[15] More than 50 per cent of respondents to a relevant survey expected trade finance in Asia to improve and only 16 per cent were optimistic about trade finance in Europe.[16]

A surge in protectionist measures is another driver of uncertainty in view of the current difficult economic climate and the lack of progress on the adoption of a multilateral trading system under the WTO Doha Round negotiations. At the November 2011 meeting of the G20, participants underscored their commitment to free trade and to the multilateral trade system.[17] However, since mid-October 2011, 124 new restrictive measures have been recorded, affecting around 1.1 per cent of G20 merchandise imports, or 0.9 per cent of world imports.[18] Relevant measures include trade remedy actions, tariff increases, import licenses and customs controls.[19]

B. WORLD SEABORNE TRADE[20]

1. General trends in seaborne trade

Preliminary data indicate that world seaborne trade held steady in 2011 and grew by 4 per cent, with total volumes reaching a record 8.7 billion tons (tables 1.3 and 1.4, and figure 1.2). This expansion was driven by rapid growth in dry cargo volumes (5.6 per cent) propelled by upbeat container and major bulk trades, which grew by 8.6 per cent (expressed in tons) and 5.4 per cent, respectively.

Table 1.2 Growth in the volume of merchandisea trade, by country groups and geographical region, 2008–2011 (Annual percentage change)

Exports				Countries/regions	Imports			
2008	2009	2010	2011		2008	2009	2010	2011
2.4	-13.1	13.9	5.9	**WORLD**	2.5	-13.4	14.1	5.0
2.5	-15.2	13.2	5.1	**Developed economies**	-0.2	-14.5	11.0	3.5
				of which:				
2.3	-24.9	27.5	-0.4	Japan	-0.6	-12.4	10.1	1.9
5.5	-14.9	15.3	7.2	United States	-3.7	-16.4	14.8	3.7
2.4	-14.3	12.0	6.0	European Union (27)	0.8	-14.2	10.0	3.2
3.2	-9.7	15.4	7.0	**Developing economies**	6.6	-9.9	19.2	6.2
				of which:				
-3.1	-9.7	8.7	-5.1	Africa	10.6	-3.9	7.1	3.9
-0.3	-11.0	10.3	3.4	Latin America and the Caribbean	8.5	-17.9	23.3	7.1
1.6	-10.9	18.8	4.5	**Asia**	8.0	-16.3	21.9	6.1
				of which:				
1.8	-10.9	18.8	4.5	ASEAN	8	-16.3	21.9	6.1
10.6	-13.9	29.0	12.8	China	2.3	-1.8	30.8	10.6
16.8	-6.6	5.9	13.7	India	29.7	-0.8	13.8	5.3
8.8	2.6	15.3	11.2	Republic of Korea	0.7	-2.7	17.4	6.7
-0.2	-14.4	11.5	6.0	**Transition economies**	15.5	-28.6	15.5	17.0

Sources: UNCTAD secretariat calculations, based on UNCTAD *Handbook of Statistics and Trade and Development Report*, 2012.

[a] Data on trade volumes are derived from international merchandise trade values deflated by UNCTAD unit value indices.

Table 1.3. Development in international seaborne trade, selected years (Millions of tons loaded)

Year	Oil and gas	Main bulks[a]	Other dry cargo	Total (all cargoes)
1970	1 440	448	717	2 605
1980	1 871	608	1 225	3 704
1990	1 755	988	1 265	4 008
2000	2 163	1 295	2 526	5 984
2005	2 422	1 709	2 978	7 109
2006	2 698	1 814	3 188	7 700
2007	2 747	1 953	3 334	8 034
2008	2 742	2 065	3 422	8 229
2009	2 642	2 085	3 131	7 858
2010	2 772	2 335	3 302	8 409
2011	2 796	2 477	3 475	8 748

Sources: Compiled by the UNCTAD secretariat on the basis of data supplied by reporting countries and as published on the relevant government and port industry website, and by specialist sources. The data for 2006 onwards have been revised and upated to reflect improved reporting, including more recent figures and better information regarding the breakdown by cargo type. Figures for 2011 are estimated based on preliminary data or on the last year for which data were available.

[a] Iron ore, grain, coal, bauxite/alumina and phosphate. The data for 2006 onwards are based on various issues of the *Dry Bulk Trade Outlook*, produced by Clarkson Research Services.

In 2011, container trade flows were sustained by non-mainlane trade as the United States and Europe continued to struggle with sluggish growth and uncertainty, while dry bulk volumes held strong with continued import demand for raw materials in large developing economies, notably China and India. Five major dry bulk flows were sustained by growth in iron ore trade (6 per cent), which caters to a strong import demand in China, a country accounting for about two thirds of global iron ore trade volumes in 2011. Tanker trade volumes (crude oil, refined petroleum products, and liquefied petroleum and gas) remained almost flat, growing by less than 1 per cent due to falling crude oil volumes. Together, trade in refined petroleum products and gas grew by 5.1 per cent, due mainly to the recent boom in liquefied natural gas (LNG) trade.

As shown in tables 1.3 and 1.4, and in figure 1.2, which feature global seaborne trade in volume terms (tons), oil trade continued to account for approximately one third of the total in 2011. During the same year, dry cargo, including major and minor dry bulks, containerized trade and general cargo held the remaining two thirds of the market. As a proportion of total dry cargo, major bulks accounted for 41.6 per cent, containerized trade for 23.3 per cent and minor bulks for 20.8 per cent. The remaining share of 14.3 per cent was accounted for by other dry goods including general cargo.

A different picture emerges, however, when one considers the contribution of these market segments to the value of world seaborne trade. While recent data, including for 2011, are not readily available, existing estimates for 2007 may provide some insight into the distribution of world seaborne trade by value and allow for some comparisons to be made. In 2007, it was not tanker cargo (oil and gas) that accounted for the largest share of global trade, but containerized cargo, with more than 50 per cent of the total, this reflecting the higher value of goods carried in containers. Tanker trade accounted for less than 25 per cent, while general and dry cargo accounted for 20 per cent and 6 per cent of the value, respectively.[21] More recent analysis of the 2008 and 2009 United Nations trade data shows an increase in the value of dry bulk cargo reflecting to a large extent the strong import demand for these commodities from emerging developing countries, in particular China.[22]

As developing countries contribute increasingly larger shares and growth to both world GDP and merchandise trade, their contribution to world seaborne trade has also been increasing. In 2011, a total of 60 per cent of the volume of world seaborne trade originated in developing countries and 57 per cent of this trade was delivered on their territories (figure 1.3 (a)). Developing countries are now major world players both as exporters and importers, a remarkable shift away from earlier patterns when they served mainly as loading areas of high volume goods (mainly of high volume raw materials and resources)

Table 1.4. World seaborne trade in 2006–2011, by type of cargo, country group and region

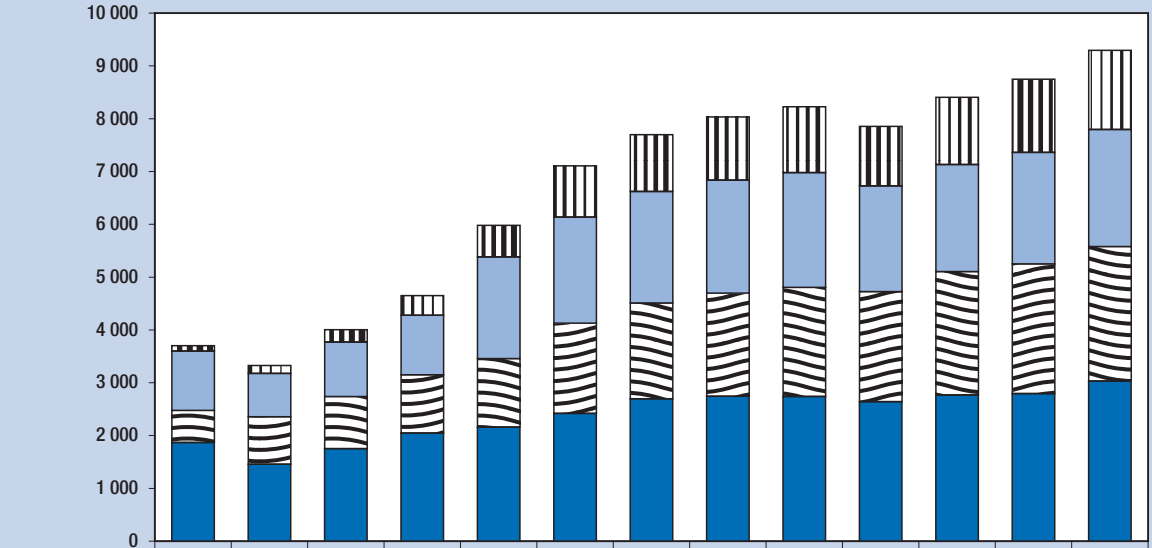
Country group	Year	Goods loaded				Goods unloaded			
		Total	Crude	Petroleum products and gas	Dry cargo	Total	Crude	Petroleum products and gas	Dry cargo
		Millions of tons							
World	2006	7 700.3	1 783.4	914.8	5 002.1	7 878.3	1 931.2	893.7	5 053.4
	2007	8 034.1	1 813.4	933.5	5 287.1	8 140.2	1 995.7	903.8	5 240.8
	2008	8 229.5	1 785.2	957.0	5 487.2	8 286.3	1 942.3	934.9	5 409.2
	2009	7 858.0	1 710.5	931.1	5 216.4	7 832.0	1 874.1	921.3	5 036.6
	2010	8 408.9	1 787.7	983.8	5 637.5	8 443.8	1 933.2	979.2	5 531.4
	2011	8 747.7	1 762.4	1 033.5	5 951.9	8 769.3	1 907.0	1 038.6	5 823.7
Developed economies	2006	2 460.5	132.9	336.4	1 991.3	4 164.7	1 282.0	535.5	2 347.2
	2007	2 608.9	135.1	363.0	2 110.8	3 990.5	1 246.0	524.0	2 220.5
	2008	2 715.4	129.0	405.3	2 181.1	4 007.9	1 251.1	523.8	2 233.0
	2009	2 554.3	115.0	383.8	2 055.5	3 374.4	1 125.3	529.9	1 719.2
	2010	2 865.4	135.9	422.3	2 307.3	3 604.5	1 165.4	522.6	1 916.5
	2011	2 966.2	123.3	423.3	2 419.5	3 615.3	1 109.6	569.9	1 935.7
Transition economies	2006	410.3	123.1	41.3	245.9	70.6	5.6	3.1	61.9
	2007	407.9	124.4	39.9	243.7	76.8	7.3	3.5	66.0
	2008	431.5	138.2	36.7	256.6	89.3	6.3	3.8	79.2
	2009	505.3	142.1	44.4	318.8	93.3	3.5	4.6	85.3
	2010	515.7	150.2	45.9	319.7	122.1	3.5	4.6	114.0
	2011	510.4	138.7	49.7	322.0	154.7	4.2	4.4	146.1
Developing economies	2006	4 829.5	1 527.5	537.1	2 765.0	3 642.9	643.6	355.1	2 644.3
	2007	5 020.8	1 553.9	530.7	2 932.6	4 073.0	742.4	376.3	2 954.3
	2008	5 082.6	1 518.0	515.1	3 049.6	4 189.1	684.9	407.2	3 097.0
	2009	4 798.4	1 453.5	502.9	2 842.0	4 364.2	745.3	386.9	3 232.1
	2010	5 027.8	1 501.6	515.6	3 010.5	4 717.3	764.4	452.0	3 500.9
	2011	5 271.2	1 500.3	560.5	3 210.3	4 999.3	793.2	464.3	3 741.8
Africa	2006	721.9	353.8	86.0	282.2	349.8	41.3	39.4	269.1
	2007	732.0	362.5	81.8	287.6	380.0	45.7	44.5	289.8
	2008	766.7	379.2	83.3	304.2	376.6	45.0	43.5	288.1
	2009	708.0	354.0	83.0	271.0	386.8	44.6	39.7	302.5
	2010	754.0	351.1	92.0	310.9	416.9	42.7	40.5	333.7
	2011	787.7	344.5	108.9	334.2	371.3	40.1	43.4	287.8
America	2006	1 030.7	251.3	93.9	685.5	373.4	49.6	60.1	263.7
	2007	1 067.1	252.3	90.7	724.2	415.9	76.0	64.0	275.9
	2008	1 108.2	234.6	93.0	780.6	436.8	74.2	69.9	292.7
	2009	1 029.8	225.7	74.0	730.1	371.9	64.4	73.6	234.0
	2010	1 172.6	241.6	85.1	846.0	448.7	69.9	74.7	304.2
	2011	1 260.0	254.0	93.5	912.4	491.5	74.1	79.3	338.1
Asia	2006	3 073.1	921.2	357.0	1 794.8	2 906.8	552.7	248.8	2 105.3
	2007	3 214.6	938.2	358.1	1 918.3	3 263.6	620.7	260.8	2 382.1
	2008	3 203.6	902.7	338.6	1 962.2	3 361.9	565.6	286.8	2 509.5
	2009	3 054.3	872.3	345.8	1 836.3	3 592.4	636.3	269.9	2 686.2
	2010	3 094.6	907.5	338.3	1 848.8	3 838.2	651.8	333.1	2 853.4
	2011	3 216.4	900.1	357.9	1 958.4	4 122.0	679.0	337.7	3 105.3
Oceania	2006	3.8	1.2	0.1	2.5	12.9	0.0	6.7	6.2
	2007	7.1	0.9	0.1	2.5	13.5	0.0	7.0	6.5
	2008	4.2	1.5	0.1	2.6	13.8	0.0	7.1	6.7
	2009	6.3	1.5	0.2	4.6	13.1	0.0	3.6	9.5
	2010	6.5	1.5	0.2	4.8	13.4	0.0	3.7	9.7
	2011	7.1	1.6	0.2	5.3	14.5	0.0	3.9	10.6

