ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

MONOGRAPH SERIES ON MANAGING GLOBALIZATION

REGIONAL SHIPPING AND PORT DEVELOPMENT STRATEGIES

(Container Traffic Forecast)

UNITED NATIONS

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

MONOGRAPH SERIES ON MANAGING GLOBALIZATION

REGIONAL SHIPPING AND PORT DEVELOPMENT STRATEGIES

(Container Traffic Forecast)

UNITED NATIONS
New York, 2005

ST/ESCAP/2398

This study was prepared under the Memorandum of Understanding between UNESCAP and the Korea Maritime Institute, signed in 1998, in collaboration with the Asia Pacific Economic Cooperation (APEC).

CONTENTS

Page

EXECUTIVE SUMMARY V

1. INTRODUCTION 1

1.1 OBJECTIVE AND SCOPE 1
1.2 THE MPPM SUITE 1
1.3 REPORT STRUCTURE AND CONTENTS 2

2. CHANGES IN INTERNATIONAL CONTAINER SHIPPING AND PORT ENVIRONMENT 3

2.1 CHANGES IN INTERNATIONAL CONTAINER TRADE 3
2.1.1 Continuing Growth of World Merchandise Trade Volume 3
2.1.2 Continuing Container Growth 4
2.1.3 Geographical Diversification of Container Trade Growth 6
2.2 TREND IN CONTAINER SHIPPING MARKET 7
2.2.1 Increased Competition 7
2.2.2 Ship Sizes Keep Growing 8
2.2.3 Financial Performance 11
2.3 SHIPPING LINE RESPONSE 13
2.3.1 Increasing Concentration 13
2.3.2 Structural Change in Shipping Service 16
2.3.3 Changing Clients Demands 17
2.4 IMPLICATIONS FOR PORTS 19
2.4.1 Increased Capital Commitment 19
2.4.2 Administrative Reform 20
2.4.3 Private Sector Participation 21
2.4.4 Global Terminal Operators 21
2.4.5 Environmental Pressures 23
2.4.6 Security Initiatives 24

3. CONTAINER TRADE GROWTH 26

3.1 ECONOMIC ASSUMPTIONS 26
3.2 GLOBAL CONTAINER FORECASTS 28
3.3 GEOGRAPHICAL DISTRIBUTION OF CONTAINER VOLUMES 29

4. TRADE STRUCTURE 32

4.1 CHANGING NATURE OF GLOBAL CONTAINER TRADE 32
4.2 ASIA - NORTH AMERICA 33
4.3 ASIA - EUROPE 34
4.4 INTRA-ASIA 35
4.5 MINOR ROUTES 38

5. CONTAINER PORT VOLUMES 39

5.1 FROM CONTAINER FLOWS TO PORT VOLUMES 39
5.2 EMPTY CONTAINERS 39
5.3 CONTAINER PORT VOLUMES: WORLD AND ESCAP REGION 42
5.4 PATTERNS OF TRANS-SHIPMENT 43
5.4.1 New Global Trans-shipment Centres 43
5.4.2 Modelling Restriction and Biases 45
5.4.3 Trans-shipment Volumes 45

6. CONTAINER BERTH REQUIREMENTS 48

REFERENCES 51

TABLES

Page

TABLE 2-1: GROWTH OF WORLD MERCHANDISE EXPORTS BY SELECTED REGION 3
TABLE 2-2: SPECIFICATION OF VERY LARGE CONTAINER SHIPS 9
TABLE 2-3: AVERAGE CONTAINERSHIP CHARTER RATE INDEX 12
TABLE 2-4: CHANGES AT THE TOP 20 LINES (1991-2004) 15
TABLE 3-1: ESTIMATED AND FORECAST GROWTH RATES FOR CONTAINER TRADE (1980–2015) 29
TABLE 6-1: PORT CLASSIFICATION AND INDICATIVE THROUGHPUT PER BERTH 49

FIGURES

Page

FIGURE 2-1: RELATIONSHIP BETWEEN WORLD TRADE GROWTH AND WORLD ECONOMIC GROWTH OVER THE POST-WAR PERIOD 4
FIGURE 2-2: GROWTH OF WORLD MARITIME TRADE (1980-2004) 5
FIGURE 2-3: WORLD CONTAINER TRADE GROWTH (1980-2004) 6
FIGURE 2-4: INCREASE IN CONTAINERSHIP SIZE (1980–2015) 9
FIGURE 2-5: SHARE OF TOP 20 LINERS IN TOTAL GLOBAL CAPACITY (1988-2004) 14
FIGURE 2-6: CALL PATTERNS OF MAJOR USA-ASIA SERVICES 17
FIGURE 2-7: ADMINISTRATIVE REFORM OF PORTS 20
FIGURE 2-8: GLOBAL TERMINAL OPERATORS 22
FIGURE 2-9: SHIPPING LINE TERMINAL OPERATORS 23
FIGURE 2-10 NEW SECURITY INITIATIVES 24
FIGURE 3-1: ECONOMIC GROWTH ESTIMATES UNDERLYING CONTAINER FORECASTS 27
FIGURE 3-2: FORECAST GDP GROWTH BY ECONOMIC GROUP 27
FIGURE 3-3: PAST AND FORECAST GLOBAL CONTAINER VOLUMES (1980–2015) 28
FIGURE 3-4: DISTRIBUTION OF CONTAINER VOLUMES – 2002 30
FIGURE 3-5: DISTRIBUTION OF CONTAINER VOLUMES – 2015 31
FIGURE 4-1: CONTAINER TRADE BY TRADE GROUP (2002 AND 2015) 32

FIGURE 4-2: EAST-WEST TRADE LANE GROWTH (2002 - 2015) 33
FIGURE 4-3: TRADE IMBALANCE ON EAST-WEST ROUTES (2015) 34
FIGURE 4-4: INTRAREGIONAL TRADE GROWTH (2002 - 2015) 37
FIGURE 4-5: INTRA-ASIAN TRADE GROWTH (2002 - 2015) 38
FIGURE 5-1: ESTIMATION OF EMPTY CONTAINER MOVEMENTS: MPPM MODELS 40
FIGURE 5-2: SHARE OF EMPTY CONTAINER MOVEMENTS (1985–2004) 41
FIGURE 5-3: ASIAN CONTAINER PORT THROUGHPUT BY SUBREGION (2002–2015) ... 43
FIGURE 5-4: TRANS-SHIPMENT PORTS INCLUDED IN MODEL 44
FIGURE 5-5: TRANS-SHIPMENT VOLUMES BY SUBREGION (2002 – 2015) 46
FIGURE 5-6: TRANS-SHIPMENT SHARES BY TRADE ROUTE (2015) 47
FIGURE 6-1: SUBREGIONAL SHARES OF NEW CONTAINER BERTH REQUIREMENTS (2002–2015) 49
FIGURE 6-2: ESTIMATED COST OF ADDITIONAL BERTH PROVISION BY SUBREGION (2002–2015) 50

EXECUTIVE SUMMARY

STUDY OBJECTIVE

This study is based on the application of the Maritime Policy Planning Models (MPPM) developed and maintained by the Transport and Tourism Division of ESCAP. Its objective is to provide a planning context for informed decision making by governments, shipping lines and port authorities in the ESCAP region. It does this by providing detailed, quantified and internally consistent forecasts of the maritime container trade and port throughputs in the ESCAP region through to the year 2015.

ECONOMIC ASSUMPTIONS

Although the world economy has displayed considerable resilience in the aftermath of the 1997 Asian currency crisis, growth rates during the coming decade are not expected to match the recent very high rates. The underlying assumption is that the average growth rate in the short term is similar to that of the recent past, and in the medium term is approximates the long-term cumulative average growth rate for the world economy over the last 30 years. It may be interpreted as hypothesizing that growth will continue along a long-term path similar to that of the past, and that, although there may be good years and bad years within the forecast period, there will not be a major, prolonged economic slowdown on the scale of that of the early 1990s.

Developing countries in Asia will continue to keep their strong economic growth pattern. It is expected that China will keep their strong growth trend until the next decade.

CONTAINER TRADE

The compound annual growth rate for global container trade volumes from 2002 to 2015 is estimated to be 6.6 per cent, compared to 8.5 per cent per annum during 1980-2002. The average growth rate through to 2010 has been estimated at 7.5 per cent per annum, while for the following five years, the growth rate is expected to decline to 5.0 per cent.

Asia's share of containerized exports is expected to rise from 55 per cent of the world total in 2002 to 64 per cent in 2015; the share of containerized imports is expected to rise from 46 per cent to 53 per cent.

Exports from North Asia are expected to grow more slowly than exports for the world as a whole, due largely to subdued growth in containerized exports from Japan. North

Asia's share of imports is also expected to fall over the forecast period, but to a less marked extent.

Container traffic to and from other parts of Asia is expected to grow more rapidly than the world average. Expansion is expected to be particularly rapid in China, continuing the trend of the last five years, and solid growth is expected in South Asia. South-East Asia is also expected to increase its share of world container traffic over the forecast period.

The intra-Asian trade will continue to outperform global container growth by some percentage points, recording an average of 8.3 per cent per annum over the forecast period.

Intra-Asian trade enjoyed spectacular growth in the decade prior to the 1997 currency crisis, with growth average well in excess of 10 per cent per annum for a decade. The crisis brought a sharp reversal of this pattern, with an absolute decline in cargo volumes in the following year. Growth in the trade has now resumed, and the prospects for the next decade appear solid.

It is expected that the trans-Pacific trade will show the strongest growth of 6.5 per cent annually among the three major East-West trades (namely, Asia-North America, Asia-Europe, and North America-Europe) during the forecast period. The prospects for the growth of Asia-Europe trade seem somewhat lower, growing at an average rate of 5.6 per cent per annum until 2015.

Since the Asian crisis the trans-Pacific and Asia-Europe trade growths have been very unbalanced, with strong growth in the Asian export trade coinciding with a slump in the Asian import volumes. As the imbalance of container flows is expected to continue, repositioning of empty containers will remains a major concern for carriers, in particular those operating on the trans-Pacific trade route.

CONTAINER PORT THROUGHPUTS

The total volumes of international container handling in the ports of ESCAP countries will increase from 133.7 million TEU in 2002 to 352.3 million TEU in 2015 at an annual average growth rate of 7.7 per cent. It appears likely on this basis that Asian ports share of the world container volumes will continue to grow to 61 per cent in 2015 from 55 per cent in 2002.

The most obvious feature is the increase in China’s share of total port throughput including Hong Kong, China and Taiwan Province of China, accounting for 48 per cent of total container throughput of the ESCAP region in 2015.

The study estimates that the total volume of containers trans-shipped within the ESCAP region will increase from an estimated 42.2 million TEU in 2002 to 109.6 million TEU in 2015. The share of trans-shipment in total port volume is expected to

remain at around 31 to 32 per cent until 2015. In the Asia-Europe route, ports of Singapore, Hong Kong and Tanjung Pelepas are expected to continue to dominate the trans-shipment business. In the trans-Pacific route, ports of Hong Kong and Busan will handle around 60 per cent of the total trans-shipment volume. In intra-Asian trade, Singapore will dominate the trans-shipment. The study estimates show that ports of Singapore and Hong Kong will remain as the main trans-shipment ports of the region.

In order to handle the anticipated port container traffic in 2015, around 570 new container berths will be required in the region. The largest number is accounted for by China including Hong Kong, China and Taiwan Province of China, which will require 270 new berths by 2015. South-East Asia's requirements are around 150 berths, while North Asia (excluding China) and South Asia will require around 65 berths each.

The estimated $36 billion investment requirement includes only the cost of developing the terminals. Substantial additional investment will also be required to secure adequate access to the terminals by road, rail and inland waterways, which will be essential for the effective distribution of containers to expanded port hinterlands. The additional costs of dredging, the provision of breakwaters and the establishment of land transport links and intermodal interchanges could easily double this total.

1. INTRODUCTION

1.1 Objective and Scope

The objective of this study is to provide a planning context for informed decision making by governments, shipping lines and port authorities in the ESCAP region. It does this by providing detailed, quantified and internally consistent forecasts of the maritime container transport serving the countries in the ESCAP region through to the year 2015.

These forecasts cover three broad areas: the container trade volume, the direction of container flows, and the port facilities required to service the trade.

1.2 The MPPM Suite

The study is based on the application of the Maritime Policy Planning Model (MPPM) developed and maintained by the Transport and Tourism Division of ESCAP.

The MPPM suite was consciously developed with an open architecture that encourages user intervention at all stages of the modelling process. In developing the models, ESCAP adopted the philosophy that the international trade and shipping system was far too complex institutionally and operationally to be reduced to a set of deterministic mathematical relationships. The fundamental strategy is to allow the modeller to input as much information as he or she believes can be reliably obtained from exogenous sources, and to present these to the models in the form of a hypothesis. Using these conditions as constraints, the mathematical relationships embodied in the models are used to fill in the gaps, to ensure internal consistency and to provide feedback on the credibility of the modeller's initial hypothesis and suggest directions in which it should be revised.