Table 1.4. World seaborne trade in 2006–2011, by type of cargo, country group and region *(continued)*

Country group	Year	Goods loaded				Goods unloaded			
		Total	Crude	Petroleum products and gas	Dry cargo	Total	Crude	Petroleum products and gas	Dry cargo
		Percentage share							
World	2006	100.0	23	12	65	100	25	11	64
	2007	100.0	23	12	66	100	25	11	64
	2008	100.0	22	12	67	100	23	11	65
	2009	100.0	22	12	66	100	24	12	64
	2010	100.0	21	12	67	100	23	12	66
	2011	100.0	20	12	68	100	22	12	66
Developed economies	2006	32.0	7	37	40	53	66	60	46
	2007	32.5	7	39	40	49	62	58	42
	2008	33.0	7	42	40	48	64	56	41
	2009	32.5	7	41	39	43	60	58	34
	2010	34.1	8	43	41	43	60	53	35
	2011	33.9	7	41	41	41	58	55	33
Transition economies	2006	5.3	7	5	5	1	0	0	1
	2007	5.1	7	4	5	1	0	0	1
	2008	5.2	8	4	5	1	0	0	1
	2009	6.4	8	5	6	1	0	0	2
	2010	6.1	8	5	6	1	0	0	2
	2011	5.8	8	5	5	2	0	0	3
Developing economies	2006	62.7	86	59	55	46	33	40	52
	2007	62.5	86	57	55	50	37	42	56
	2008	61.8	85	54	56	51	35	44	57
	2009	61.1	85	54	54	56	40	42	64
	2010	59.8	84	52	53	56	40	46	63
	2011	60.3	85	54	54	57	42	45	64
Africa	2006	9.4	20	9	6	4	2	4	5
	2007	9.1	20	9	5	5	2	5	6
	2008	9.3	21	9	6	5	2	5	5
	2009	9.0	21	9	5	5	2	4	6
	2010	9.0	20	9	6	5	2	4	6
	2011	9.0	20	11	6	4	2	4	5
America	2006	13.4	14.1	10.3	13.7	4.7	2.6	6.7	5.2
	2007	13.3	13.9	9.7	13.7	5.1	3.8	7.1	5.3
	2008	13.5	13.1	9.7	14.2	5.3	3.8	7.5	5.4
	2009	13.1	13.2	7.9	14.0	4.7	3.4	8.0	4.6
	2010	13.9	13.5	8.7	15.0	5.3	3.6	7.6	5.5
	2011	14.4	14.4	9.0	15.3	5.6	3.9	7.6	5.8
Asia	2006	39.9	51.7	39.0	35.9	36.9	28.6	27.8	41.7
	2007	40.0	51.7	38.4	36.3	40.1	31.1	28.9	45.5
	2008	38.9	50.6	35.4	35.8	40.6	29.1	30.7	46.4
	2009	38.9	51.0	37.1	35.2	45.9	34.0	29.3	53.3
	2010	36.8	50.8	34.4	32.8	45.5	33.7	34.0	51.6
	2011	36.8	51.1	34.6	32.9	47.0	35.6	32.5	53.3
Oceania	2006	0.0	0.1	0.01	0.0	0.2	–	0.7	0.1
	2007	0.1	0.1	0.01	0.0	0.2	–	0.8	0.1
	2008	0.1	0.1	0.01	0.0	0.2	–	0.8	0.1
	2009	0.1	0.1	0.02	0.1	0.2	–	0.4	0.2
	2010	0.1	0.1	0.02	0.1	0.2	–	0.4	0.2
	2011	0.1	0.1	0.02	0.1	0.2	–	0.4	0.2

Source: Compiled by the UNCTAD secretariat on the basis of data supplied by reporting countries, and data obtained from the relevant government, port industry and other specialist websites and 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. Figures for 2011 are estimated based on preliminary data or on the last year for which data were avaialble.

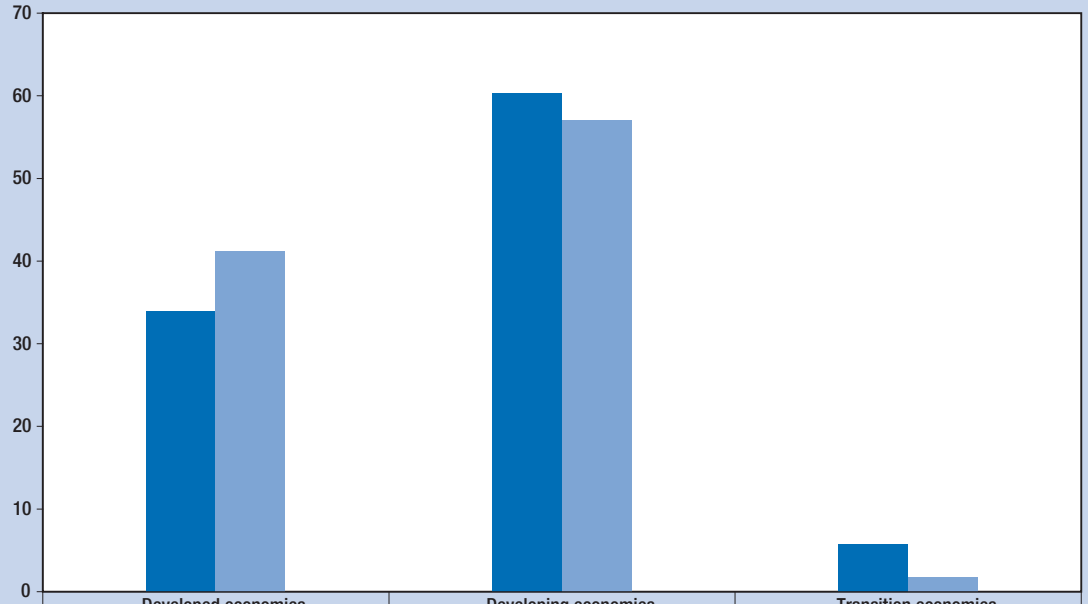
Figure 1.2. International seaborne trade, by cargo type, selected years (Millions of tons loaded)



	1980	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Container	102	152	234	371	598	969	1 076	1 193	1 249	1 127	1 275	1 385	1 498
Other dry cargo	1 123	819	1 031	1 125	1 928	2 009	2 112	2 141	2 173	2 004	2 027	2 090	2 219
Five major bulks	608	900	988	1 105	1 295	1 709	1 814	1 953	2 065	2 085	2 335	2 477	2 547
Oil and gas	1 871	1 459	1 755	2 050	2 163	2 422	2 698	2 747	2 742	2 642	2 772	2 796	3 033

Source: UNCTAD *Review of Maritime Transport*, various issues. For 2006–2012, the breakdown by type of dry cargo is based on Clarkson Research Services' *Shipping Review & Outlook*, various issues. Data for 2012 are based on a forecast by Clarkson Research Services in *Shipping Review & Outlook*, spring 2012.

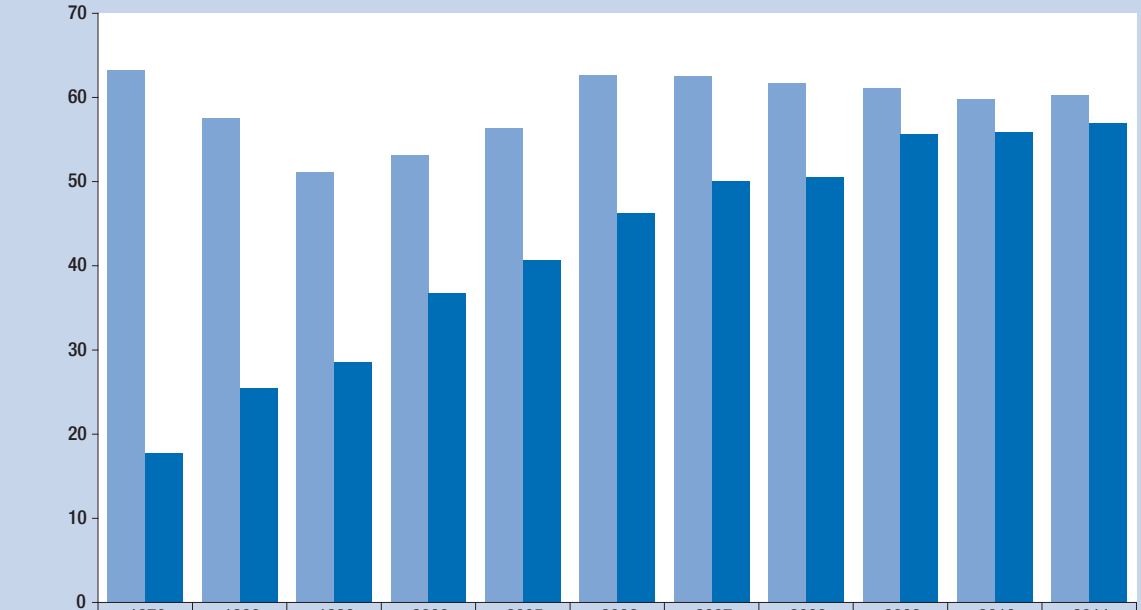
Figure 1.3 (a). World seaborne trade, by country group, 2011 (Percentage share in world tonnage)



	Developed economies	Developing economies	Transition economies
Loaded	34	60	6
Unloaded	41	57	2

Source: Compiled by the UNCTAD secretariat on the basis of data supplied by reporting countries, and data obtained from the relevant government, port industry and other specialist websites and sources. Figures are estimated based on preliminary data or on the last year for which data were available.

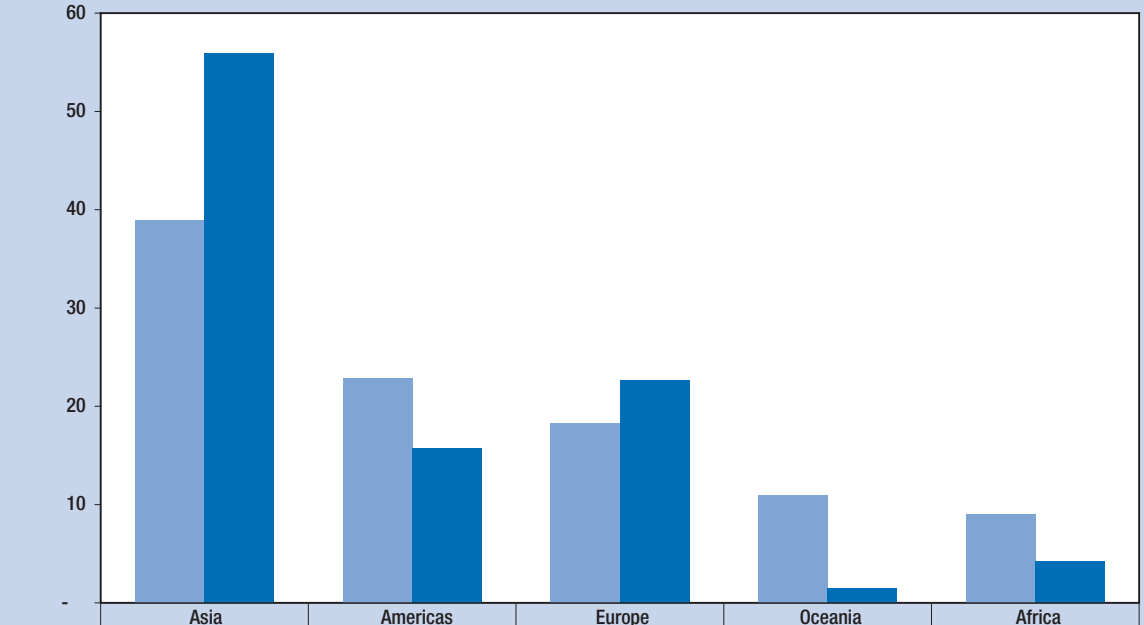
Figure 1.3 (b). Participation of developing economies in world seaborne trade, selected years (Percentage share in world tonnage)



	1970	1980	1990	2000	2005	2006	2007	2008	2009	2010	2011
Loaded	63	58	51	53	56	63	62	62	61	60	60
Unloaded	18	26	29	37	41	46	50	51	56	56	57

Source: UNCTAD *Review of Maritime Transport*, various issues.

Figure 1.3 (c). World seaborne trade, by region, 2011 (Percentage share in world tonnage)



	Asia	Americas	Europe	Oceania	Africa
Loaded	39	23	18	11	9
Unloaded	56	16	23	1	4

Source: Compiled by the UNCTAD secretariat on the basis of data supplied by reporting countries, and data obtained from the relevant government, port industry and other specialist websites and sources. Figures are estimated based on preliminary data or on the last year for which data were available.

as shown in figure 1.3 (b). With regards to developed countries, their share of imports outweighed exports, totalling 41 per cent and 34 per cent, respectively. Transition economies continued to account for the remaining trade, their contribution to world seaborne exports and imports totalling 6.2 per cent and 2 per cent, respectively. Geographically, Asia maintained its lead position and continued to fuel world seaborne trade with its share of goods loaded amounting to 39 per cent, while that of goods unloaded reaching 56 per cent (figure 1.3 (c)).

For 2012, Clarkson Research Services are forecasting a 4.3 per cent annual growth rate in the volume of world seaborne trade. However, several downside risks continue to stand in the way of a robust and sustainable recovery in shipping, including the current global economic uncertainty, security concerns and maritime piracy, limited trade finance and geopolitical tensions, as well as a potential rise in trade restrictions.

2. Seaborne trade in ton-miles[23]

The unit of ton-miles offers a measure of true demand for shipping services and tonnage as it takes into account distance, which determines ships' availability. Between 1999 and 2011, ton-miles have increased for all cargoes, and are projected to rise further in 2012 (table 1.5 (a), figures 1.4 (a) and 1.4 (b)). The most impressive growth over this period has been in LNG (258 per cent), followed by iron ore (183 per cent), grain (71 per cent), coal (67 per cent), petroleum products (58 per cent) and crude oil (13 per cent). Since 2000, a surge in China of import demand for industrial commodities necessary for steel production has fuelled rapid growth in the iron ore and coal trades. The growing appetite of China for these commodities has heightened the need to diversify sources of supply, and include more distant locations such as Brazil, the United States and South Africa. While the estimated average distance of global iron ore trade increased from 5,451 miles in 1998 to 6,260 miles in 2011, iron ore ton-miles are expected to increase further as new mines in the Arctic and West Africa start up.[24]

Steam and coking coal ton-miles varied both over time and between the Atlantic and the Pacific regions.[25] In 2011, coal trade patterns shifted, with growth in ton-mile exports falling by 2 per cent in the Pacific and rising for the first time since 2006 in the Atlantic at an annualized rate of 12 per cent. The ton-mile decrease in the Pacific resulted in part from the Australian floods, which reduced supply and drove coal prices up.[26] Meanwhile, higher demand for thermal coal in Europe and a rise in coal exports from the United States have boosted the Atlantic trade. The predominance of the Pacific coal trade continues, however, with China in particular emerging as a net importer, and with Indonesian exports predominantly catering for this demand. In view of the relatively short distances between China and Indonesia, compared with the United States or South Africa, estimated average distances fell from 4,998 miles in 1998 to 3,910 miles in 2011.[27]

Refined petroleum products (for example, gasoline and kerosene) and crude oil recorded the smallest ton-mile growth, reflecting the slow pace at which crude oil trade has been evolving over the past decade. Tanker trade patterns, including associated ton-mile demand, are changing as a result of the strategies seeking to diversify crude oil supply sources. In China, where crude imports increased nearly five times between 2001 and 2011, the share of the country's ton-mile trade sourced from Western Asia has been decreasing, while the proportion of its ton-miles sourced from the Caribbean has increased.[28] The share of crude ton-miles from Western Asia fell from 64 per cent of the country's total in 2001 to 52 per cent in 2011, while the Caribbean share increased from 1 per cent to 18 per cent.[29] The Western Asia share of crude ton-miles to North America fell from 62 per cent in 2001 to 53 per cent in 2011, while the shares of the Caribbean and West Africa helped offset this decline.[30] In 2014, the crude ton-mile demand of China is expected to surpass that of North America.[31]

In 2011, although crude oil flows declined, trade distances rose in certain regions. Europe, for example, replaced crude oil from Libya with longer-haul substitutes from Western Asia, the Black Sea, and Western Africa.[32] Furthermore, tankers trading between Western Asia and the Atlantic coast of the United States are increasingly travelling greater distances to avoid piracy off the coast of Somalia in the Indian Ocean.[33]

Oil products have also shown slower ton-mile growth over the past decade as an increased refinery capacity in Asia implies a lesser need for long-haul petroleum products imports. However, with the closing of three refineries in the East Coast of the United States, the country's ton-mile demand for crude oil imports will likely be reduced. This means, in parallel, that its ton-mile demand for refined products can be expected to rise with higher import volumes from Europe, India

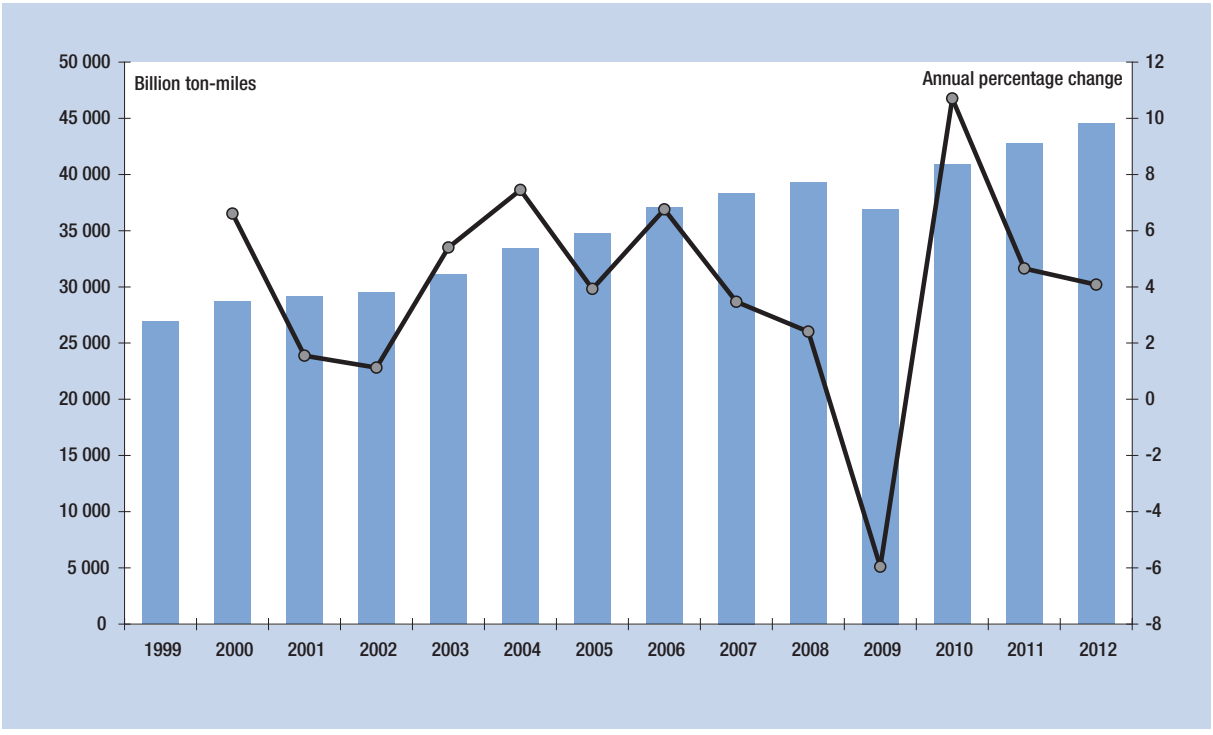
Table 1.5 (a). World seaborne trade in cargo ton-miles and by cago type, 1999–2012 (Estimated billions of ton-miles)

Year	Crude	Products	Oil trade	LPG	LNG	Gas trade	Iron ore	Coal	Grain[a]	Five main dry bulks[b]	Other dry cargoes	All cargoes
1999	7 761	1 488	**9 249**	188	267	**456**	2 338	2 196	1 122	**6 046**	**11 191**	**26 942**
2000	8 014	1 487	**9 500**	199	317	**516**	2 620	2 420	1 224	**6 649**	**12 058**	**28 723**
2001	7 778	1 598	**9 376**	182	341	**523**	2 698	2 564	1 293	**6 922**	**12 347**	**29 168**
2002	7 553	1 594	**9 146**	192	360	**552**	2 956	2 577	1 295	**7 212**	**12 587**	**29 497**
2003	8 025	1 697	**9 723**	187	399	**586**	3 148	2 771	1 382	**7 710**	**13 072**	**31 091**
2004	8 550	1 836	**10 386**	192	429	**621**	3 667	2 901	1 397	**8 424**	**13 975**	**33 407**
2005	8 643	2 057	**10 701**	187	444	**631**	3 900	2 984	1 459	**8 819**	**14 570**	**34 720**
2006	8 875	2 192	**11 067**	195	537	**732**	4 413	3 103	1 496	**9 508**	**15 759**	**37 065**
2007	8 836	2 223	**11 060**	198	614	**812**	4 773	3 177	1 610	**10 090**	**16 390**	**38 351**
2008	8 965	2 277	**11 241**	205	660	**865**	5 000	3 260	1 721	**10 523**	**16 646**	**39 276**
2009	8 138	2 233	**10 371**	193	668	**862**	5 569	3 060	1 693	**10 715**	**14 988**	**36 936**
2010	8 688	2 272	**10 960**	198	861	**1 059**	6 121	3 540	1 948	**12 042**	**16 829**	**40 891**
2011[c]	8 762	2 351	**11 112**	201	955	**1 155**	6 608	3 664	1 920	**12 666**	**17 861**	**42 794**
2012[d]	8 918	2 449	**11 367**	213	1 065	**1 278**	6 948	3 763	1 940	**13 141**	**18 754**	**44 540**

Sources: Based on data from Clarkson Research Services' *Shipping Review & Outlook*, spring 2012.