This approach to modelling inevitably means that producing forecasts is time-consuming, and demands a high level of both modelling expertise and industry knowledge on the part of the modeller. But it also allows the introduction of a host of considerations that defy mathematical formulation, and hence can produce forecasts that are genuinely realizable future states rather than Utopian abstractions.

Two modules of the MPPM suite were applied in this study:

- the Trade module, used to produce forecasts of containerized cargo on a region to region basis, and to partition these trade flows into port-to-port cargo movements; and

- the Liner Shipping Network module, used to heuristically design a shipping network capable of accommodating those cargo flows, to assign

the cargo to the network, and to estimate the total costs of different shipping system configurations.

The full suite of models has been validated in previous studies:

- Prospects for container shipping and port development for ASAEN Subregion (1992), South Asia Subregion (1993), East Asia Subregion (1994) and intraregional study (1997); and
- Regional Shipping and Port Development Strategies under a Changing Maritime Environment (2001).

1.3 Report Structure and Contents

The full details of the forecasts produced by the modelling process would fill many large volumes if produced in printed form. This report does not attempt a comprehensive presentation of the study forecasts. Rather, it attempts to present the salient features of the forecast in a readily interpretable form.

This Chapter 1 provides an introduction to the report. Chapter 2 discusses some of the major changes that have occurred in the container shipping and port environment over the last decades. Chapter 3 is concerned with the economic growth context within which the container forecasts are set, and the magnitude of the increase in container volumes that this economic growth will bring. Chapter 4 is devoted to discussion of the model's forecasts on structural changes in trade patterns.

Chapter 5 examines the implications of changes in trade for the volume of containers that will need to be handled in the ports of the region. The report concludes with the estimates of the port facilities that will be required to meet the projected container handling demand and the investment implications of these requirements in Chapter 6.

2. CHANGES IN INTERNATIONAL CONTAINER SHIPPING AND PORT ENVIRONMENT

2.1 Changes in International Container Trade

2.1.1 Continuing Growth of World Merchandise Trade Volume

The changes that have occurred within the liner shipping and ports over the last decade can be reviewed in the context of the larger forces that have brought significant changes in the structure of the world economy. The fundamental underlying factor has been an increased reliance on international trade as the primary engine of economic growth and development. This is a major ideological shift: many economies have in the past pursued development strategies that have emphasized self-sufficiency and the protection of domestic markets. However, in the recent past there has been a growing consensus that the route to prosperity lies in integration within the global economy.

As a result of this globalization trend, world trade volume has continued to grow with the gradual removal of trade barriers under the World Trade Organization (WTO) and through regional trade agreements (RTA). In 2004, world trade volume in real terms increased 8.9 per cent over the previous year, the best performance since 2000 (see Table 2-1).

Table 2-1: Growth of world merchandise exports by selected region

(Annual percentage change)

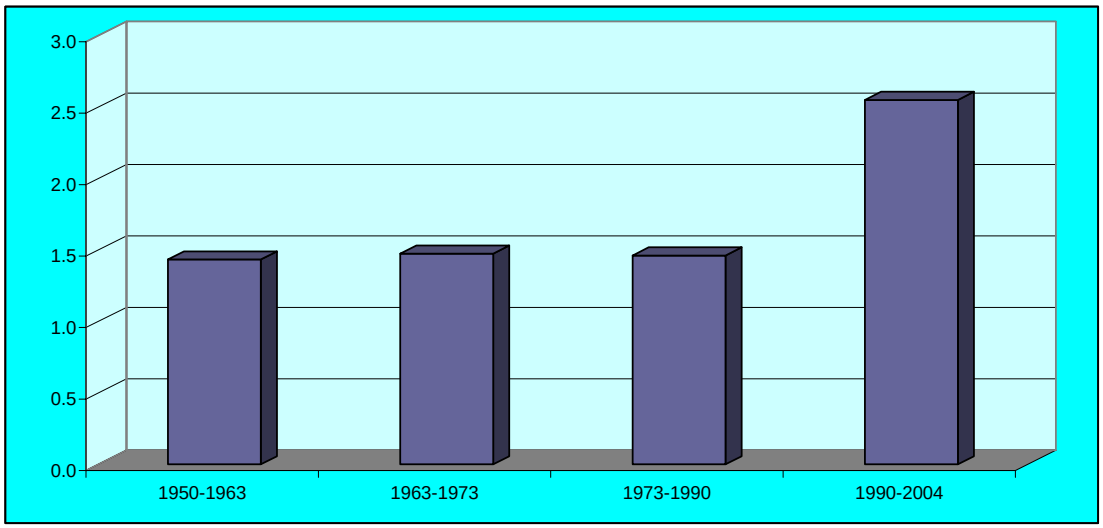
	1998	1999	2000	2001	2002	2003	2004
World	4.7	4.7	10.4	-0.6	3.4	4.8	8.9
North America	4.6	6.9	9.6	-5.0	-2.7	1.1	7.4
South and Central America	9.0	-0.4	4.4	5.0	1.9	6.0	13.1
Europe	5.5	3.3	9.3	2.4	1.9	1.8	6.4
Commonwealth of Independent States	0.9	-8.8	11.8	4.5	8.7	12.8	13.0
Asia	3.8	7.3	14.2	-3.4	11.2	11.4	14.1

Source: WTO
Note: Excluding re-export of Hong Kong, China

The impact of these changes can be seen clearly in Figure 2-1. While the rate of world economic growth fluctuated greatly during the post-war period, the relationship between economic growth and growth in the value of international trade stayed almost

constant until 1980s: the value of trade grew approximately 1.5 times as fast as the world economy. However, the 1990s and early 2000s have seen a major change in this ratio: the value of trade is now growing at around 2.5 times the rate of growth of the world economy. As this pattern continues, trade becomes an ever more crucial component of global economic activity.

Figure 2-1: Relationship between world trade growth and world economic growth over the post-war period



2.1.2 Continuing Container Growth

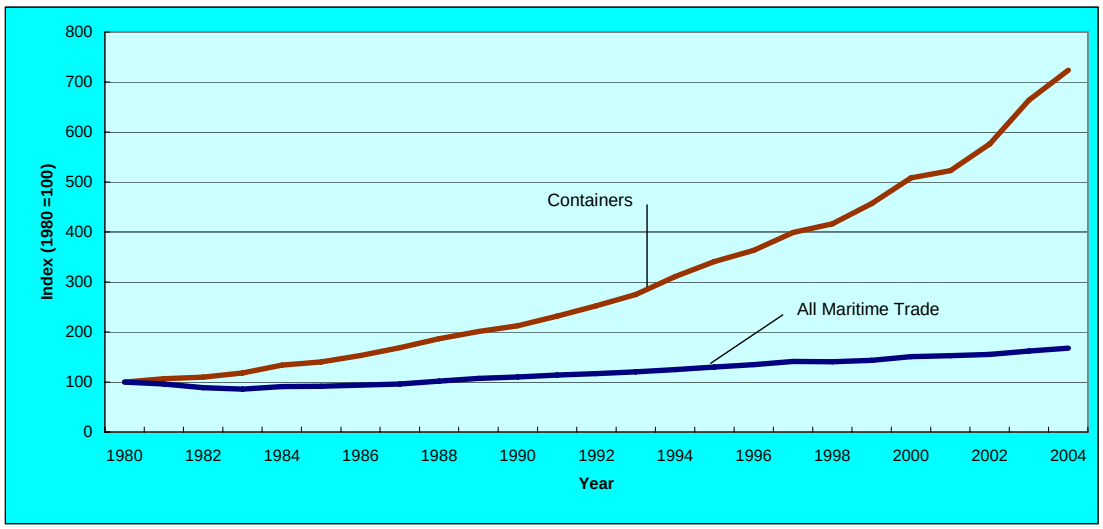
During the last decades, international container trade continued to increase at a rate far exceeding that of maritime trade as a whole. Figure 2-2 shows worldwide growth in maritime trade volumes over the period 1980 through to 2004.

Total international maritime trade volumes grew at an average of 2.4 per cent per annum over the period, with the result that, by 2004, total seaborne trade had increased by approximately 70 per cent over 1980 volumes. Containerized cargoes, by contrast, grew at an annual average growth rate of 8.6 per cent per annum over the same period, leading to an increase more than 600 per cent in total maritime container movement. Due to the increasing importance of trans-shipment movements (the transfer of cargo from one ship to another) the number of containers handled in the world's ports grew at any even faster rate around 9.6 per cent.

During the 1980s, a large portion of growth, which recorded an annual average rate of 7.8 per cent, could be attributed by an increase in the container penetration rate. As more and more shippers became aware of the benefits of shipping in containers, and more and more ports developed the infrastructure and acquired the handling

equipment needed to cater for container vessels, goods that had previously been shipped as loose cargoes gradually converted to containers.

Figure 2-2: Growth of world maritime trade (1980-2004)



Source: Drewry Shipping Consultants; Fearnleys.

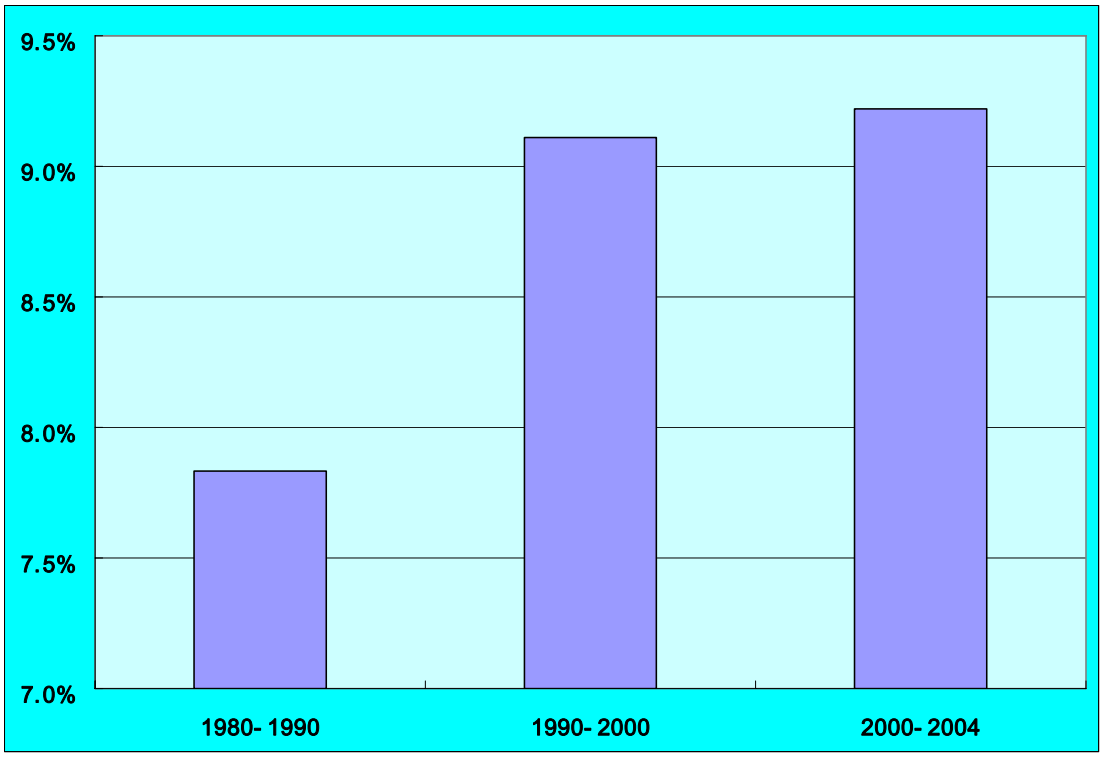
During the 1990s and in early 2000s, the growth of world container trade was accelerated to an average growth rate of 9.1 per cent per year. This can be attributed to several reasons:

- As discussed in the previous section, liberalization of international trade and the globalization that has accompanied it, have accelerated the growth of international trade. At the same time, the change in the composition of international trade, with a shift away from basic commodities towards processed primary products and manufactured goods, also favoured growth in container volumes.

- Containerization, combined with developments in information, food and other technologies, has expanded the range of trading possibilities, and again provided a stimulus to volumes. The most obvious instances are in the carriage of highly perishable goods.

- China has emerged as a major new container market. At the beginning of the 1990s, containerization was in its infancy in China. Rapid progress has been made, and volumes to and from China have grown enormously over the decade.

Figure 2-3: World container trade growth (1980-2004)



2.1.3 Geographical Diversification of Container Trade Growth

Another shaping factor of the ESCAP ports and shipping scene has been the series of transformations that have occurred in the geographical distribution of container trade. In the 1970's, Asia's container trades were Japan's container trades, and the trans-Pacific trade was in effect a bilateral trade between The United States of America and Japan.

By 1985, this had changed dramatically. The diversification of Asian container trade was already entering its mature phase. Container volumes from Hong Kong, China; Taiwan Province of China and the Republic of Korea comprised over 40 per cent of the Asia total, while Japan's share had shrunk to 31 per cent. Container volumes from the ASEAN countries were still modest, but Singapore had begun to emerge a major global hub: with total throughput of 1.7 million TEU, it was the sixth largest container port in the world (two places behind New York/New Jersey).