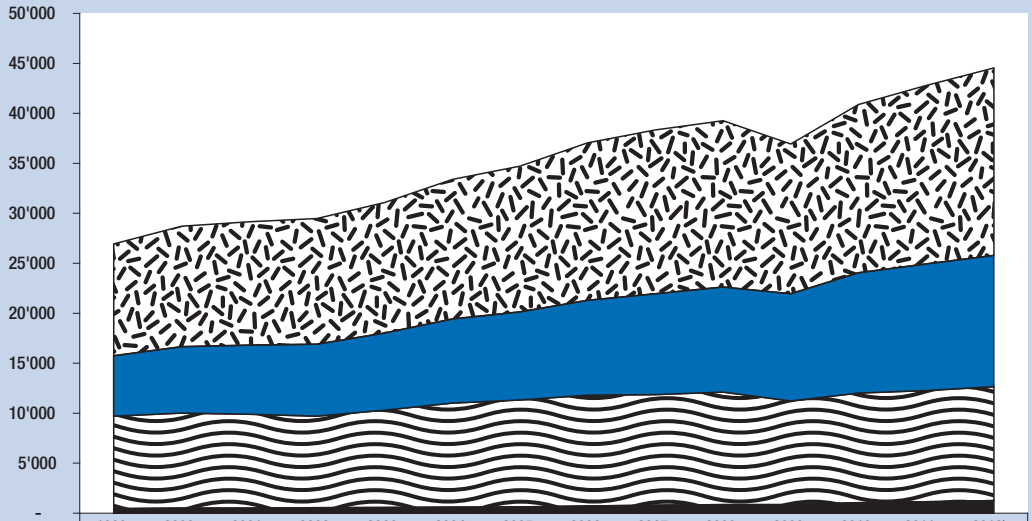
[a] Includes soybean period.
[b] Includes iron ore, coal, grain bauxite/alumina and rock phosphate.
[c] Estimated period.
[d] Forecast period.

Figure 1.4 (a). World seaborne trade in cargo ton-miles, 1999–2012 (Billions of ton-miles)



Source: UNCTAD secretariat based on data from Clarkson Research Services' *Shipping Review & Outlook*, spring 2012.

Figure 1.4 (b). World seaborne trade in cargo ton-miles and by cargo type, 1999–2012 (Billions of ton-miles)



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[a]	2012[b]
Other dry cargo	11 191	12 058	12 347	12 587	13 072	13 975	14 570	15 759	16 390	16 646	14 988	16 829	17 861	18 754
Five main dry bulks	6 046	6 649	6 922	7 212	7 710	8 424	8 819	9 508	10 090	10 523	10 715	12 042	12 666	13 141
Oil	9 249	9 500	9 376	9 146	9 723	10 386	10 701	11 067	11 060	11 241	10 371	10 960	11 112	11 367
Gas	456	516	523	552	586	621	631	732	812	865	862	1'059	1'155	1'278

Source: UNCTAD secretariat based on data from Clarkson Research Services' *Shipping Review & Outlook*, spring 2012.
[a] Estimated.
[b] Forecast.

Table 1.5 (b). World seaborne trade in dwt-miles, 2008-2011 (Estimated billions of dwt-miles)

Year	Container	General Cargo	RoRo	Reefer	Dry Bulk	Oil	Gas	World Total
2008	18 400	2 800	1 812	496	25 606	29 310	2 538	80 962
2009	15 313	2 366	1 217	405	24 550	26 228	2 344	72 423
2010	16 508	2 457	1 468	333	26 784	27 787	3 322	78 659
2011	18 756	2 472	1 578	356	31 788	28 181	3 816	86 947

Source: *Lloyd's List Intelligence*, 2012. www.lloydslistintelligence.com

and Western Asia. Refinery developments in the oil-producing regions could help shift a larger share of the oil trade from crude oil to refined petroleum products (for example, gasoline, kerosene, and the like).

Table 1.5 (b) features estimated annual deadweight ton-miles (dwt-miles), which are calculated by multiplying the number of voyages between each port by the distance and individual vessel dwt. Therefore, unlike cargo ton-miles, dwt-miles measure total annual vessel activity not only when the ship is laden but also when in ballast. Thus, this measure is not equivalent to measuring the potential ton-mile capacity, as data in table 1.5 (b) reflect voyages actually made, and do not account for unused ship supply capacity (for example, ships that are laid up, waiting or out of service). Therefore, the dwt-mile data presented in table 1.5 (b) do not measure supply or determine utilisation. The dwt-miles to cargo ton-miles ratio over the 2008–2011 period is around 2, reflecting, in part, the difference between the two measures.

Bearing in mind these differences, the evolution of dwt-miles as shown in table 1.5 (b) appears to be in line with the trends observed in cargo ton-miles as shown in table 1.5 (a). The performance of dwt-miles clearly highlights the impact of the 2009 downturn when global trade collapsed, as well as the strong rebound in trade volumes recorded since 2010. Rapid growth in gas trade and, more specifically, the recent surge in LNG trade have been key drivers of growth in dwt-miles over the 2010–2011 period. Table 1.5 (b) also shows the relative resilience of dry bulk trade owing to the booming Asian demand for commodities such as iron ore and coal.

3. Seaborne trade by cargo type

Tanker trade[34]

Crude oil production and consumption[35]

In 2011, world oil consumption grew marginally by 0.7 per cent to reach 88 million barrels per day (bpd). While consumption in the OECD countries declined by 1.3 per cent, it rose by 2.8 per cent in developing countries. Interestingly, after growing by an average of 12 per cent annually between 2006 and 2010, oil consumption growth in China slowed down in 2011, reflecting, in particular, the effect of the country's tighter monetary and fiscal policies.

Global production increased by 1.3 per cent to reach 83.6 million bpd in 2011, with members of the Organization of the Petroleum Exporting Countries (OPEC) leading the growth. Non-OPEC supply remained flat as growth in the United States, Canada, the Russian Federation and Colombia was offset by declines in Norway and the United Kingdom. An overview of major producers and consumers is presented in table 1.6.

Recent developments in drilling activity point to future oil supply increases. Drilling activity picked up in 2011 due in part to the allocation of new drilling permits in the Gulf of Mexico. This follows the end, in October 2010, of the moratorium established in this region after the Deepwater Horizon incident. Activity also revived with the emergence of new exploration of fields in Brazil and the Gulf of Guinea (Ghana, Angola, Equatorial Guinea and the Congo) and with new projects being launched in 2011.

Crude oil shipments

Over the past decade, crude oil volumes increased at a relatively slower pace than other market segments. Between 2000 and 2011, crude oil shipments grew annually at an average rate of less than 1 per cent while in 2011, they declined by 1.4 per cent. In 2011, the total volume of crude oil loaded globally amounted to about 1.8 billion tons. Western Asia remained the largest loading area, followed, Africa, developing America and the transition economies. Major importing areas were in ascending order, Japan, North America, Europe and developing Asia.

Tanker trade patterns are changing as crude oil source diversification continues. A new map of crude supplies is being drawn up as new oil discoveries are made in different regions and as new market suppliers emerge. Underpinning the diversification strategy is the active move by China to secure its energy supply through foreign investments.[36] In March 2009, China lent up to $40 billion to the Russian Federation, Kazakhstan, the Bolivarian Republic of Venezuela and Brazil,[37] in exchange for oil, while its investment in the mining sector in sub-Saharan Africa accounted for about one third of the country's foreign direct investment (FDI).[38] There are now 50 countries in which Chinese oil companies have more than 200 upstream investments.[39] The extent to which the international tanker market would benefit from the full opportunities arising from these projects remains unclear as the strategy being developed by China also aims to ensure that, by 2015, half the country's crude imports are shipped on domestic ship tonnage. Another trend reshaping the market is the falling demand in the United States – the world's largest oil consumer – and the consequent reorientation of cargo flows towards Asia.

Current sanctions applying to the oil trade of the Islamic Republic of Iran are also influencing the tanker market and raising uncertainties. The sanctions have a direct impact on this country's oil exports as well as on the oil trade that passes through the Strait of Hormuz. An escalation of these geopolitical tensions could lead to a shutdown of the Strait, which in turn would create oil shortages and raise oil prices to potentially extreme levels, including the range of $200–$400.[40] Although temporary waivers have been issued for a number of countries, concerns remain with respect to the likely severe impact of the sanctions, including those enacted by the European Union. These latter sanctions prohibit insurers in Europe – marine insurers are to a large extent based in Europe and the United States – from issuing or maintaining insurance to tankers involved in servicing the oil trade of the Islamic Republic of Iran. Pressure is particularly high for some key crude importers, which could be forced to provide sovereign guarantees to tankers.

In a separate development, tanker trade has also been affected by rising operating costs resulting from the higher oil and bunker fuel prices that prevailed in 2011. Tanker operators had to reduce speed to optimize fuel consumption and also absorb excess tonnage capacity. Slow steaming has been implemented in the tanker trade, with most voyages taking place at an average of 13 knots (compared to 14 knots), and at 10–11 knots when sailing in ballast (see also section C).

Table 1.6. Major producers and consumers of oil and natural gas, 2011 (World market share in percentage)

World oil production		*World oil consumption*	
Western Asia	33	Asia Pacific	32
Transition economies	16	North America	24
North America	14	Europe	16
Africa	11	Latin America	9
Latin America	12	Western Asia	10
Asia Pacific	10	Transition economies	5
Europe	5	Africa	4
World natural gas production		***World natural gas consumption***	
North America	25	North America	25
Transition economies	24	Europe	16
Western Asia	16	Asia	17
Asia Pacific	15	Transition economies	18
Europe	8	Western Asia	14
Latin America	7	Latin America	7
Africa	6	Africa	3

Source: UNCTAD secretariat on the basis of data published in the British Petroleum (BP) *Statistical Review of World Energy 2012* (June 2012).

Note: Oil includes crude oil, shale oil, oil sands and natural gas liquids NGLs – the liquid content of natural gas where this is recovered separately). The term excludes liquid fuels from other sources as biomass and coal derivatives.

Refinery developments, shipments of petroleum products and gas

In 2011, global refinery throughputs increased marginally by 0.5 per cent and averaged 75.7 million bpd. The drop in the OECD output was offset by increased production in developing countries, including India, China and those of Latin America. For the fifth time in six years, growth in throughput was outpaced by growth in the global refining capacities, which expanded by 1.5 per cent in 2011. The largest capacity growth continues to take place in the Asia–Pacific region and in Western Asia.

Refiners in Europe are confronted with a number of difficulties. These include a falling demand in Europe and the United States (the largest market for European gasoline), the shutdown of seven refineries, the need to seek alternative markets in Africa and Western Asia for European gasoline, and a supply and demand mismatch with refineries in Europe being geared towards gasoline production and global demand supporting diesel. The closing of refineries in Europe, however, could mean greater European imports of oil products in the future.

In 2011, world shipments of petroleum products and gas, including LNG and liquefied petroleum gas (LPG) increased by 5.1 per cent, taking the total to 1.03 billion tons. The growth rate reflects the booming LNG trade. If gas trade were to be excluded, and using estimates for LNG and LPG trade published by Clarkson Research Services (*Shipping Review & Outlook*, spring 2012), the growth rate would moderate and amount to 3.3 per cent. In 2011, the United States became a net exporter of refined petroleum products for the first time on record.

Natural gas supply and demand

Natural gas is the third largest source of energy consumed globally, after oil and coal. North America continues to account for the largest share of world gas consumption, although the largest growth rate was recorded in the Asian market.

In 2011, natural gas consumption increased by 2.2 per cent, with consumption in North America expanding by 3.2 per cent due to low gas prices. Elsewhere the largest growth was recorded in China, Qatar, Saudi Arabia and Japan. The combined effect of a weak economic situation, relatively high gas prices, warmer weather conditions and an incremental shift towards greater use of renewable power generation has led gas consumption in the European Union to drop by 10 per cent.

In 2011, global natural gas production grew by 3.1 per cent, with production in the United States growing by 7.7 per cent and this country ranking as the largest world producer. The United States has been gradually reducing its dependency on foreign energy supplies, in part through increased exploitation of its shale gas.

Output of natural gas grew rapidly in Qatar, the Russian Federation and Turkmenistan, which helped to offset the lost output from Libya and the United Kingdom. Production in the European Union also declined as demand in the region weakened and gas fields matured or were under maintenance.

Liquefied natural gas shipments

In 2011, global natural gas trade increased by 4 per cent, with 32 per cent of this trade being carried as LNG on board gas carriers and the remaining share being carried via pipelines. Shipments of LNG grew by 10.3 per cent in 2011, taking the total volume to 330.8 billion cubic meters. Growth was fuelled by

increasing exports from Qatar and increasing imports into the United Kingdom (35.3 per cent), Japan (12.6 per cent) and the Republic of Korea (11 per cent). Asia accounted for 62.7 per cent of global LNG imports, with Japan remaining the world largest importer, followed by the Republic of Korea.

Over the past few years LNG has been one of the fastest-growing cargoes owing to the increasing interest in LNG as a greener alternative to other fossil fuels. Interest in LNG heightened in 2011 as the fallout from the disaster in Japan highlighted the risk of a great reliance on nuclear power over the long term. New and expanding LNG-receiving terminals (for example, in the United Kingdom, the United States, China, the United Arab Emirates, Chile, and Thailand) are being set up, and a total of five new liquefaction projects started operations between 2010 and 2011, including those in Qatar, Peru and Norway. Overall, the outlook for LNG is positive and is supported by growing demand from Asia, including a projected growth in demand from traditionally large LNG exporters such as Indonesia and Malaysia.

One study projects that by 2030 Norway and the Russian Federation will be driving global exports of LNG and that these two countries will lead the fourth wave of LNG exports.[41] The first wave is taking place at the present time and is led by Qatar, the second wave is projected to occur in 2014 with Australia and the Asia Pacific region being major players, and the third wave is expected to occur around 2020 and be driven by West Africa.[42]

Dry cargo trades: major and minor dry bulks and other dry cargo[43]

In 2011, the momentum was maintained for dry cargo trade, which increased by a firm 5.6 per cent, taking the total to nearly 6 billion tons. Dry bulk cargo, including the five major commodities (iron ore, coal, grain, bauxite/alumina and phosphate rock) and minor bulks (agribulks, fertilizers, metals, minerals, steel and forest products) increased by 5.6 per cent, down from the 12.3 per cent increase recorded in 2010. The total volume of dry bulk trade amounted to 3.7 billion tons in 2011.

Major dry bulks: iron ore, coal, grain, bauxite/ alumina and phosphate rock

In 2011, the five major dry bulks accounted for approximately 42 per cent of total dry cargo, driven by iron ore volumes, which accounted for the largest share (42.5 per cent), followed by coal (38.1 per cent), grain (14 per cent), bauxite/alumina (4.4 per cent) and phosphate rock (1.1 per cent).

Growth in the five major bulks remained closely linked to steel production, growing infrastructure development needs of emerging developing countries, urbanization and the evolution of the global manufacturing base. World consumption and production of steel, a key product supplier to many industries, continued to expand in 2011 despite prevailing global economic uncertainties and volatilities. In 2011, world steel consumption grew by 6.5 per cent, down from 15.1 per cent in 2010. The deceleration reflects the overall weakness of the world economy and the slight slowdown in the economic expansion of China. With most of Chinese steel demand being driven by expenditure on investment and construction, the country's steel consumption grew by 8.9 per cent in 2011, a slower pace than in 2010.

World steel production is estimated to have grown by 6.8 per cent in 2011, reaching a record 1.6 billion tons. Steel production in China increased, albeit at a slower pace, and still accounted for almost half of the global output in 2011. Other emerging developing economies such as India, Brazil, the Republic of Korea and Turkey, which have featured among the top 10 steel producers for the past 40 years, also increased output. Major world steel producers and consumers are featured in table 1.7.

Coal production, consumption and shipments

With a share of 30.3 per cent of global energy consumption, coal is the second most important primary energy source and is used mainly in power generation. Global coal consumption grew by 5.4 per cent in 2011, with consumption outside the OECD countries, led by China (9.7 per cent), rising by 8.4 per cent. Despite growth in Europe, overall consumption in the OECD countries declined by 1.1 per cent due to falling demand in the United States and Japan.

Coal production grew by 6.1 per cent in 2011, with most of the growth occurring in developing countries and with China accounting for over two thirds of this expansion. Since China has emerged as a net importer of coal, coal prices have been rising, as have new investments in exporting countries, including Australia, Indonesia, the Russian Federation, Mongolia and more recently Mozambique, which has

Table 1.7. Major dry bulks and steel: main producers, users, exporters and importers, 2011 (Market shares in percentages)

Steel producers		*Steel users*	
China	46	China	45
Japan	7	European Union 27	11
United States	6	North America	9
Russian Federation	5	Confederation of Independent States	4
India	5	Middle East	4
Republic of Korea	4	Latin America	3
Germany	3	Africa	2
Ukraine	2	Other	22
Brazil	2		
Turkey	2		
Others	18		
Iron ore exporters		***Iron ore importers***	
Australia	42	China	63
Brazil	31	Japan	12
Others	10	European Union 15	10
India	7	Republic of Korea	6
South Africa	5	Middle East	2
Canada	3	Others	6
Sweden	2		
Coal exporters		***Coal importers***	
Indonesia	34	Japan	18
Australia	30	Europe	18
United States	10	China	13
Colombia	8	India	13
South Africa	7	Republic of Korea	13
Russian Federation	6	Taiwan Province of China	6
Canada	3	Malaysia	2
Others	2	Thailand	2
China	1	Israel	1
		Others	12
Grain exporters		***Grain importers***	
United States	36	Asia	33
European Union	12	Latin America	21
Argentina	11	Africa	22
Australia	10	Middle East	14
Canada	9	Europe	6
Others	23	Confederation of Independent States	3

Source: UNCTAD secretariat on the basis of data from the World Steel Association (2012), Clarkson Research Services, published in the June 2012 issue of *Dry bulk Trade Outlook*, and the World Grain Council, 2012.

been attracting investors, especially from Brazil and India. The year 2011 saw the first coal shipment from Mozambique.[44]

In 2011, the volume of coal shipments (thermal and coking) totalled 944 million tons, up by 5.1 per cent compared with 2010. In 2011, coking coal shipments declined by 5.5 per cent, reflecting developments on the demand side as well as supply side constraints resulting from tighter market conditions caused by output cuts from Australia. The floods in Australia interrupted coal mine operations, which reduced supply and raised coal prices. This in turn depressed demand, especially from China, where domestic supplies provide a better alternative to less competitive coal imports.

Growth in overall coal shipments held strong due to an increase of 8.7 per cent in thermal coal trade. Growing energy requirements in emerging developing countries in Asia, a stronger demand for steam coal in Europe, for a short while, high oil prices and the aftermath of the nuclear accident in Japan have all contributed to boost demand for thermal coal.

In 2011, Indonesia remained the leading exporter of thermal coal with a share of 44.9 per cent, followed by Australia (20.4 per cent). Strong demand in China and India as well as in Europe has boosted thermal coal imports. Import levels in Japan and the United States dropped due, in part, to the aftermath of the March 2011 disaster in Japan, stringent environmental regulation and comparatively low gas prices in the United States.

One study projects that Australia will overtake Indonesia as the biggest exporter of coal by 2016.[45] Australia is investing in the establishment of new mines and expanding existing ones. According to the Australian Bureau of Agricultural and Resource Economics and Sciences, by October 2011 there were 20 committed coal-mining projects in the country and 76 proposals.[46] Meanwhile, some observers are noting that the growing power generation needs in Indonesia may constrain the country's exports starting in 2014.[47] This would likely provide an opportunity for other suppliers, including those situated in locations distant from China, to step in and meet the growing demand. Potential new players that may develop a bigger role include the United States, the Russian Federation, South Africa and Mongolia. Main world coal importers and exporters are featured in table 1.7.

The outlook for coal trade remains promising, as developing nations continue to require more coal to meet their energy needs. It remains subject, however, to developments in coal production and consumption patterns in China, as the scale of the country's large domestic supply means that any small shift could turn the country into a net exporter again.[48] Additionally, the country's Five-Year Plan for the period 2011 to 2015, which aims to reduce the energy and carbon intensity of the economy, is likely to impact on coal trade.

Iron ore and steel production and consumption

In 2011, iron ore trade expanded by 6 per cent, taking the total volume past 1 billion tons. This growth remains highly concentrated with China being the main driver.

Major iron ore exporters in 2011 were Australia, Brazil, India, South Africa and Canada (table 1.7). With a joint market share of 73 per cent, Australia and Brazil increased their export volumes by 8.9 per cent and 6.4 per cent, respectively. Except for India, where iron ore exports were constrained by the introduction of mining and export bans, as well as higher export duties, all other exporters have recorded positive export growth.

Reflecting their weaker economic stance, European countries reduced their iron ore imports by 3.7 per cent, while Asian developing countries recorded an increase of 2 per cent. Although positive, this rate is dwarfed by the 32 per cent recorded in 2010. Import demand in China increased by a strong 10 per cent, anchoring the country's dominance in this particular trade. Most other Asian countries increased their imports, but Japan and Indonesia recorded a decline of 4.4 per cent and 21.7 per cent, respectively.

In 2011, concerns were raised regarding new port restrictions introduced by Chinese authorities. These would restrict access to the purpose-built very large ore carriers (VLOCs) of 400,000 dwt, owned or ordered by Vale to service booming iron ore demand from China (see also chapters 2 and 4 for more detailed information). For Brazil, in particular, the strategic importance of its bilateral trade with China cannot be overemphasized. Brazilian exports to China increased by 46.1 per cent in 2011 to reach $44.3 billion, up from $30.8 billion in 2010, while exports from China to Brazil grew by 34.6 per cent to $32.8 billion.[49] Iron ore accounts for 40 per cent of Brazilian exports to China, soybeans for 27 per cent, crude oil for 10.5 per cent, pig iron for 4 per cent and sugar for 2.7 per cent. Brazil and China are increasingly investing in port infrastructure projects to address any potential bottlenecks that may hinder this trade.[50]

Although it remains subject to developments in the wider economy and the steel-making sector, and more importantly, to the effect of new macroeconomic policies being instigated by China, the outlook for iron trade remains positive, with shipments projected by Clarkson Research Services to grow by 6 per cent in 2012.

Grain shipments

Total grain production in the crop year 2010/2011 fell by 2.6 per cent to 1.75 billion tons, while production in the crop year 2011/2012 increased by 5.1 per cent, taking the total to 1.84 billion tons. World grain consumption increased by 1 per cent in 2010/2011 to reach 1.79 billion tons and further increased in 2011/2012 by 2.8 per cent, taking the total to 1.84 billion tons.

World wheat consumption is expected to increase from 657 million tons in 2010/2011 to 688 million tons in 2011/12, up by 4.7 per cent. Food use accounts for over two thirds of the total growth. However, with maize supplies being more limited and prices being higher, lower-grade wheat becomes a good alternative for use as feedstock. Industrial use remains small but is expected to grow as demand for wheat-based ethanol increases.

World grain shipments totalled 347 million tons in the full year 2011, up by 1.5 per cent over 2010. Wheat and coarse grain accounted for 73.8 per cent of the total grain shipments. For the crop year 2011/12, volumes of wheat exports increased by 15.6 per cent due to a strong demand, especially from developing economies, and improved harvests. These factors eased wheat prices. Wheat export increases were recorded in Argentina (50 per cent), Australia (24.9 per cent) and Canada (10.4 per cent). Exports by majors such as the United States and the European Union dropped by 21.9 per cent and 29.1 per cent, respectively, due in particular to better priced grain from other regions, including from the Black Sea. Meanwhile, shipments of coarse grains increased by 5.8 per cent, with large increases recorded in Australia (51.1 per cent) and Argentina (9.7 per cent).

Bauxite/alumina and phosphate rock

Bauxite ore is mined and then transferred to a refinery for the processing and extraction of alumina. The world's largest bauxite deposits are located in Guinea, Australia, Brazil and Jamaica. In 2011, world production of alumina increased by 8 per cent over 2010. Growth resulted mainly from the increased production of bauxite (6 per cent) from expanded, new and reopened mines in Brazil, China, Guinea, India, Jamaica, Suriname and the Bolivarian Republic of Venezuela. Bauxite production in Australia declined slightly because of the flooding that forced production cuts at some mines. World trade in bauxite/alumina increased by a strong 17.2 per cent, totalling 109 million tons in 2011.