By 1995, another profound change had occurred. During the decade 1985-1995, container volumes through the ports of ASEAN countries increased six-fold, so that by the end of the decade they collectively handled almost one-third of the Asian total. The other three tiger economies continued to grow strongly, maintaining their share at over 40 per cent. Japan ports now handled less than one-fifth of all Asian container.

And something else was happening. In 1989 the volume of containers handled by the mainland ports of China was less than 1 million TEU. By 1995, this had climbed to over 4 million. In 2002, it was over 12 million, and was increasing by around 25 per cent a year. The Chinese container market (excluding Hong Kong, China and Taiwan Province of China) has now overtaken Japan and the United States as the world's largest container market.

What will happen next is of course pure speculation. But many eyes are on India, where container volumes remain very low compared to both population and GDP.

2.2 Trend in Container Shipping Market

2.2.1 Increased Competition

International liner trades have been faced with new regulatory developments since the introduction of the Ocean Shipping Reform Act (OSRA) of 1998 in the UNITED STATES, a revision of the 1984 Shipping Act. As OSRA became law, it is predicted that new business strategies will be needed for both carriers and shippers. OSRA's most important change allows shippers and carriers to make confidential rate agreements. This means that vessel operators may discriminate with varying rate structures among similarly situated shippers.

The new law also allows individual carriers to sign contracts with individual shippers, by giving both carriers and shippers new privileges to conduct one-to-one negotiations and consequently enter into long-term relationships (Harrington 1999). This freedom to contract gives them much greater scope to frame customised long-term contracts that exploit carriers' expertise and serve shippers' specific needs (Butz 1998). On the other hand, the new law has severely weakened the conference system because the act removes restriction on vessel operators entering into service contracts with shippers. A conference cannot prevent member carriers from contracting with shippers (Calderwood 1999).

European policy has also been towards limiting the scope of conference exemptions with the intention of enhancing the role of competitive market forces. The last decade has seen two important developments in the European Commission's approach to regulation of liner shipping.

The first has been the ruling that consortia are not shipping conferences, and therefore do not enjoy automatic exemption under Regulation 4056/86 from competition policy as provided in Article 85 and 86 of the Treaty of Rome 1957. As a consequence, the EC has introduced specific regulations exempting certain categories of consortia (EC

Council Regulation 479/92 and Commission Regulation 870/95).[1] Recently, the European Commission's White Paper on the review of Regulation 4056/86, published on 13 October 2004, proposed to repeal the present block exemption for liner shipping conferences (European Liner Affairs Association)

The second is clarification of the European Commission stance with regard to the setting of intermodal rates. Whereas one of the major innovations of the US Shipping Act 1984 (retained in OSRA) was that it clarified the right of conferences to agree on inclusive rates for door-to-door movements, the EC has taken the view that conference agreements cannot include joint rate-setting for inland haulage.

These developments in the United States and Europe have clearly shaped the environment within which shippers and carriers now appear to be located in an unrestricted competitive market.

2.2.2 Ship Sizes Keep Growing

The history of containerisation has witnessed a progressive increase in maximum vessel size. By the mid-1970's, the 1000 and 1500 TEU ships of the first and second generation were being replaced by ships of 2000+ TEU, signaling a trend of gradual increase that led eventually to the 4000+ TEU Panamax vessels that most major lines were ordering in the early 1990's.

Figure 2-4 shows, however, an uncharacteristically rapid increase in vessel size during the mid-1990s, as the post-Panamax concept, pioneered by APL as early as 1989, really took hold. By 1996, vessels of around 6,000 TEU had appeared on the scene. Subsequently, we have seen a resolution of the 'size creep' that characterized earliest, with vessel of over 7,000 TEU now in service.

According to BRS-Alphaliner, the orderbook is characterized by the emergence of the VLCS (Very Large Container Ships – ships over 7,500 TEU; see Table 2-2). As many

[1] Commission Regulation 870/95 included provisions for the monitoring of consortia based on market share. The market share of a consortium consisting solely of conference members is limited to 30 per cent, while a consortium of non-conference members is limited to a 35 per cent market share. Consortia that exceed these limits must notify the Commission. In the case of a consortium with 30-50 per cent market share, the Commission must oppose the exemption within six months failing which the consortium is deemed to be included under the block exemption. A consortium holding more than 50 per cent market share may not benefit from the block exemption. However, if the consortium is notified to the Commission and fulfils the conditions of Article 85(3), it may be granted an individual exemption.

as 15 large operators have now ordered such ships. There are 156 VLCS on order, in addition to the 34 already in service as of 1st July 2004.[2]

Figure 2-4: Increase in containership size (1980–2015)

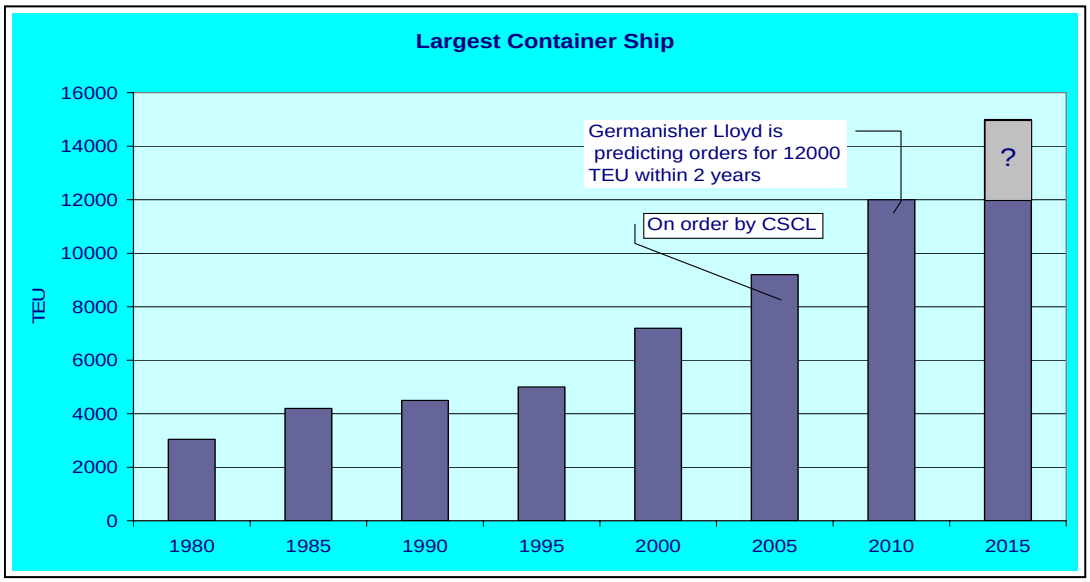


Table 2-2: Specification of Very Large Container Ships

Ship	Malacca-max (project)	Suez-max (project)	Sovereign Maersk (in operation)
TEU capacity	18,154	11,989	8,400
Length (m / feet)	400 / 1,312	400 / 1,312	348 / 1,141
Breadth (m / feet)	60 / 197	50 / 164	43 / 140
Draft (m / feet)	21 / 69	17 / 56	14 / 46
Depth (m/ feet)	35 / 115	30 / 98	24 / 79
Displacement (tones)	313,371	212,194	142,500
Deadweight (tones)	243,600	157,935	105,000
Vessel speed (knot)	25	25	25

Source: American Shipper

[2] According to BRS-Alphaliner, as of 1st January 2005, the cellular fleet reached 3,362 ships for 7.29 million TEU, in progression of 9.8 per cent on 12 months, a relatively modest increase as the average annual progression during the past 10 years has reached 10.7 per cent. The cellular fleet accounts for 89 per cent of the total fleet deployed on liner trades in TEU terms. The containership fleet counts 49 units of more than 7,500 TEU and there are 165 more of these giants on order, some of them reaching the 10,000 TEU mark. By the end of 2007, there will be enough of these giants to run 15 Asia-Europe and 15 Asia-US loops.

Recently CSCL ordered eight vessels of 9,200 TEU and COSCO ordered four vessels of 10,000 TEU while Hyundai Merchant is planning to order eight vessels of 9,000 TEU. These are just examples showing trends for larger container ships. The vessel of 10,000 TEU is estimated to have maximum width of 45.6m with 18 rows of container stacks and 352 m of length. It has become increasingly clear that there are no insurmountable technical barriers: concept design already exist for ships up to 18,000 TEU. The limits to growth, if there are any, will be market-determined.

There are divided opinions on where we will go from here. Some analysts argue that the search for economies of scale is inexorable, and will drive vessel sizes up through 12,000 TEU and beyond within the next decade. Shipping liners have pursued more fuel economy and economy of scales in vessel size in order to reduce cost, to increase market share and to take leading positions in the sector. Larger ships typically have a lower cost per TEU-mile than smaller units with the same load factor.

- Samsung demonstrated that a vessel of 12,000 TEU on the Europe – Far East route would generate a 11 per cent cost saving per container slot compared to a 8,000 TEU vessel and even 23 per cent compared to a 4,000 TEU unit.

- Drewry Shipping Consultants Ltd. (Drewry) also made similar calculations to point to potential cost differences of around 50 per cent between a Panamax unit of 4,000 TEU and a mega post-Panamax unit of 10,000 TEU (Drewry 2001; Notteboom 2004).

- Asaf Ashar of the US National Waterways Research Institute predicted that the long-term future of liner shipping would be triggered by the expansion of the Panama Canal's locks which would result in the emergence of equatorial-round-the world (ERTW) services and a grid of supporting feeder services.

Even though there have been strong indications that vessel sizes will become larger and larger, there are also skeptical views about the introduction of mega size containerships (Notteboom 2004):

- Shipping lines have made a huge investment in establishing competitive networks to satisfy the global requirements of the shippers, such as a weekly departure at each port of call. Upgrading the vessel size on a specific route takes several years and demands huge investments.

- The economic and operational considerations will act as the ultimate barrier on super large vessel sizes and designs of the future. When the container volume in a specific route and shipper's demand on frequency are considered, there are strong indications that the range of 5,500 to 6,500 TEU will be revealed as the most competitive vessel size for the time being, as these ships offer more flexibility in terms of the number of

potential ports of call and, consequently, direct access to specific regional markets.

- The ultra-large container ships can be deployed efficiently on the major trade lanes, provided they are full. However, many carriers have not been able to realize a continuous high utilization of available slot capacity on their bigger vessels. Fierce price competition leaves the entire liner shipping industry worse off in terms of profitability. Adding postpanamax capacity can give a short term competitive edge to the early mover, putting pressure on the followers in the market to upgrade their container fleet and to avert a serious unit cost disadvantage. A boomerang effect eventually also hurts the carrier who started the price war.

Drewry Shipping Consultants Ltd. also point out some limits on the introduction of larger and larger ships:

- Cost of transshipment and feeder services may outweigh mainline vessel savings.
- Inland transport costs may be higher.
- Shippers prefer greater frequency; the price is already low.
- Port constraints – water depth, equipment, port time – seriously affect the larger vessels.

The trend towards larger ships makes it clear that larger vessels will be dominant in east-west routes. Even though there are some debates about the container ship size increase, it will be normal on the Asia Pacific route to see more vessels of bigger than 8,000 TEU in service. As a consequence major port operators have been trying to provide port facilities in order to accommodate mega size vessels, aiming at becoming hub ports even though for the cost of such development is very high. Others must match these efforts just to stay in the game.

2.2.3 Financial Performance

Over the last decade container carriers have significantly underperformed financially compared to other industries. The weaker performance can be related to the combination of the capital-intensive operation and the high risks associated with the revenues. Shipping remains a very capital-intensive industry where some assets are owned and others are leased and there exists a wide variability in cost bases. These explain the short-term instability in this industry (Brooks 2000).

In liner shipping, in spite of efforts by shipping conferences[3] to achieve rate stability, a significant decline in rates has been experienced since the mid 1990s on most major trade routes. This has been the result of:

- the introduction of large ships;
- growing competition from non-conference carriers;
- an increase in carrier alliances on some routes;
- imbalance of container volume in a trade route which cause liners to strive to find customers in lower price to fill the space in backhaul journey;
- global economic decline and overcapacity;
- difficulties of securing cargo continuously.

For example, imbalance in trade, together with other factors, caused a significant decline in the freight rate of – 42.2 per cent between 1995 and 2000 in westbound freight on the trans-Pacific route (the United States to Asia). In recent years, however, liners have performed well financially due to world economic recovery in 2003 and 2004 after decline period of 2001-2002 (Table 2-3).

Table 2-3: Average Containership Charter Rate Index

(January 1997=1,000)

Year	1997	1998	1999	2000	2001	2002	2003	2004
Average Index	911.7	750.2	675.1	868.1	707.9	576.8	940.4	1506.6

Source: Howe Robinson Container Index

[3] There are roughly 150 conferences in operation worldwide as of 2001 (OECD 2002). Their market shares vary. The Far East Freight Conference, which operates on the European-Far East trade route, has a capacity share of about 60 per cent as of 2000, whereas the Transatlantic Conference Agreement has a capacity share of about 46 per cent as of 2000 (OECD).

2.3 Shipping Line Response

2.3.1 Increasing Concentration

The combination of these forces has created new and expanded challenges for liner shipping companies. Meanwhile, advances in global communications and logistics management have increased performance expectations of all transport enterprises. Part of the response has been with new forms of collaboration, some broader and more diffused than traditional conference arrangements, others narrower and deeper.