World phosphate rock production capacity is projected to increase by nearly 20 per cent between 2011 and 2015, with most of the increases occurring in Africa, in particular Morocco. Other new mines are planned in Australia, Brazil, Namibia, and Saudi Arabia. World consumption of phosphate rock for fertilizers is projected to grow at a rate of 2.5 per cent per year during the next 5 years, with the largest increases being in Asia and South America. Phosphate rock volumes increased by 8.7 per cent, down from 15 per cent recorded in 2010. Total volumes reached 25 million tons, reflecting in part the continued improved economic situation in the first half of the year. With no substitutes for phosphorus in agriculture, increased demand for grain and improved production levels have also contributed to the continued growth. Growing demand for fertilizers and increased production by new or expanding plants in producing countries are expected to sustain growth in phosphate rock trade.

Dry cargo: minor bulks

In line with developments in the world economy and the deceleration of growth since the third quarter of 2011, growth in minor bulks trade decelerated to 6.1 per cent. Global volumes reached 1.2 billion tons, a level surpassing the pre-crisis peak of 1.1 billion tons achieved in 2007. Exports of metals and minerals recorded the second fastest growth (7.4 per cent) after agribulks (8.6 per cent), while manufactures expanded by 5.6 per cent and fertilizers (excluding phosphate rock) grew by 4.3 per cent. The only contraction recorded was in sugar volumes, which fell by 7.4 per cent, following a growth of 11.9 per cent in 2010. Looking to the future, trade in minor bulks is projected to expand further in 2012, albeit at a slower rate, reflecting in part the weakening in the world economy and the slowdown in steel production activity, an important source of demand for a number of minor bulks.

Containerized cargo

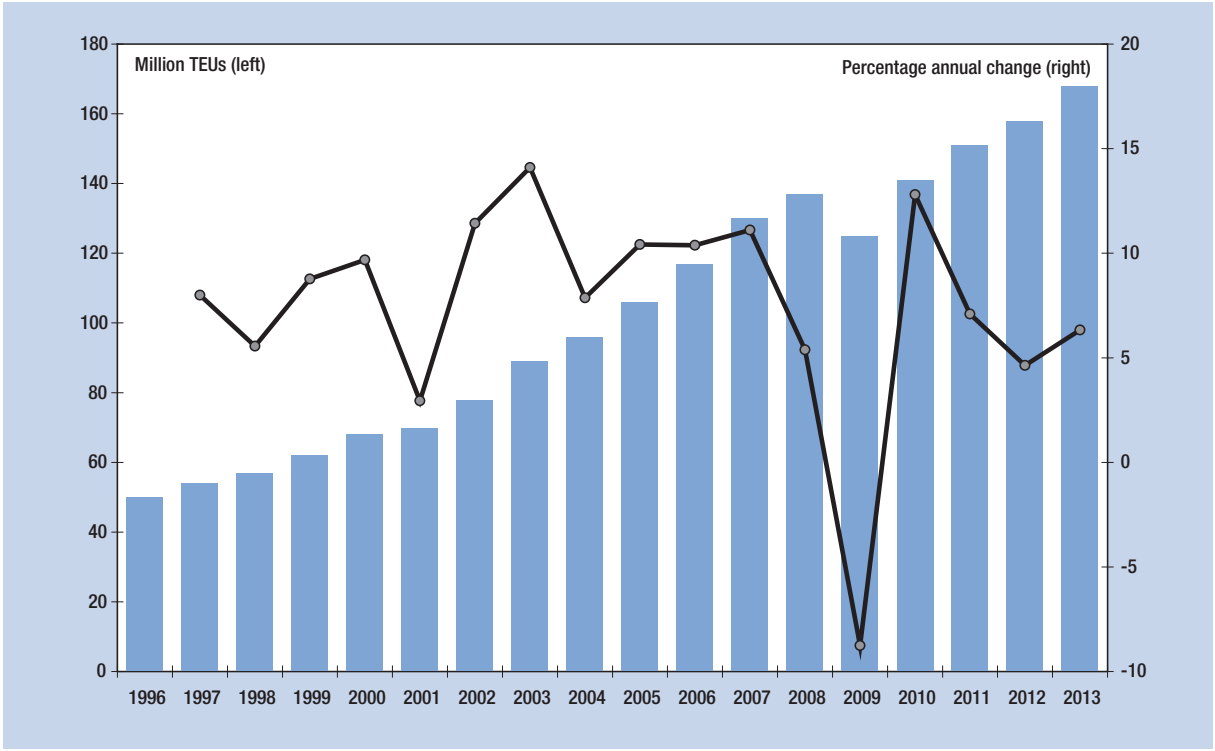
Accounting for about 62 per cent of the remaining 2.2 billion tons of dry cargoes, world container trade, expressed in 20-foot equivalent units (TEUs), grew by 7.1 per cent in 2011, down from 12.8 per cent in 2010. According to Clarkson Research Services, total container trade volumes amounted to 151 million TEUs in 2011, equivalent to about 1.4 billion tons. These headline figures conceal some differences at regional and route levels that have significantly impacted the container trade market during the year.

Global growth in 2011 was limited by the slowdown recorded on the mainlane East–West trade. As shown on table 1.8, trade on the trans-Pacific route declined by 0.5 per cent while volumes on the Asia–Europe and trans-Atlantic routes expanded by 6.3 per cent and 5.7 per cent, respectively (figures 1.5(a), 1.5 (b), 1.5 (c) and table 1.8).

Growth was mainly generated by increased demand for imports in developing regions, with container trade volumes expanding strongly on the non-mainlane East–West, North–South and intraregional lanes. Non-mainlane East–West trade grew by 8.9 per cent, while North–South and intraregional trades expanded by 8.9 per cent and 9.2 per cent respectively.[51] According to data from Clarkson Research Services, in 2011, the three mainlane trades totalled 47.3 million TEUs, while the non-mainlane trades reached 103.3 million TEUs.[52]

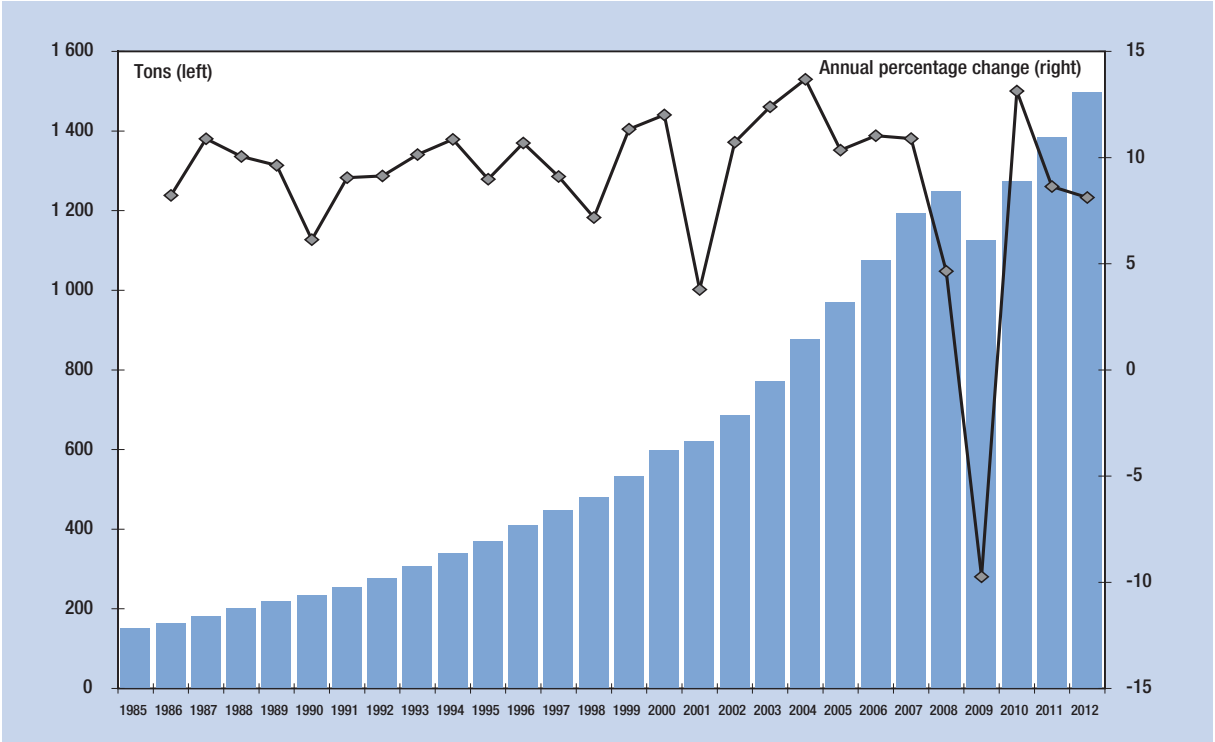
One current opinion maintains that greater containerization could help generate additional cargo for container shipping. It is argued that unconventional commodities can be carried increasingly in containers. These include, for example, larger volumes of scrap steel and recycled paper from North America and Europe to Asia, and general cargo and bulk commodities that can be transported in smaller batches and containerized (for example, segments of food commodities and raw materials). Other commodities include more refrigerated cargo, chemicals and even Handysize loads of bulk commodities, such as iron ore, which is reported to have already been shipped in small parcels from Africa to China. For these ideas to materialize, however, prevailing price and cost barriers need to be removed and cost-effectiveness and vessel specifications need to be assessed.[53]

Figure 1.5 (a). Global container trade, 1996–2013 (Millions of TEUs and annual percentage change)



Source: UNCTAD based on Drewry Shipping Consultants, *Container Market Review and Forecast 2008/2009*; and Clarkson Research Services, *Container Intelligence Monthly*, various issues.

Figure 1.5 (b). Global container trade, 1985–2012 (Millions of tons and annual percentage change)



Source: UNCTAD based on Clarkson Research Services' *Shipping Review & Outlook*, spring 2012.

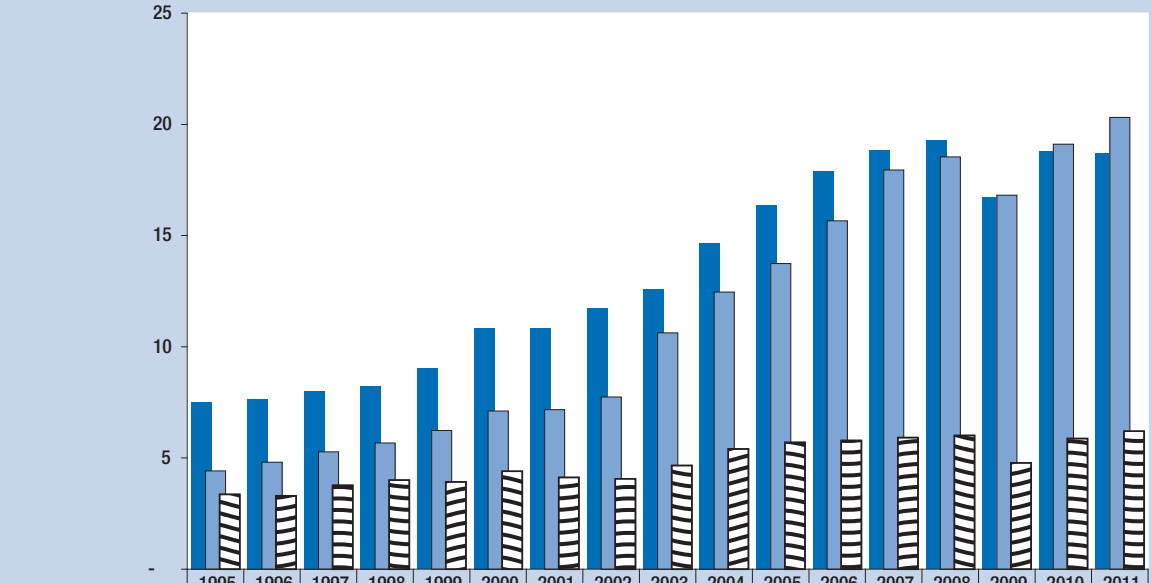
Table 1.8. Estimated containerized cargo flows on major East–West container trade routes, 2009–2011 (Millions of TEUs and percentage change)

Year	Transpacific		Europe Asia		Transatlantic	
	Asia–North America	North America–Asia	Asia–Europe	Europe–Asia	Europe–North America	North America–Europe
2009	10.6	6.1	11.5	5.5	2.8	2.5
2010	12.8	6.0	13.5	5.6	3.1	2.8
2011	12.7	6.0	14.1	6.2	3.4	2.8
Percentage change 2010–2011	**1.2**	**0.9**	**4.6**	**10.6**	**8.3**	**2.8**

Source: UNCTAD based on Container Trade Statistics, March 2012; *Containerisation International*, 1 September 2012; and the Global Insight Database as published in *Bulletin FAL*, issue number 288, number 8/2010 (*International maritime transport in Latin America and the Caribbean in 2009 and projections for 2010*), ECLAC.