Cooperation between container shipping companies in many different forms of partnership such as slot purchase, slot exchange, vessel-sharing agreements or joint services has been an essential feature of the industry for a long time. These forms of carrier cooperation tended to be on a trade-specific basis. However, in recent years there has been a growing trend towards carrier alliances on a global basis. Carriers entered into partnerships that covered their operations worldwide – or at least on the main East-West routes – rather than on a single trade lane. This offered significant additional advantages in container logistics and the rationalization of port terminals, while allowing shipping lines to retain their distinctive marketing identities and ownership.

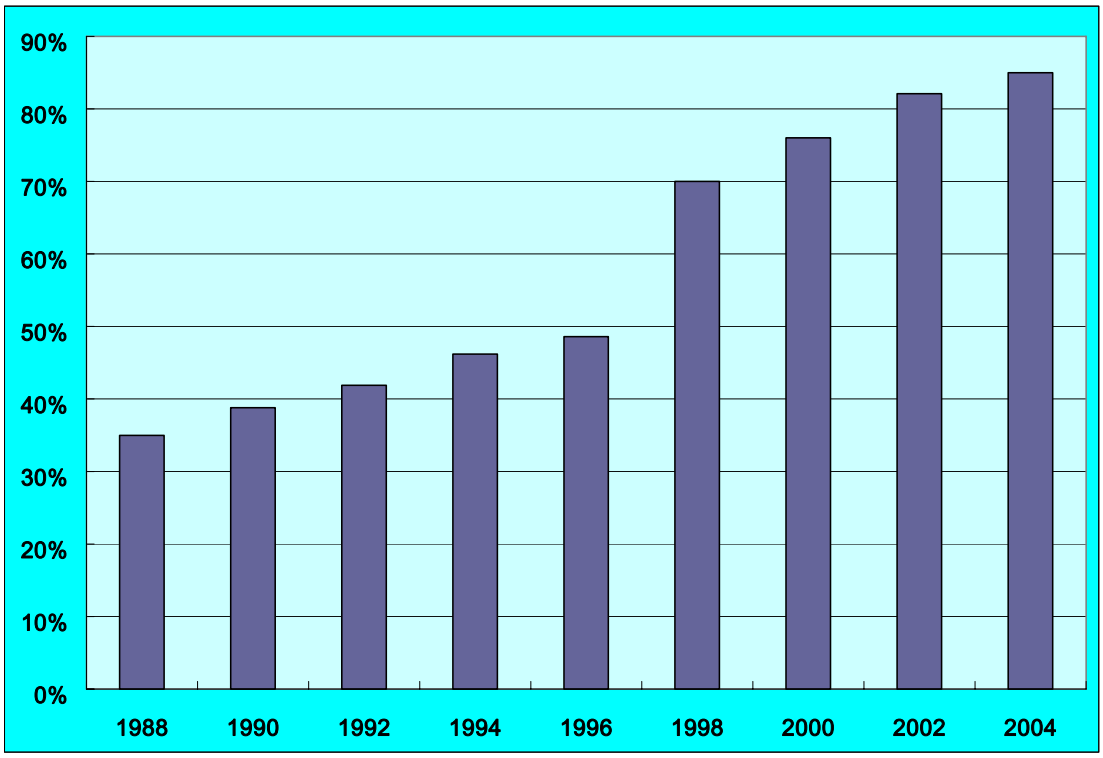
The latest development, however, has been a wave of mergers and acquisitions[4] that are clearly visible in statistics on the degree of concentration in the liner shipping industry. In 1988, the top twenty container lines controlled approximately 35 per cent of the total global TEU capacity.[5] This figure crept up, slowly but apparently inexorably, until by 1996 it had reached around 50 per cent of total global shipping capacity. Then, between 1996 and 1998 the share of the top twenty lines leapt to 70 per cent, as the merger wave began in earnest. Since then there has been a further

[4] Although the majority of the carriers acquired have been second- or third-tier operators, some significant carriers, including APL and DSR-Senator, were taken over by NOL and Hanjin respectively. P&O Containers and Nedlloyd Lines merged in 1997 to create P&O Nedlloyd Container Line, which later took over Blue Star Line and Tasman Express Line. Evergreen became the second largest carrier in the world, in terms of TEU slots under its control, through the takeover of Lloyd Triestino in 1998. In 1999, Maersk Line acquired the international shipping operations of Sea-Land to form a company controlling 9.2 per cent of the world container shipping fleet. After a dullness in merger and acquisition in early 2000's, a renewed interst was led by US$ 2.8 billion takeover of P&O Nedlloyd by AP Moller-Maersk in 2005. When ita full integration is completed, the enlarged Mearsk and its associate companies will have a fleet of around 1.8 million TEU (Drewry 2005)

[5] Includes cellular fleet only.

increase, so that more than 80 per cent of total global capacity is now controlled by the top twenty lines[6] (Figure 2-5).

Figure 2-5: Share of top 20 liners in total global capacity (1988-2004)



Source: Containerisation International

The composition of the top twenty carriers has also changed significantly over the decade. The character of the new entrants to the premier league is in itself interesting. China Shipping Container Lines is the fastest growing member of the top twenty. In many ways, it is typical of the lines that entered the top ranks during the late 1980's and early 1990's. For a start, Asian carriers dominated expansion of container fleet capacity over this period. Secondly, its growth has been organic: it has grown entirely by expanding its own business, not as a result of merger and acquisition activity. Finally, it is State-owned, and many earlier entrants were partly or wholly owned by the State, or enjoyed some some form of State sponsorship or protection.

[6] By any standard, the liner shipping industry is far more concentrated than it was a decade ago, and it is likely to become more so in the future. But it is important to retain a sense of perspective. By comparison with other capital intensive industries operating in a global market - with, for instance, oil production or the manufacturing of aluminium – the container shipping industry is still very fragmented. In these industries, the focus is usually on the market share of the top four operators, rather that the top twenty, and concerns about concentration typically emerge when this ratio exceeds 70 per cent. In the liner shipping industry, the share of the top four lines – Maersk-Sealand, Evergreen, P&O Nedlloyd and Mediterranean Shipping Corporation – stood at around 40 per cent in November 2000.

Table 2-4: Changes at the top 20 lines (1991-2004)

Rank	Carrier (1991 Rank)	2004	1991	2004/1991
1	AP Moller Group (2+4)	900,509	220000	4.09
2	MSC (22)	618,025	30,000	20.6
3	Evergreen (1)	437,618	131,000	8.34
4	P&O Nedlloyd (7+10)	426,996	143,000	2.99
5	CMA CGM (16)	373,391	66,000	5.66
6	APL (8+22)	295,321	100,000	2.95
7	Hanjin (11+21)	284,710	115,000	2.48
8	NYK (3)	265,192	107,000	2.48
9	COSCO (5)	253,007	97,000	2.61
10	CSCL (-)	263,079	0	n.a.
11	OOCL (14)	216,527	56,000	3.87
12	MOL (6)	213,195	83,000	2.57
13	Zim (12)	196,420	60,000	3.27
14	CP Ships	196,317	45,000	4.36
15	K Line	195,750	69,000	2.84
16	ASAV (25)	190,143	30,000	6.34
17	Hapag Lyoyd (13)	186,610	57,000	3.27
18	Yangming (15)	168,006	51,000	3.29
19	Hyundays (24)	139,243/	20,000	6.96
20	Hamburg-Sud (20)	131,713/	34,000	3.87
	Average	293,239/	75,700	4.62

Source: American Shipper

Two other recent entrants, however, depart from this pattern. MSC, it is true, has grown principally through organic growth, but it is Europe-based, and has neither been owned or supported by the State. CP Ships is a subsidiary of a Canadian company, but has its operating headquarters in London: its rapid growth owes a great deal to acquisition.

These developments are further indicators of the impact of the twinned developments of globalisation and economic liberalism. Location is less important than it was in determining comparative advantage in shipping (MSC after all is a Swiss company!). And both MSC and CP Ships have shown that the market is sufficiently open to make it possible to grow a major unsubsidised private shipping line rapidly and virtually from nothing over a very short period.

2.3.2 Structural Change in Shipping Service

During the last decades, the successive waves of Asian economic development have brought with them progressive changes in structure of container shipping networks in the inter-continental trades to and from Asia as well as intra-Asian trades.

In the early 1970s, Asian shipping networks concentrated largely on the Japan; Hong Kong, China; and Singapore in structuring the Europe/Far East and the trans-Pacific (both East and West Coasts of the United States, with East Coast services transiting the Panama Canal) mainline services. The Europe/Far East services terminated in Japan and the Far East/the US services hubbed over the ports of Hong Kong and Singapore. Since containerization of trades within Asia lagged behind the containerization of inter-continental trades, the volume of local traffic on these early services was therefore modest.

As economies of the Republic of Korea and Taiwan Province of China grew, an increasing number of lines began providing shipping services to these locations, initially in conjunction with services to Japan and later with additional dedicated services. Somewhat later, Kaohsiung and Busan were developed as regional hubs. Significant volumes of regional cargoes also began to emerge on short-sea routes linking these new centers to Japanese main hubs. Later, the spread of intermodal services in the United States led to a decline in service transiting the Panama in favour of landbridging from West coast ports to the Midwest and even to East Coast destinations.

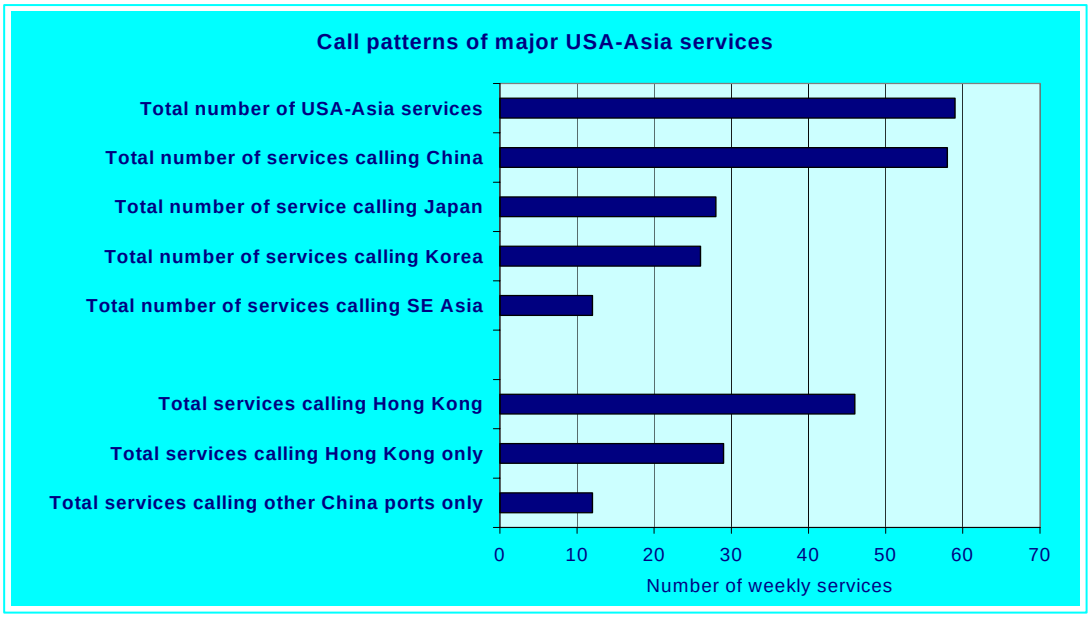
With rapid economic development in South-East Asia during 1980s, increasingly complex feeder services were introduced to link the regional ports to key hub ports of Hong Kong, Singapore and Kaohsiung. Shipping lines began to experiment with additional calls at South-East Asian ports including Port Klang and Bangkok. Local routes were also developed linking Japan and Far East initially to Singapore, then to other South-East Asian ports.

In the 1990s, with the rapid growth of Chinese container trades, Chinese ports were included into new feeder shipping networks, adding further complexity to the Asian shipping system. Intense networks were developed between Pearl River delta ports and Hong Kong port. Busan and Japanese ports increased feeder links with Shanghai and the central and the northern regions of China. Chinese cargoes bound for Japan, the Republic of Korea and Hong Kong, China mixed with feeder cargoes destined for trans-shipment at these locations. A number of shipping services between South-East Asian ports and Chinese ports were also developed.

With further growth in South-East Asia, a new strategy for serving the East Coast of the United States was introduced, with vessels proceeding from Asia via the Suez Canal. This route has proved to be attractive for cargoes from Taiwan Province of China and Hong Kong, China as well as from South-East Asia.

Continuing pace of the rapid growth in Chinese cargoes, improved handling facilities at the ports of mainland China and congestion in the port of Hong Kong, led major lines to experiment with direct calls at mainland ports, collecting cargoes previously transhipped over Hong Kong port or Japanese ports. This trend has now consolidated, with mainline services making direct calls at an increasing range of mainland ports.