The policy of China to move up the value chain in global manufacturing is causing manufacturing operations of low-value goods to relocate to other lower-cost production sites such as in Viet Nam, Bangladesh and Indonesia.[54] Chinese manufacturers have been moving up the value chain as exports in power equipment, auto parts and electronics are growing faster than average.[55] Research from the Boston Consulting Group argues that with rapidly rising labour costs in China, manufacturing business could shift operations from China back to the United States.[56] Another research by Cost and Capital Partners suggests that relocation is taking place towards Mexico rather than the United States in view of Mexico's cost competitiveness and more reliable supply chains.[57] This is further illustrated by recent data from Piers indicating that exports from

Figure 1.5 (c). Estimated containerized cargo flows on major East–West container trade routes, 1995–2011 (Millions of TEUs)



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Transpacific	8	8	8	8	9	11	11	12	13	15	16	18	19	19	17	19	19
Europe–Asia–Europe	4	5	5	6	6	7	7	8	11	12	14	16	18	19	17	19	20
Transatlantic	3	3	4	4	4	4	4	4	5	5	6	6	6	6	5	6	6

Source: Based on the Global Insight Database as published in *Bulletin FAL*, issue number 288, number 8/2010 (*International maritime transport in Latin America and the Caribbean in 2009 and projections for 2010*). ECLAC. Data for 2010 and 2011 are based on table 1.8.

China to the United States have been growing at a much slower rate (2 per cent for the 12 month period up to January 2012) than exports from Mexico to the United States (68 per cent over the same period).[58] Overall, both the cost and the transit time of shipping are viewed as key considerations for moving from China to Mexico.

Import demand from China could also have a deep impact on future container trade patterns. Supported by the policy within China of promoting greater consumer spending, some rebalancing of container trade flows is emerging, breaking away from past trends as containerships are increasingly sailing full to China.[59] The shift not only reflects the robust Chinese demand for raw materials and commodities, including metals, waste paper and plastics, but also its growing demand for higher-value goods.[60] These include items such as machine tools and instruments, hi-tech products, luxury goods and cars.[61]

In a separate development and against a background of increasing costs and lower earnings, container shipping witnessed a structural change in 2011 with the emergence of alliances and oligopolistic competition (see chapter 2).[62] At the same time, decisions to maintain exemptions of liner shipping from the application of competition laws have been made by a number of administrations during the year. In February 2012, a study for the United States Federal Maritime Commission (FMC) did not confirm the merit of repealing the exemption, while in Singapore, the block exemption from competition rules for liner shipping agreements was extended until 2016. Japan also decided to maintain its antitrust immunity system till at least 2015, while an agreement by the Asia–Pacific Economic Cooperation (APEC) forum was adopted in 2011 setting up guidelines on maritime competition rules for consortia. In Europe, however, where such exemptions were repealed in 2008, compliance with the competition law continues to be enforced by the European Commission, which in March 2012 fined 14 international logistics companies, including UPS and Kuehne and Nagel, €169 million for operating four price-fixing cartels.[63]

Finally, another important concern for the container industry was dealt with in 2011 as the call by the shipping and port industries for mandatory controls on the weighing of freight containers received full attention at the International Maritime Organization (IMO). An amendment to the International Convention for Safety of Life at Sea (SOLAS) to create a new legal obligation requiring containers' actual weight to be verified prior to loading aboard a ship is now being considered by IMO.[64]

C. SELECTED EMERGING TRENDS AFFECTING INTERNATIONAL SHIPPING

Against a background of economic uncertainty, faltering demand and the burden of ship tonnage overcapacity (see chapter 2), the shipping industry is also confronted by a rapidly changing operating environment, in which some trends are reshaping the industry's future and altering global seaborne trade patterns. Shipping and logistics will need to address these developments to adapt to the new realities and remain operational and competitive. Featuring high on the list of these trends are:

- Climate change;
- Shift in global economic influence and changing trade patterns;
- Rising bunker fuel prices and operating costs;
- Maritime piracy (see chapters 5 and 3);[65]
- Growing momentum of sustainability imperatives (see chapter 6).[66]

While all these issues warrant due consideration, the following section focuses on three developments that entail particularly long-term implications, namely climate change, shifting global economic mass and trade patterns, and rising fuel and operating costs.

1. Transport and the climate change challenge

Climate change is one of the greatest challenges facing our societies, economic structures and environmental systems. A significant risk multiplier, climate change undermines the objectives of sustainable development by exacerbating other interconnected global problems, including poverty, food shortages, water scarcity, energy insecurity and environmental degradation.

Transportation and the greenhouse gas (GHG) emissions that it generates are at the centre stage of the current climate change debate. While the entire sector needs to reduce its carbon footprint, international shipping, in particular, has attracted

attention because the GHG emissions generated by this sector are not covered under the United Nations Framework Convention on Climate Change (UNFCCC). Another reason for this heightened interest is the renewed opportunity provided by the current climate negotiations under UNFCCC and IMO to adopt, for the first time, a binding international regime. Some regulatory measures focusing on technical and operational aspects of international shipping have recently been adopted by IMO while other measures, such as market-based instruments, are still being considered (see chapters 5 and 6). Mitigation action is also gathering momentum among the shipping and port industries with a number of measures being planned or having already been implemented (see chapter 6). However, although mitigation action in maritime transport is critical, it is not sufficient to effectively address climate change and its related impacts. Adaptation action based, as a prerequisite, on a good understanding of risks and vulnerabilities is fundamental to help minimize the effects of unmitigated climate change on transport and trade. While adaptation action in maritime transport is increasingly recognized as important, it should be noted that it is a newcomer to the climate change policy debate and has so far attracted much less interest than mitigation.

Within the transport sector, the special case of seaports calls for particular attention. With 80 per cent of world trade by volume being carried by sea, ports fulfil a critical function as links of global supply chains and constitute engines of economic growth. At the same time, these key infrastructural assets are vulnerable to climate change impacts and associated risks, given their location in coastal zones, low-lying areas and deltas.

Risks for maritime transport include accelerated coastal erosion, port and coastal road inundation or submersion, increased runoff and siltation requiring increased dredging, restrictions on access to docks, deterioration of conditions and problems with the structural integrity of pavements and railway tracks within port areas and related hinterland connections.[67] In addition to these impacts on physical infrastructure, climate change also affects shipping volumes and costs, cargo loading and capacity, sailing and/or loading schedules, storage and warehousing.[68] These impacts are likely to impose costs that will be correlated to the degree of exposure and vulnerability, as well as constraints on the adaptive capacity. Furthermore, greater global interconnectedness and economic integration with supply chains acting as transmission channels entail additional costs. A localized impact on ports can have ripple effects that extend beyond borders to affect industries, stakeholders and economies in distant locations. Although not necessarily driven by climate change, supply chain disruptions resulting from damage to ports caused by natural disasters in Japan and Thailand in 2011 provide a poignant illustration.

The implications of any damage or disruption to transport networks, including ports, can be particularly challenging for the transport and trade of developing countries such as small island developing States (SIDS). The challenge for SIDS is of greater magnitude given their high economic, geographic and climatic vulnerabilities and their generally limited adaptive capacity.[69] In this context, building the capacities of developing countries, including SIDS, with a view to reducing their vulnerability and managing disaster risks is crucial and should be pursued as a matter of priority.[70]

Assessing with any certainty the costs for ports and their hinterland connections associated with the impacts of climate change is difficult. There is no doubt, however, that these impacts can reach extreme proportions in ports and port cities.[71] A study by OECD assessed the exposure of the world's largest port cities to coastal flooding in 2005 and has estimated the total value of assets exposed across all 136 port cities examined to be $3 trillion.[72] A more recent study examining the same 136 port megacities has found that, assuming a sea-level rise of 0.5 metres by 2050, the value of exposed assets may be as high as $28 trillion.[73] These costs are rising in tandem with ever increasing urbanization, population growth, investment in port and transport infrastructure, and wealth expansion around coastal areas.

Against this background, the case for designing and implementing appropriate adaptation strategies to address climate-change impacts on transport, and more specifically on ports is a strong one. Given the long lifetime of transport infrastructure, adaptation has to happen now to avoid high retrofitting costs.[74] However, a review of the available literature reveals that adaptation action in ports appears to be scarce.[75] Over recent years, various studies have addressed the impacts of climate change on transportation infrastructure generally, for example in the case of the United States,[76] Canada, Australia and the United Kingdom. Most of these studies, however, are not

mode-specific and very few specifically focus on ports.[77] Within the existing literature available in the public domain, the United States report, *Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I*, is of particular relevance for ports and their hinterland connections.[78] Other studies worth noting include the report commissioned by the International Finance Corporation (IFC), which focuses on the case of the Terminal Maritimo Muelles el Bosque (MEB), in Cartagena, Colombia. The aim of this study was to help develop knowledge, tools and methods for analysing climate-related risks and opportunities, and for evaluating adaptation responses. Equally relevant is the study commissioned by the International Association of Ports and Harbours (IAPH), *Seaports and Climate Change – An Analysis of Adaptation Measures*.[79]

While adaptation strategies in ports may vary (for example, retreat/relocate, protect, and/or accommodate), the ultimate objective is to enhance the resilience of facilities and systems. This may be achieved by, for example, changes in operations, management practices, planning activities, design specifications and standards. This may involve integrating climate change considerations into transport and port investment and planning decisions, as well as into broader transport and port design and development plans. A number of factors could, nevertheless, potentially delay or pose challenges to adaptation action. Firstly, as ports involve multiple players in the decision-making process, it may be difficult to proceed effectively with adaptation plans and strategies.[80] Secondly, factors such as a high perception of uncertainty, limited information about the cost-effectiveness of adaption options and about the cost of inaction, the need for realistic predictions of impacts and for science-based policy formulation that takes into consideration the specifics of the region, and resource intensiveness and costs could all, either individually or in combination, hamper adaptation action in ports.