Figure 2-6: Call patterns of major THE UNITED STATES-Asia services



2.3.3 Changing Clients Demands

At the same time as they have been experimenting with new ways of relating to their colleagues, shipping lines have been desperately searching for ways to improve client service and to differentiate themselves from them. Some the major changes have been adopted by most if not all major lines into to improve service quality and lower costs. Larger vessels have been brought into service in order to reduce unit cost. Predictability has been enhanced by the almost universal adoption of fixed-day weekly services. The introduction of multiple strings on major trade routes has enabled lines improve transit times between important port pairs. Heavy investment in information technology and the use of multimodal services have reduced documentation and expedited processing.

However, the poor market conditions that dominated most of the 1990s convinced major operators that concentrating purely on the provision of line haul services on the sea leg was an inadequate business strategy. Essentially, this approach trapped the line into supplying a pure commodity that was easily replicated by competitors

whenever markets appeared to be recovering, and lead to repeated entry and chronically low profitability.

The response was to seek ways to 'add value' through diversification and enhancement. Different lines have sought to do this in different ways. Many, led by the American lines, have sought to establish seamless intermodal services, extending their operations to include inland haulage and offering door-to-door transportation. Some, including P&O Nedlloyd, OOCL and NOL, have developed other elements of the logistics chain, expanding their warehousing, cold storage and related activities. With the expansion of the value chain, those shipping lines that have developed the logistics services are lifting the competition platform from low level price competition to the total logistics services value competition.

In particular, following the development of supply chain management (SCM), information and communication technologies (ICT) and e-business tools in the shippers' logistics systems, many shipping lines have extended their services from providing little differentiated port-to-port transportation services to more customized logistics service packages. This has fuelled the gradual replacement of isolated transportation transactions by long-term supply chain partnerships based on integration of land and sea transport, including port terminals and inland depots. (UNCTAD, 2004)

Most have taken advantage of more flexible regulatory regimes to move away from strict adherence to standard tariffs into price/service packages tailored for particular customers. Those lines with the capacity to do so have sought to negotiate global service arrangements with clients, protecting themselves by packaging a range of services that new entrants would find very difficult to emulate. Finally, many lines sought to improve the quality of the service that they offered to customers by increasingly sophisticated cargo care, improved information systems allowing continuous container tracking, and the introduction of a range of e-commerce initiatives.

Faced with more and more pressure from lowering costs and improving services to meet changing clients demand, shipping lines are adopting new strategies to expand their services to provide total logistics solutions. For example, COSCO formulated the strategy of the transformation from a global shipping carrier to a global logistics provider.[7]

- *The transformation of service content from one product to integrated product*. The core of logistics management is to extend its focus from one sector in logistics to the whole multi-function and conglomerate logistics chain, and to pursue maximum achievement in the whole logistics chain. Through the development of a global logistics service, COSCO is trying to adjust and optimize the sectors of the shipping industry chain and the value chain and further integrate related industries in the group.

[7] COSCO's internet web site

- *The transformation of service measure from stock management to information management*. Global logistics is an industry depending on modern technology. To develop a high-tech logistics service is an indispensable factor in adapting to the new requirements raised by rapidly developing IT and e-commerce.

- *The transformation of management behaviour from trading relationship to partner relationship*. To a logistics enterprise, the establishment of cooperative partnerships with the customers is an effective entry obstacle to other competitors, and a unique logistics management is the stepping-stone to establishing a partnership.

- *The transformation of organization pattern from independent operation unit to logistics chain*. Through internal integration, COSCO has established a professional logistics company —China Ocean Logistics Company. The company is focused on the logistics service chain and integrates logistics strategy making and execution, logistics supply chain management, logistics distribution, stock management, vessel agent, cargo transportation service, through transportation, airlift, etc., and further strengthens service capability to provide customers with a global logistics and value increment service.

2.4 Implications for Ports

2.4.1 Increased Capital Commitment

As part of their response to the new challenges, shipping lines have also made greater demands on port facilities, in terms of both capacity and performance. The most obvious and frequently cited impact of the increase in vessel size is the need for greater channel depth. This is certainly a real issue. However, the post-Panamax vessels have tended to be designed in such a way that most of the increased capacity is provided by increasing the beam rather than the length or draft of the vessels: the first post-Panamax vessels were actually shorter than the first Panamax vessels, and required less draft.

The emphasis of greater breadth has, however, had important implications for terminal investment. Ports and terminals that wished to be candidates for calls by such large vessels have needed to acquire cranes that are taller with a longer outreach – and of course more expensive. This has been accompanied by an increase in the size of container terminals as the demand for land backing has risen in line with increases in vessel size.

Larger vessels also bring with them a need for better handling performance and container management in order to ensure that the time spent in port does not become

excessive. This need is met in part by investment in increasingly sophisticated information technology system.

Finally, for most ports what comes in by sea must go out by land. Larger ships with faster discharge rates place increased stress on the land transport interface, and generate a need for faster and more efficient intermodal connections. These demands for enhanced port performance and increased investment in port facilities have in turn led to changes the port policy of many countries.

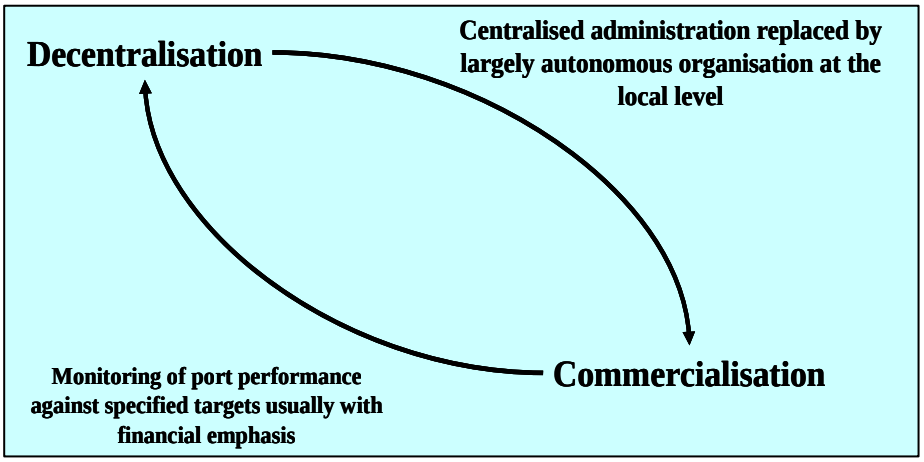
2.4.2 Administrative Reform

These demands for enhanced port performance and increased investment in port facilities have in turn led to changes the port policy of many countries.

There has been a widespread movement in both developed and developing countries to a new administrative model employing combination of decentralisation and commercialisation of ports. Centralised bureaucracies have in general proved to be too cumbersome and unresponsive to meet the challenges that have been set by the new paradigm. The response in many cases has been to devolve more decision-making to the local level. Few national ports authorities have survived, and those that have survived operate within a much narrower remit.

Accountability for decisions under a more decentralised model is achieved by monitoring of port performance against more clearly articulated expectations and standards. Usually, though not necessarily universally, these are modeled fairly closely on the commercial disciplines faced by private sector firms, and include requirements to achieve a certain rate of return on capital invested. Often this has to be achieved within a regime of regulated prices. This can make it difficult for ports to accumulate reserves, and makes future investment dependent on either loans or equity contributed by government – or, increasingly, from private equity investors.

Figure 2-7: Administrative Reform of Ports



2.4.3 Private Sector Participation

Increased private sector participation in the ports has been one of the most widespread, and in some areas controversial, areas of change.

The form which this increase has taken has varied greatly from port to port. The most extreme form was pioneered in the United Kingdom of Great Britain and Northern Ireland, where whole ports – including land – were sold on a freehold basis to private sector interest. Few other countries, have, at least so far, chosen to follow the British model. However, some ESCAP countries – Malaysia is the most obvious example – have in some cases adopted models that resemble it fairly closely: for instance, the sale of the port business at Johor. The main differences are the retention by government of a golden share and the fact that the arrangement is a long term lease not a freehold sale.

More common are concessions for parts of ports – individual terminals or clusters of terminals. As many authors have pointed out, this is not novel, but has long been a popular form of port development in many parts of the work. However, for many ESCAP countries that have in the past funded port works solely from the public purse, this is a new departure.

Other countries (China provides the most conspicuous example) have chosen the joint venture route, maintaining a continuous involvement in the port facility while accessing private sector funds and expertise.

In still other instances, ports have retained responsibility for and revenues from basic infrastructure, while contracting out the management of the facility, usually for a period much shorter than that of a typical concession.

Finally, as a result of liberalisation of entry into selected port service sectors, private firms have begun, in some instances, to operate in competition with and alongside port authority operations.

2.4.4 Global Terminal Operators

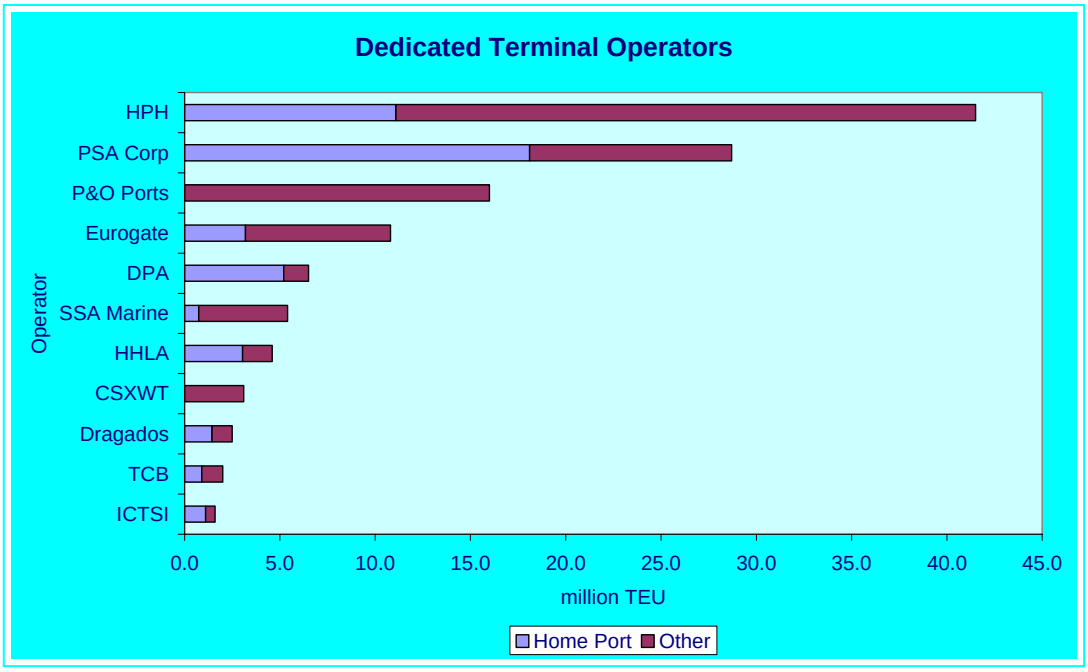
The expanded range of opportunities for private investment in the port sector has given rise to a new species: the international port entrepreneur. Historically, providing port services has tended to be a domestic industry, dominated by firms that are nationals of the country in which the port is located.

This has changed radically, with the emergence of a number of major global players. The largest of these, in terms of TEU handled, is Hutchisson Port Holdings, whose original stronghold in Hong Kong has served as a launching pad for a wide range of investments on the Chinese mainland and a range of other locations including the United Kingdom, Indonesia and most recently Malaysia. PSA Corporation of Singapore currently operates terminals in 10 different ports and continues to maintain

its expansion strategy. Around 48 million TEU, or 21 per cent of the world container throughput, was handled at the terminals operated by PSA and HPH in 2000. Australian-based P&O Ports has a lower global throughput, but an even more diverse range of port investments which includes facilities in China, SE Asia, India, the Middle East, Europe and Africa. Other important port specialists include PSA Corp, Philippines ITCSI and Stevedoring Services of America.

As well as the port specialist, some major shipping lines also control international terminal networks. Some, like Maersk, are clearly focused primarily on controlling stevedoring for their own vessels. Others, however – and Contship stands out in this category – have developed facilities that are clearly intended to serve a range of shipping lines, including both allies and competitors. Contship's Gioia Tauro terminal is a prime example of this type of development.

Figure 2-8: Global terminal operators



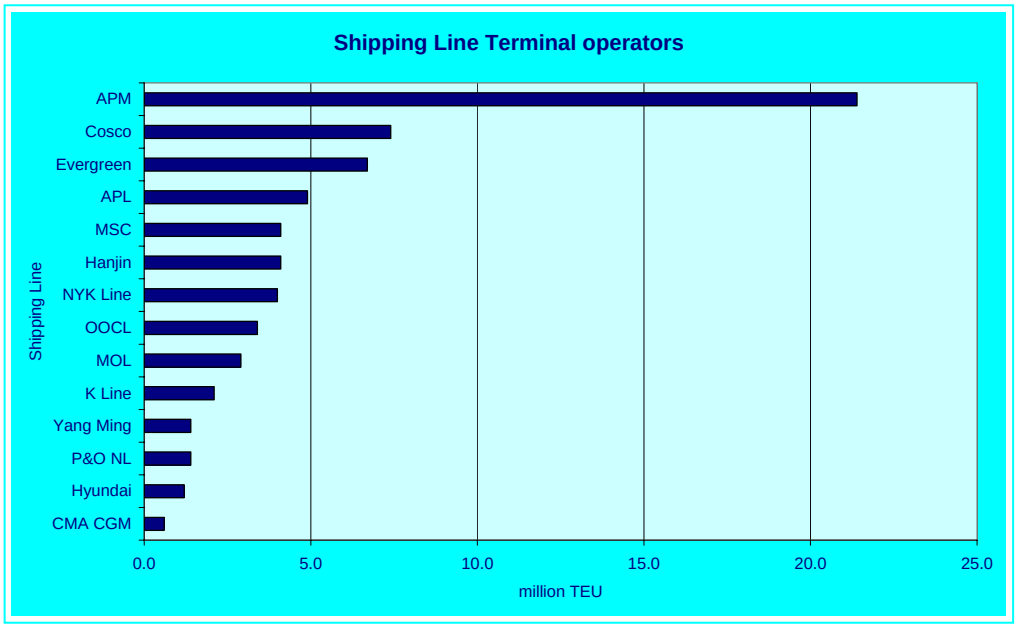
One of the major implications for port operators of the developments of the last decade or so is a shift in the balance of power between shipping lines and ports – a shift in favour of shipping lines.

The greater volumes that are now controlled by a single line or alliance mean that the capacity of an individual line to seriously affect the business of even a major port is now much greater than it has been in the past. The most dramatic recent example of course is Maersk's Lines to transfer its business to the new port of Tanjung Pelepas.

This decision of a single shipping line is expected to cost Singapore – the world's premier hub port – approximately 15 per cent of its total business. One of main considerations in this and a number of other recent shifts is control – more and more lines are seeking dedicated terminal facilities and direct control over landside operations.

As a result we are seeing a change in the basic paradigm of port-carrier relations. The traditional paradigm is that ports serve basically local trade, and shipping lines come to the cargo. Under the emerging paradigm, shipping lines serve regional, largely non-local trade, and the cargo is moved – by feeder or intermodal service – to the ship.

Figure 2-9: Shipping line terminal operators



2.4.5 Environmental Pressures

Last, but certainly not least, amongst the challenges that have faced ports over the last few decades is dealing with a growing environmental consciousness.

As with many other industries, ports are facing increased costs and are required to adopt increasing sophisticated management techniques in order to minimise the impact of their operations on the natural environment. The most profound impact has in general been felt in dredging and reclamation projects. The disposal of spoil from dredging, which is often contaminated by a variety of toxins, is an enormously contentious issue, particularly in Europe and the United States. We can confidently expect both the difficulty of obtaining approval for dredging and reclamation projects, and the cost of undertaking them once approval is given, to increase further over the next decade.

Conflicts between ports and urban uses – the 'built environment' – have also become more intense. Traffic to and from the port is a major source of conflict in many communities, and has in some cases led to the imposition of severe restrictions on port activity – the imposition of the 1m TEU cap on the throughput of Bangkok port is an example. The high prices of scarce waterfront land in many cities has also placed pressure on port land holdings. Increased community sensitivity to risks associated with certain port activities, and to noise and light emissions, have also emerged as important constraints on port development.

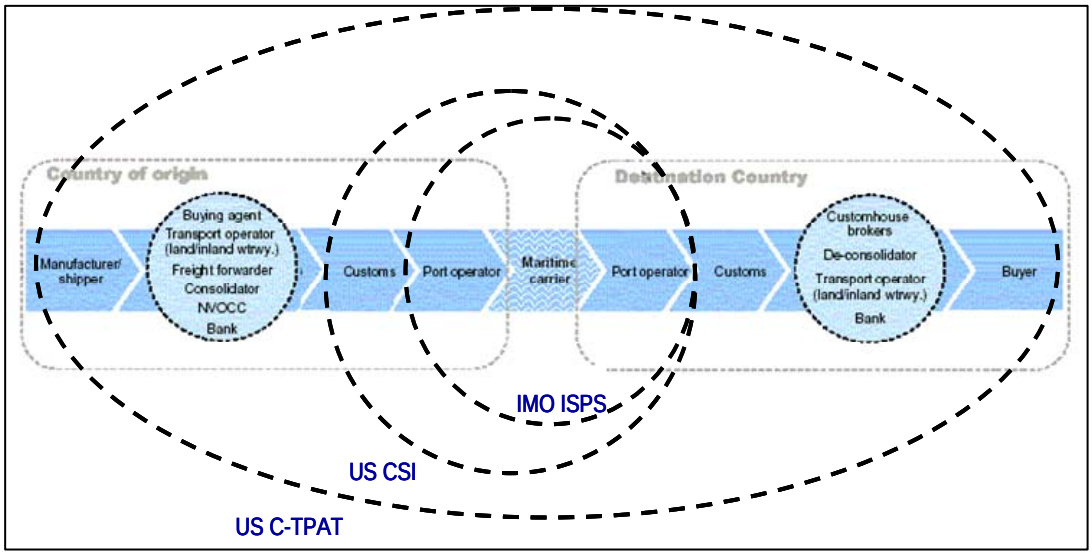
2.4.6 Security Initiatives

Maritime container transport faces a number of security challenges. While containers have seen as the strength and sign of success of the maritime transport system, it is also true that containers can be mis-used by terrorists.

Container transport is characterized by complex interactions among multiple actors, industries, regulatory agencies, modes, operating systems, liability regimes, legal frameworks, etc. Therefore, a comprehensive intermodal framework integrating measures across the entire container transport chain is required in addressing the security of the container transport chain.

The International Ship and Port Facility Security Code (ISPS) exists at the centre of the chain but covers only ports and maritime transport. For the US trade, the Container Security Initiative (CSI) also covers Customs in the countries originating containers, while C-TPAT has an extended coverage including inland transport.

Figure 2-10: New Security Initiatives



Source: OECD

Many ports started to take steps to implement the measures required by the ISPS Code, which involves conducting security audits to determine the measures to be taken and their cost, and identifying the sources for funding. Also, major world ports implemented measures prescribed by the United States' security initiatives.[8]

The cost of implementing security measures, such as installing new equipment like scanners, could be significant for ports. The issue of recovering security expenses has emerged in several ports. HPH, the largest global container operator, sought to impose a security charge[9] on containers passing through Felixstowe (United Kingdom) for additional security measures mandated by the ISPS Code. Two Malaysian port authorities, Port Klang and Tanjung Pelepas, stated that no security charge was to be imposed on container trade, but some weeks later two terminal operators, Northport and Westport, in Port Klang started to charge $34 per TEU as "extra movement charges" for boxes selected for scanning under the Container Security Initiative. In Charleston (United States), after inconclusive negotiations between the port authority, carriers and terminal operators, the port authority stated that it would impose a surcharge of $1 per foot of length for every vessel calling at the port. (UNCTAD, 2004)

[8] For example, agreements were worked out, such as the one reached, at the end of 2003, between the European Commission and the United States concerning the procedures to be applied in connection with the Container Security Initiative (CSI). This agreement followed the acceptance by some European ports that US Customs officers inspect containers bound to the United States. (UNCTAD, 2004)

[9] $9.20 per export container and $17.50 per import box.

3. CONTAINER TRADE GROWTH

3.1 Economic Assumptions

Growth in the container trade is ultimately driven by economic growth. An underlying assumption of this study is that, for the next decade at least, the structural relationships between the growth in container trade and economic growth will remain basically unchanged.[10] The starting point for our analysis was therefore expectations of future economic growth.

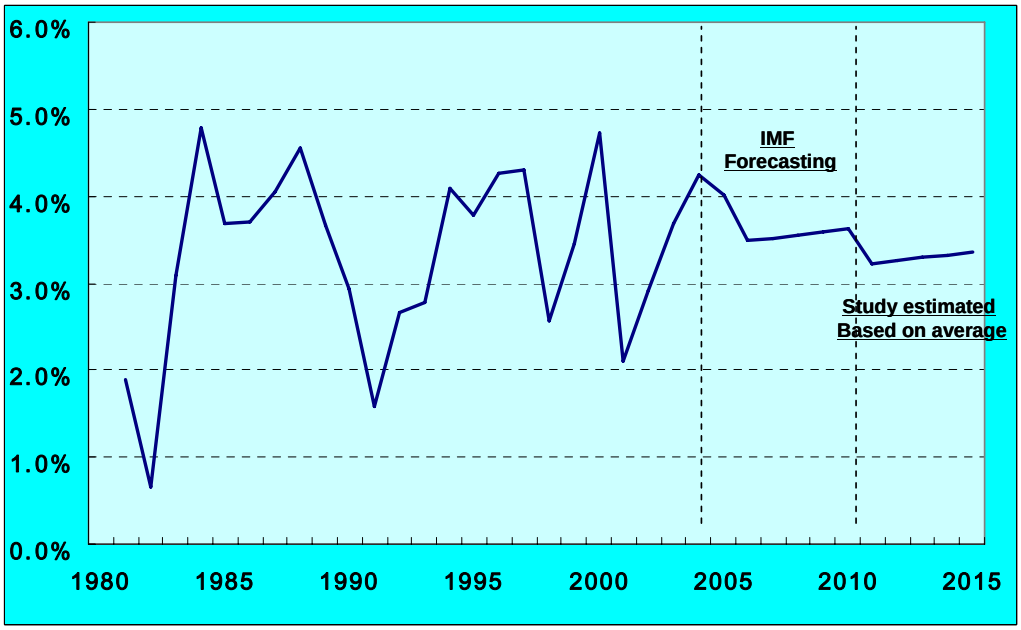
The study has relied as far as possible on the projection of IMF to underpin our estimates. The IMF projection provides estimates for major economies. The IMF projections however extend through only to 2009, whereas the study period runs through to 2015. In extending the forecast period, a very simple method was adopted in general: the average growth rate for the period during which the IMF projections provided explicit forecasts was applied for the remainder of the forecast period. For some countries other sources available were also referred in estimating the GDP growth rates for the years beyond 2009. This was done for each economy independently.

The consequent economic growth estimates are shown in Figure 3-1. They embody a view of future economic growth that is reasonably optimistic: the average growth rate in the short term is similar to that of the recent past if the economic downturn of the early 2000's is ignored, and in the medium term is approximates the long-term cumulative average growth rate for the world economy over the last 30 years.

The horizon for these forecasts is medium term – 10 years from now – and it is impossible to predict the timing of economic cycles which will inevitably occur during that period. The economic growth assumptions underlying the present study may therefore be interpreted as hypothesizing that growth will continue along a path similar to that of the recent past, and that, although there may be good years and bad years within the forecast period, there will not be a major, prolonged economic slowdown on the scale of that of the early 1990s.

[10] The economic relationship between GDP and trade volume is considered useful in forecasting the development of the container sector, although the relationship is not considered a sufficient explanation of the growth. There are a wide range of factors that impact on the volume of container imports and exports, including exchange rate fluctuations, changes in economic structure etc. However, for forecasting purposes it is necessary to use very simplified relationships, because many of the causal variables are themselves even harder to predict than container volumes. Container imports and exports are, for instance, undoubtedly greatly affected by exchange rate movements. However, the uncertainties involved in estimating exchange rates are immense. The forecasting relationships used in this study in fact are simple, linear relationships between container volumes and GDP. In most cases, the regression analysis provided a surprisingly good fit for these simple relationships. Further testing indicated that this was not simply because both variables tended to rise over time.

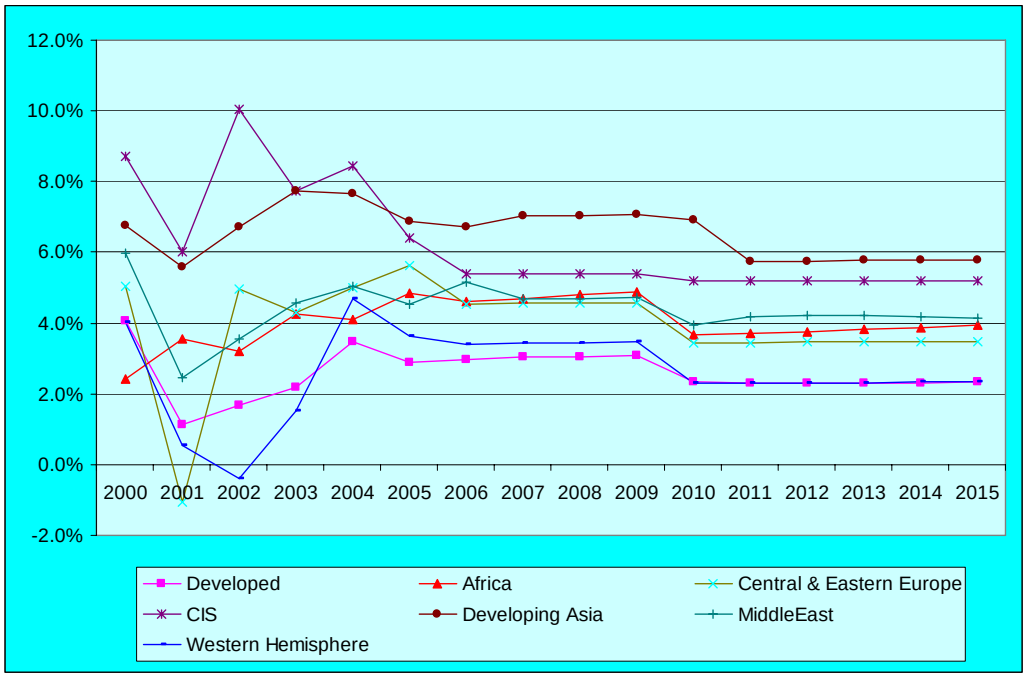
Figure 3-1: Economic growth estimates underlying container forecasts



Source: Study estimates based on IMF and other sources.