More specifically, costs and the constraints of financial resources could pose a great challenge to adaptation action. Existing studies on adaptation costs provide only a wide range of estimates and have many information gaps. Much more knowledge is required regarding the impacts of climate change and how they interact, and regarding information on relevant adaptation options.[81] Although not specific to transport or ports, a study produced by the World Bank estimates that, for developing countries, the cost of adapting to an increase in temperature by approximately 2° C by 2050 would be, for the period 2010–2050, in the range of $75 billion–$100 billion annually.[82]

Estimates for Barbados that are more specific for transportation, based on the Intergovernmental Panel on Climate Change (IPCC) emission projection scenarios SRES B2[83] and SRES A2, indicate that by 2050 the total impact of climate change on international transport expenditures could range from $12.7 billion (scenario SRES B2) to $14.9 billion (scenario SRES A2).[84] The costs for maritime transportation alone range between $2 billion (SRES B2) and $2.6 billion (SRES A2).[85] Another study has estimated the total costs of climate change for international transportation in Montserrat to be between $839 million and $1.1 billion under scenarios SRES B2 and SRES A2, respectively,[86] while for maritime transport, estimates amounted to between $209 million (SRES B2) and $347 million (SRES A2).[87]

Nevertheless, the benefits of adaptation in terms of the effects on frictions to international trade and development are expected to outweigh the costs.[88] One study which compared the cost of adaptation with the cost of inaction at the European Union level finds that by 2020, the net benefit of adaption will range between €3.8 billion (low sea-level-rise scenario) and €4.2 billion (high sea-level-rise scenario). These benefits are expected to increase further by 2080.[89]

Some of these critical considerations have been considered as part of the activities of UNCTAD aimed at addressing the climate change challenge from the maritime transport perspective.[90] These include the 2009 first session of the Multiyear Expert Meeting on Transport and Trade Facilitation, which had as title Maritime Transport and the Climate Change Challenge, the 2010 Joint UNECE-UNCTAD Workshop on Climate Change Impacts on International Transport Networks, the 2011 UNCTAD Ad Hoc Expert Meeting entitled Climate Change Impacts and Adaptation: A Challenge for Global Ports, and the new book entitled *Maritime Transport and the Climate Change Challenge*, edited by UNCTAD and co-published by the United Nations and Earthscan/Routledge in May 2012.[91] Some of the key messages emerging from this work include the wide recognition that adaptation action in transport and more specifically in ports should be

pursued without delay, and that adaptation planning for those impacts that are already known should be a priority. Furthermore, collaboration between scientists, engineers, policy makers, governments and industry is key and should be improved. Equally, compiling more data, in particular data on local impacts and vulnerabilities, and conducting cases studies and pilot projects is crucial. Awareness-raising activities need to continue and guidance as well as best practices should be compiled and widely disseminated.

To sum up, climate change impacts on ports and their hinterland connections and related adaptation requirements are development challenges with direct implications for trade and growth. While more work is needed to help advance understanding of the various issues at stake and better assess their full implications, adaptation action in transport generally and, especially, in ports, is an imperative and a sound investment with high returns in the long term.

2. Shift in global economic influence and changing trade patterns

Over the past few years developing countries have been leading a global transformation which entails major implications for the global economy, geopolitics and international trade. The 2008/2009 crisis has deepened the shift of influence and economic mass from advanced economies to emerging developing countries. This trend is creating a multipolar global economy[92] (see previous discussion on a global new design in the *Review of Maritime Transport 2011*, section C).

It is projected that, by 2025, fast-growing developing economies and transition economies, led by China, will grow on average by 4.7 per cent per year between 2011 and 2025, with Brazil, China, India, Indonesia, the Republic of Korea and the Russian Federation expected to account for more than 50 per cent of global growth.[93] By comparison, GDP growth in advanced economies is forecast to grow at less than half this rate (2.3 per cent) over the same period.[94] The share of merging developing economies in global real GDP is forecast to expand from 36.2 per cent in 2010 to 44.5 per cent in 2025.[95] In line with economic growth, the share of all developing countries in international trade flows has also increased over the past few decades, rising from 30 per cent in 1995 to an estimated 42 per cent in 2010. Much of this growth is being generated by South–South and intraregional trade.[96]

Some observers argue that the winner of globalization will be Asia, with rising intra-Asian trade becoming the focus of the global economy. South–South interregional trade is also expected to grow and gather momentum.[97] Supply chains, greater integration in the world economy, growing regional concentration and a shift of technology will all propel East Asian countries (led by China) to become the largest trading bloc in 2015, surpassing the areas of the North American Free Trade Agreement (NAFTA) and the Euro.[98] Such a development will have tangible implications for global transport and trade patterns. One recent analysis predicts that in 2015 China will be the top exporter and importer and that by 2030 the world's largest trade corridor will not involve the United States or Europe, but will instead extend from the advanced to the emerging Asia of Thailand and Viet Nam.[99] It is forecast that by 2050 60 per cent of exports from advanced Asia will go to emerging Asia, thus reinforcing the move eastwards and South–South trade.[100]

In parallel to projected economic and trade growth, freight transport is expected to expand. It has been projected by OECD that by 2050, world freight flows will be from two to four times above their 2010 levels, driven by growth outside OECD, where flows are expected to be between two and six times higher than in 2010.[101] This has implications for international shipping and seaborne trade and will require that appropriate policies and strategies be elaborated to effectively respond to the new realities. All shipping market segments are likely to be affected through changes and adjustments to infrastructure, services, equipment and operations, as well as to the underlying legal and regulatory frameworks. For its part, the transport and logistics industry is also making efforts to ensure that it remains relevant and maintains a competitive edge by being more responsive to the needs of its customers. This is illustrated by the increasing tendency within this industry to reach out to its customer base to solicit its input and help map out its needs and requirements.[102]

To better understand the full impact of the changing global transport and trade landscape, a number of key questions, however, remain and need to be addressed. Relevant considerations include how shipping energy consumption patterns and carbon emissions, production processes, decisions about production plant location and infrastructure investment will all be affected.

3. Rising bunker fuel prices and operating costs

Bunker fuel prices increased in tandem with global oil prices, as shown by the price of 380 centistokes (cSt) in Singapore, which increased by 40 per cent to reach $647 per ton in 2011. Higher fuel costs have a disproportionate effect on transportation companies, as fuel is a necessary cost input. Fuel costs are estimated to have made up 60 per cent of total freight earnings on the benchmark very large crude carrier (VLCC) Western Asia to Far East voyage – taking an average bunker price of $630 per ton for March 2011. This share was only 36 per cent in June 2010. To put this in perspective, in 2008 the annual capital cost for a new Panamax bulker was $6 million, and the annual bunker cost $3.3 million. In 2011, the costs were $2 million and $5.5 million, respectively (see also chapter 3).[103]

In addition to fuel expenses, other cost items are also increasing. Drewry estimates that ship-operating costs have risen between 4 and 6 per cent, depending on the market segment. This has been due to increases in commodity prices, which drove up lube, repair and maintenance costs, as well as to additional insurance cover against piracy.[104] These developments have significantly weighed down on the shipping industry and undermined its profitability – an industry which has been, in addition, struggling with excess tonnage capacity, slowing demand and falling freight rates. In the tanker market, for example, the Republic of Korean operator Samho Shipping filed for court protection against creditors following months of financial difficulties. Reasons cited included increasing bunker costs, low freight rates and the costs associated with piracy attacks against its vessels.[105] In the liner industry, the overall loss in 2011 was estimated at over $6 billion.[106]

In a context of increasingly higher costs and weak economic juncture, cost management and control is becoming important. Relevant cost-cutting measures include speed management through slow steaming, bunker adjustment, paper hedges and selection of the most economical routing options. Among these strategies, slow steaming has evolved into a key cost-cutting measure that reduces bunker fuel consumption and helps absorb capacity. Today, slow steaming is implemented across various market segments and in particular container trade, which relied heavily on this strategy during the 2008/2009 crisis. The global containership fleet has been cutting sailing speeds by an average of 13 per cent in 2011 on a number of mainlane trades[107] and has continued to reduce sailing speed from 24–25 knots to 21 knots (slow steaming), 18 knots (extra-slow steaming) and 15 knots (super-slow steaming).[108] In the tanker trade, slow steaming has been implemented with most voyages occurring at an average of 13 knots (compared to 14 knots), and 10–11 knots when sailing in ballast (see also previous section on crude oil shipments and chapter 2).[109]

Some argue that slow steaming has its limitations and that it may not be advisable to implement it in all cases. First, slow steaming may be better limited to a few long-haul routes and not used for short-haul ones. Second, there is a need to assess the implications of employing additional ships and container equipment. Furthermore, increased transit time, especially for the dominant leg, may not be acceptable for supply chains, as shown by a study investigating the merits of slow steaming.[110] This study argued that other factors need to be accounted for, including the auxiliary bunker costs and the sensitivity of demand to transit time. Figures for January 2010 indicated a limited use of slow steaming on the Europe–South American trades (with around 30 per cent of services operating slow steaming) as compared with over 80 per cent of services operating slow steaming on those between Europe and the Far East. The study concludes that a differentiated strategy by shipping lines of sailing at a different speed depending on the leg, or of using hubs instead of direct services maybe recommended. Such differentiated strategy would also take into account the sensitivity of demand to transit time, such as, for example, by distinguishing between frozen and dry and fresh products.

While slow steaming is viewed by many as a short-term fix, others consider it to be a long-term trend. In view of current developments in the energy sector, growing demand, constrained and uncertain supply, as well as ongoing geopolitical risks affecting oil producing regions, oil prices and therefore bunker fuel costs will not doubt continue to trend upward.[111] Interestingly however, the historical correlation between bunker and crude prices seems to have changed slightly in 2011, as the rise in bunker prices exceeded that of crude oil. A potential reason for this could be that the large ship deliveries of recent years have increased demand for marine fuels against a slower supply.[112]

With bunker fuel being a residual of the refining process, it is possible that efforts by refineries to maximize the middle distillates output have reduced the quantity of residual marine fuels. Another reason that could have reduced the quantity of residual marine fuels is the combination of increased demand for petroleum products from Japan that followed the disaster in March 2011 and the cuts in oil supply from Libya during the course of the year.[113]

World energy demand is projected to grow and add some 39 per cent to global consumption by 2030, with almost all the growth being generated in developing regions.[114] Whether adequate levels of energy at affordable prices will be available to match the increased global energy requirements remains uncertain (see *Review of Maritime Transport 2011*, for a detailed discussion of oil supply and demand fundamentals). It is worth noting in this respect that global replacement costs of existing fossil fuel and nuclear power infrastructure are estimated at $15 trillion to $20 trillion at least, equivalent to between 25 and 33 per cent of global GDP.[115] Geopolitical risks and tensions, including economic sanctions, civil unrest and conflicts also weigh down on the supply side. Some observers forecast that the price of crude oil will reach extreme levels if current geopolitical risks escalate and if strategic transit points for oil trade are closed. According to Drewry Supply Chain Advisors, Europe is reliant on Suez transits for about 15 per cent of its crude, and the bunker adjustment factor can be expected to increase by 7 to 9 per cent annually over the next three years on trade between South China and Northern Europe.[116]

Another major development with a bearing on the bunker market relates to the requirement under the IMO International Convention for the Prevention of Pollution from Ships (MARPOL) annex VI, governing air pollution and Emission Control Areas (ECAs) in the European Union and North America, for ships to use low-sulphur fuel (see chapter 5). Ships are required between now and 2020 to burn a more expensive but less polluting fuel, namely distillate grade fuel. The price differential with residual fuel is currently estimated at 50 per cent. While ships are allowed to use technology such as cleaning systems for exhaust gas (scrubbers), the effective widespread use of such scrubbers remains uncertain. These developments raise concerns about their potential economic impact on shipping, especially at a time when fuel costs account for more than two thirds of operational ship expenditure. The price differential between low-sulphur fuel and residual bunker fuel is projected to increase further with growing demand not being matched by increased supply. Other concerns relate to the potential for inducing an undesirable modal shift. Recent studies supported by the European Community Shipowners' Associations (ECSA) have suggested that applying the 0.1 per cent limit on sulphur fuel could result in a modal shift from water to surface transport which could be detrimental for local shipping and the environment. This concern is shared with respect to trade in the Great Lakes of Canada and the United States.

To sum up, rising energy prices and fuel costs remain a great challenge for the shipping industry in view, in particular, of rising demand, supply pressures and increasing environmental regulation. Cost control and fuel consumption management is essential and may involve a range of strategies. These may include speed management through slow steaming, selection of the most economical routing options and technology-based solutions. These strategies will impact on the design of vessels and propulsion systems, as well as on other technology-related strategies and operational measures. While these may apply differently, depending on the vessel and type of operations, overall a combination of technology-based and operational measures have a significant potential to help address rising fuel and operational costs. As shipping has over recent years intensified efforts to optimize fuel consumption, in view in particular of the more stringent environmental regulatory framework and given the concerns over climate change, new options and solutions are being increasingly developed and tested.

The trends discussed above are all interconnected and entail both challenges and opportunities for the shipping industry. By altering costs, prices and comparative advantages, these developments and related impacts on shipping and seaborne trade can greatly determine countries' trade performance and competitiveness. Improved understanding of these issues and their impacts, both individually and in combination, is required, with active involvement by all stakeholders, including policy makers, investors, transport planners, operators and managers.

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