Figure 3-2 shows a breakdown of forecast economic growth rates by economic grouping.

Figure 3-2: Forecast GDP growth by economic group



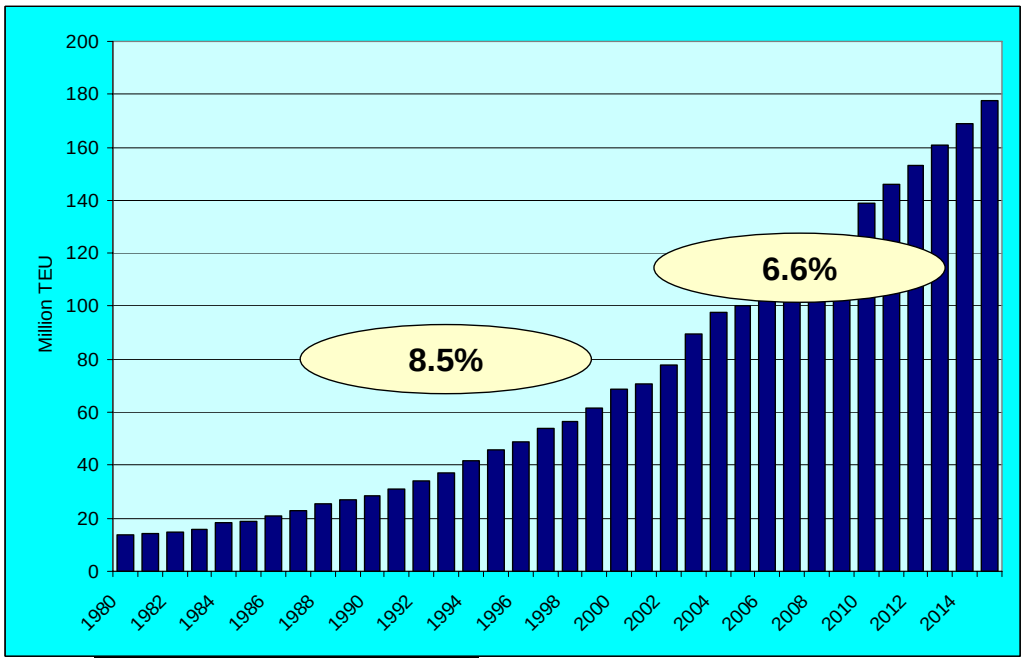
GDP growth rate of most of developed economy in the future will be low relatively. Developing countries in Asia will continue to keep their strong economic growth pattern. It is expected that China will keep their strong growth trend until the next decade. The forecast also embody a positive outlook for the two regions that suffered the greatest economic difficulties during the 1990s: Africa and Eastern Europe. Many economists point out that The Russian Federation will keep their current economic growth pace.

3.2 Global Container Forecasts

The next step in the forecasting process was the conversion of economic growth rates into projected full container volumes. Imports and export volumes were estimated from independent equations for individual countries.[11]

Figure 3-3 shows the global container forecasts that result from this process. The volumes shown in the figure are full origin-destination containers only: that is, empty containers are not included, and each container is counted only once during its entires journey, regardless of how many times it may be handled.

Figure 3-3: Past and forecast global container volumes (1980–2015)



[11] This was done by estimating separate forecasting equations for individual countries in the ESCAP region. For the countries outside of ESCAP, separate equations were estimated for each 'region', which was defined as a group of countries. In a number of cases, however, the historical time series data was simply not able to support a formal regression process. This is the case in particular where the country is still in the very early stages of containerization. In such cases, there was little alternative but to use professional judgement, informed by an examination of the history of containerization in similar countries during a similar phase of economic development.

The total number of full containers shipped internationally is expected to grow to 177.6 million TEU by 2015, up from an estimated 77.8 million TEU in 2002, but at a slower rate of 6.6 per cent per annum compared to 8.5 per cent per annum during 1980-2002. Average growth in the first half of the 2010's is expected be lower than in the 2000's: 7.5 per cent per annum is expected during the period of 2002-2010, falling to 5.0 per cent per annum in the following five years.

These comparisons are summarised in Table 3-1. Comparison of the study's forecasts with those provided by private consulting firms suggest that these global level estimates lie within the range of expert opinions, but slightly towards the more conservative end of that range.

It should be noted that these forecasts depend critically on the assumptions that are made about future world economic growth. Analysis conducted during the course of the study suggests that, for every 1 per cent per annum increase or decrease in estimated global economic growth, the rate of growth in container volumes will change by approximately 1.5 per cent per annum.

Table 3-1: Estimated and forecast growth rates for container trade (1980–2015)

Year	*Container volumes (million TEU)*	*Compound average growth rate over previous period*
1980	13.5	-
1990	28.7	7.8%
2000	68.7	9.1%
2010	138.9	7.3%
2015	177.6	5.0%

Source: Study estimates

3.3 Geographical Distribution of Container Volumes

Figure 3-4 shows the estimated contribution made to total global container flows by each major geographical region[12] in the year 2002. The chart has been constructed by summing up the full import and export containers for each region, and computing the total as a percentage of total world imports plus exports. Figure 3-6 shows that East Asia is the most important driver of the global container trade, generating 24 per cent

[12] In this analysis, the countries in the ESCAP region are grouped into the following subregions: East Asia (China including Hong Kong, China and Taiwan Province of China); North Asia (Democratic People's Republic of Korea, Japan and Republic of Korea); South-East Asia (Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam); and South Asia (Bangladesh, India, Pakistan and Sri Lanka). Islamic Republic of Iran and Turkey are included in South Asia, and Pacific Coast of the Russian Federation is included in North Asia.

of total trade, with Europe the next most important region with 22 per cent of the total. North America generates a volume that is slightly smaller, accounting for 17 per cent of the total trade. North Asia and South-East Asia account for 10 per cent each of global volumes.

Figure 3-4: Distribution of container volumes – 2002

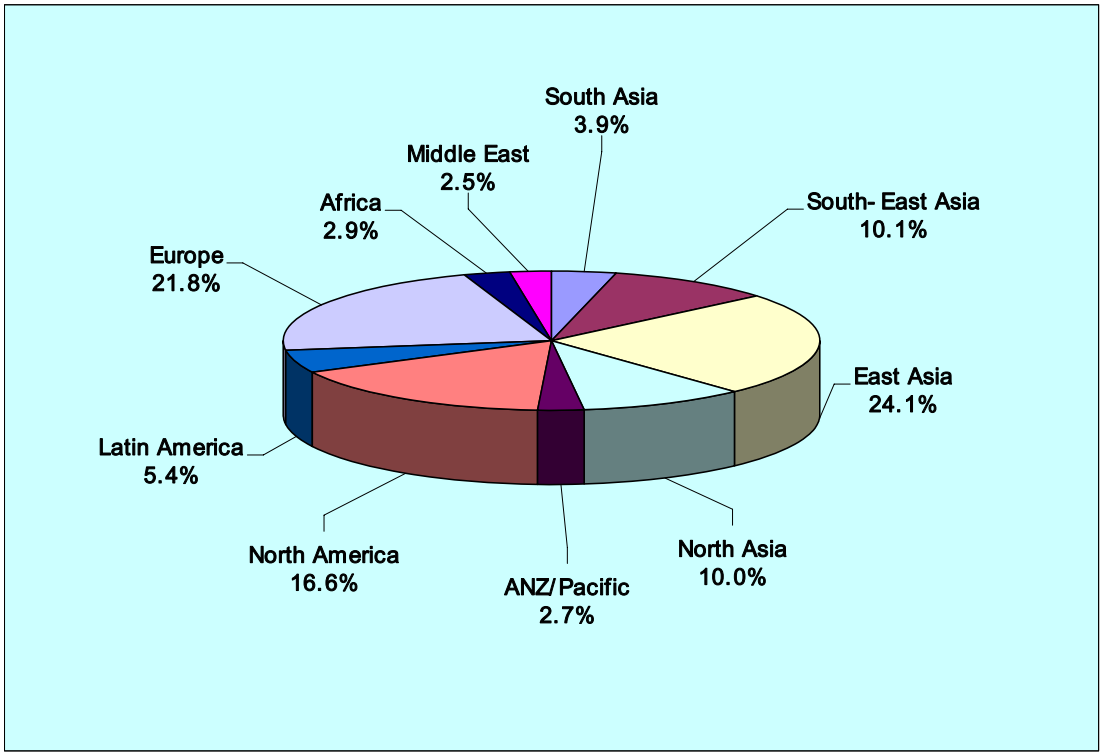
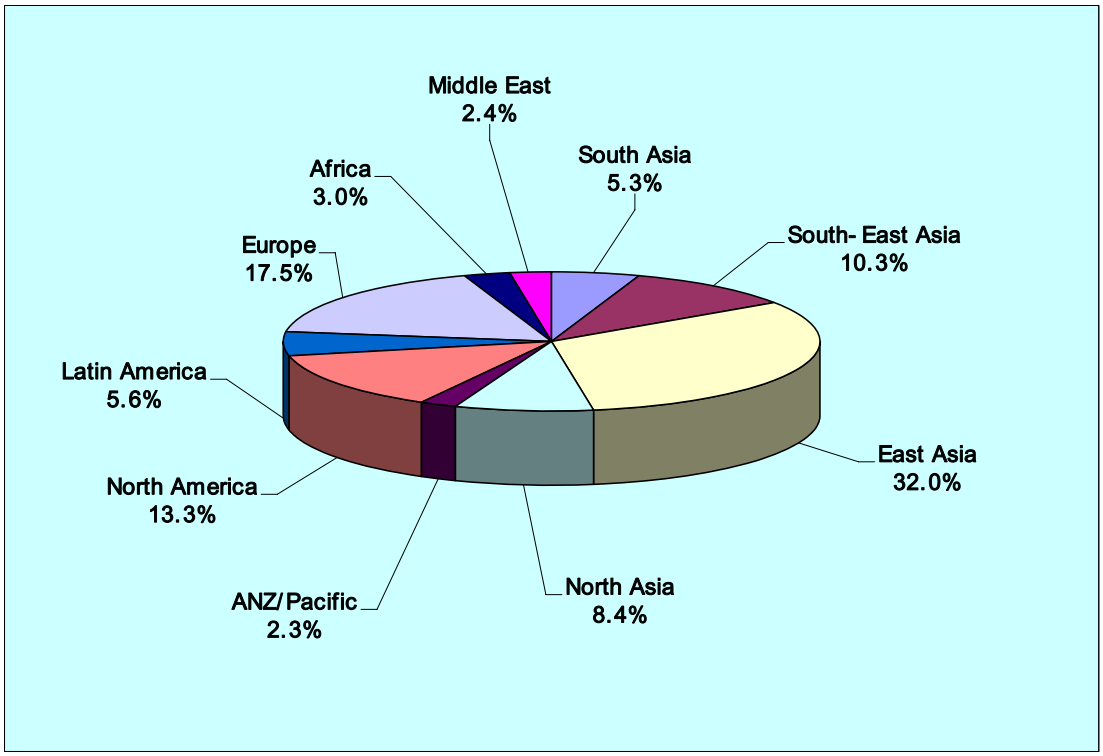


Figure 3-5 indicates how these contributions are expected to change by 2015. By this time, it is expected that East Asia will enhance its role as the biggest driver of the global container trade, with an increased share of 32 per cent of the total. The shares of Europe and North America are expected to decline to 18 per cent and 13 per cent, respectively. Stronger growth over the period will also allow the volumes generated by South-East Asia to surpass those from North Asia. The South Asian countries are also expected to increase their share of the global total.

Looking closely at Asia, exports from North Asia are expected to grow more slowly than exports for the world as a whole, due largely to subdued growth in containerized exports from Japan. North Asia's share of imports is also expected to fall over the forecast period, but to a less marked extent.

Figure 3-5: Distribution of container volumes – 2015



Container traffic to and from other parts of Asia is expected to grow more rapidly than the world average. Expansion is expected to be particularly rapid in China, continuing the trend of the last five years, and solid growth is expected in South Asia. South-East Asia is also expected to increase its share of world container traffic over the forecast period.

Taken together, Asia's share of containerized exports is expected to rise from 55 per cent of the world total in 2002 to 64 per cent in 2015; the share of containerized imports is expected to rise by a similar from 46 per cent to 53 per cent.

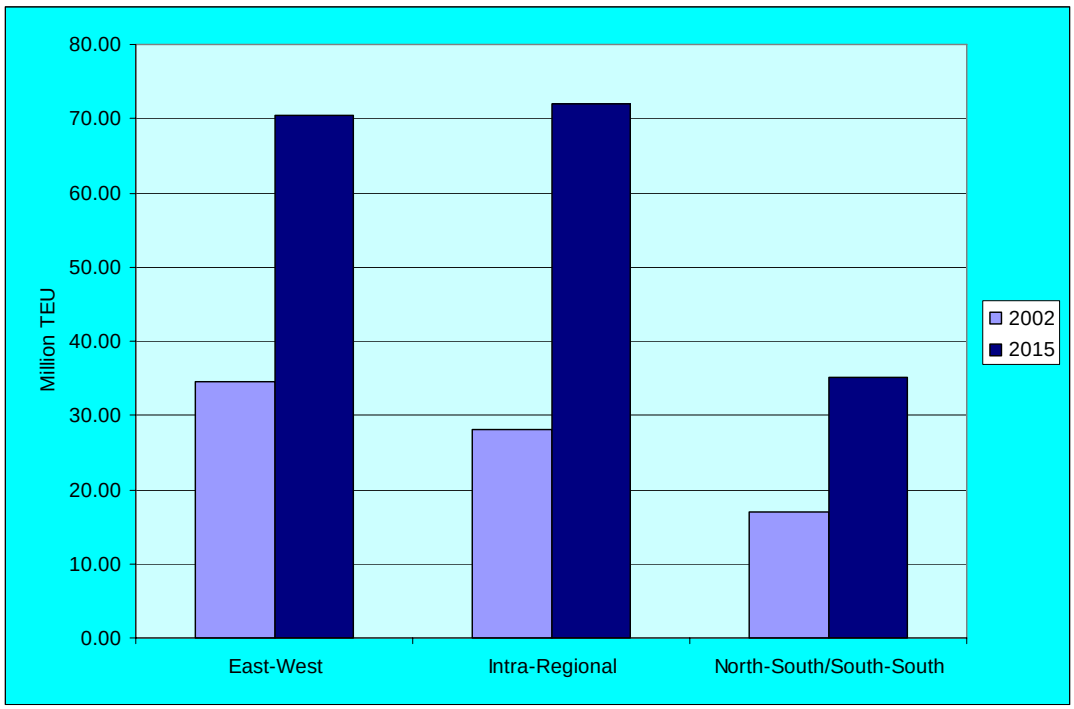
4. TRADE STRUCTURE

4.1 Changing Nature of Global Container Trade

Container shipping routes can be divided into three main groups: (1) East-West trades, which circle the globe in the Northern Hemisphere linking the major industrial centres of North America, Western Europe and Asia; (2) North-South trades articulating around major production and consumption centres of Europe, Asia and North America, and linking these centres with developing countries in the Southern Hemisphere; and (3) intraregional trades operating in shorter hauls and with smaller ships. North–south routes are

Figure 4-1 shows study estimates of the container trade volumes (full export/import containers only) in 2002 and 2015 of each of trade groups. Container trade volumes on the East-West routes will increase from 34 million TEU in 2002 to 70 million TEU in 2015 representing 5.8 per cent of annual average growth rate. The study forecasts suggest that the intraregional trades will show solid growth from 28 million TEU to 72 million TEU with a compound average growth rate of 7.5 per cent per annum over the same period. The North-South trade is also expected to grow at a rate of 6.2 per cent per annum on average, exceeding the growth rate of the East-West trade.

Figure 4-1: Container Trade by Trade Group (2002 and 2015)

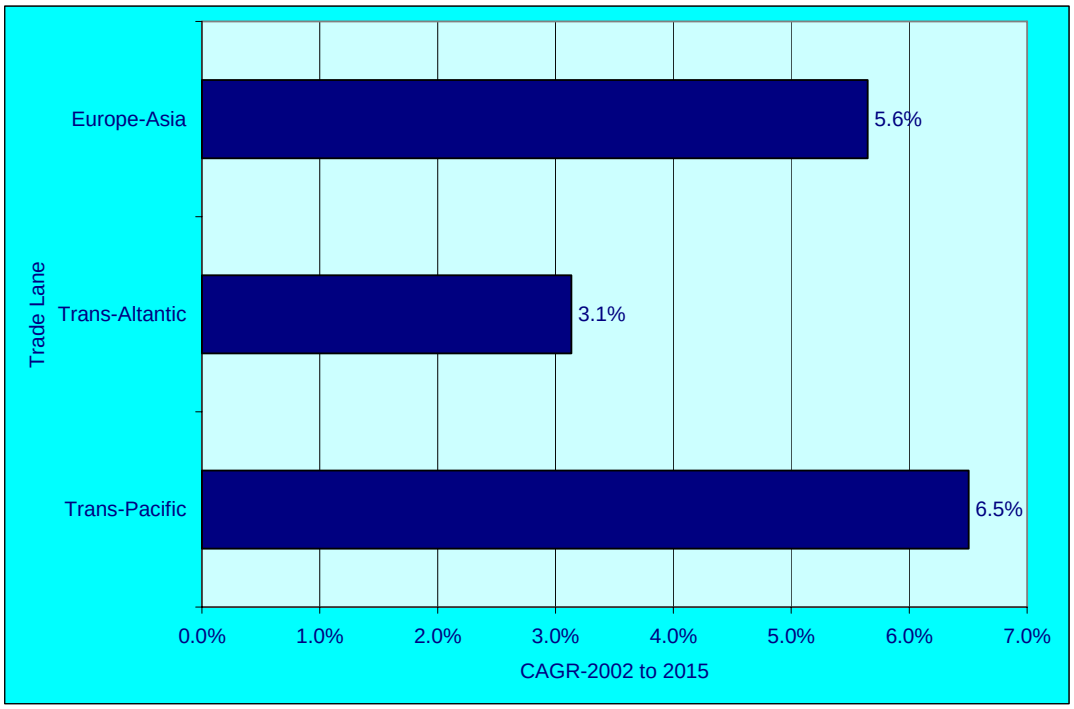


4.2 Asia - North America

The biggest deep sea liner route is the trans-Pacific trade between Asia and North America, representing 14.5 million TEU in 2002, equivalent to 43 per cent of the total East-West trade and 19 per cent of the world total. The services operate between the North American ports on the East Coast, the Gulf and the West Coast, and the industrial centres of Asian countries, with some services extending to the Middle East.

As shown in Figure 4-2, it is expected that the trans-Pacific trade will show the strongest growth of 6.5 per cent per annum among the three major East-West trades (namely, Asia-North America, Asia-Europe, and North America-Europe) during the forecast period and reach 33.5 million TEU in 2015.

Figure 4-2: East-West Trade Lane Growth (2002 - 2015)



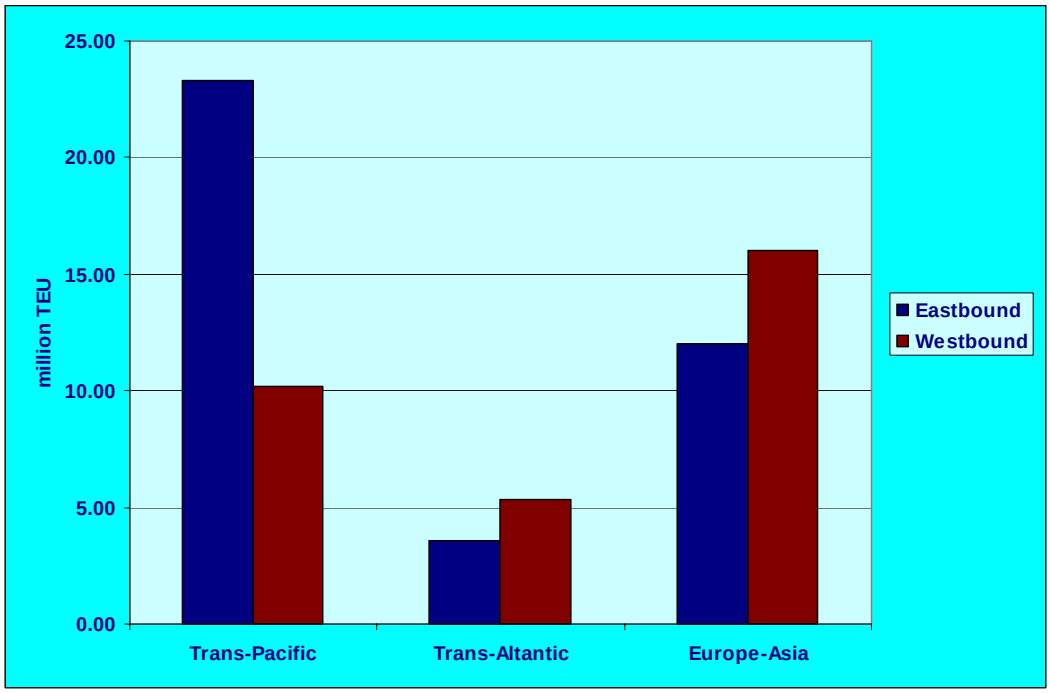
Since the Asian crisis the trans-Pacific trade growth has been very unbalanced, with strong growth in the eastbound trade coinciding with a deep and protracted slump in westbound volumes. Container flows on the dominant leg, Asia to North America, reached 9.1 million TEU in 2002, while in the opposite westbound direction the flow stood at 5.7 million TEU.

The study forecasts suggest that the current trade imbalance is likely to be deepened in a long-term. An average growth rate of 4.6 per cent per annum until 2015 is forecast for the westbound trade, compared with a growth rate of 7.5 per cent per

annum in the eastbound trade. It is expected that in 2015 the container volume of westbound trade on the trans-Pacific route will be around 10.2 million TEU, which is less than half of the eastbound trade, 23.3 million TEU.

As the imbalance of container flows is expected to continue, repositioning of empty containers will remains a major concern for carriers, in particular those operating on the trans-Pacific trade route.

Figure 4-3: Trade Imbalance on East-West Routes (2015)



4.3 Asia - Europe

The study estimates show that container trade volume on the Asia–Europe route reached 13.7 million TEU in 2002. The prospects for the growth of Asia-Europe trade seem somewhat lower than trans-Pacific trade, growing at an average rate of 5.6 per cent per annum until 2015 (Figure 4-2). It should be noted however that this growth rate covers the whole of the Asia-Europe trade, including some very mature markets such as Northern Europe- Japan, which are expected to grow only slowly. Some other components – for instance, trade between East Asia and the Mediterranean, and between India and all parts of Europe – are expected to grow more rapidly than the rate quoted above.

Like the trans-Pacific trade, this Asia-Europe trade has also become seriously unbalanced since the 1997 Asian currency crises. In the early 1990s, the volume of cargo carried in each direction in this trade lane was reasonably equal: although

westbound TEU numbers exceeded eastbound by around 10 per cent, this was offset by the fact that eastbound containers were, on average, significantly heavier.

By 2002, this had changed greatly, particularly with respect to Asian trade with Northern Europe. The study estimates that westbound TEU numbers now exceeds eastbound by around 25 per cent, although the imbalance is less pronounced than that existing across the Pacific.

According to the study forecasts, the trade imbalance on the Asia-Europe route will be further increased to around 34 per cent in 2015. Westbound volumes are expected to increase from 7.6 million TEU to 16.0 million TEU at an average of 5.9 per cent per annum over the forecast period, compared to the estimated rate of growth of 5.4 per cent for westbound volumes from 6.1 million TEU to 12.0 million TEU during the same period.

4.4 Intra-Asia

The growth model for almost all of the principal Asian economies has been based on the pivotal role of trade as the driver of Asian economic growth. Trade growth has occurred at the same time as a burgeoning of FDI by the more wealthy Asian economies, initially Japan, but subsequently the Republic of Korea; Taiwan Province of China; Hong Kong, China; and Singapore, in manufacturing plants located in lower wage cost countries. This, together with trends in manufacturing processes that have favoured the two-way trade in components and sub-assemblies, led to spectacular levels of growth in the intra-Asian container trades during the early and mid-1990s, until the Asian economies were hit by the 1997 crisis.

It is a very difficult task to draw a comprehensive picture of the intra-Asian trade, although there have been some attempts to quantify the intra-Asian container flows based on some statistics available on container liftings of major shipping lines. In 1991, K-Line quantified the intra-Asian cargo flows between nine major Asian economies: Hong Kong, China; Indonesia; Japan; Malaysia; the Philippines; Republic of Korea; Singapore; Taiwan Province of China and Thailand. Total cargoes carried between countries/economies of the group at that time was estimated at 2.98 million TEU. In April 1997, an attempt was made by DRI/Mercer World Sea Trade Service to quantify the level of trade between these same nine economies. The estimated total for 1996 was 5.5 million TEU, a little short of double the 1991 total. This translates to a growth rate of 13 per cent per annum, compared to a growth in global container trade over the same period of around 8 per cent per annum.

It is likely that this quantification underestimated the real rate of growth in intra-Asian trade as a whole. The omission of China is the most obvious reason for this. In a separate publication, DRI/Mercer estimates that the number of containers flowing between the ports of China and the Far East Newly Industrialized Economies grew at an average of 30 per cent per annum over the first half of the 1990s. The DRI/Mercer

also omits other container markets that are expected to grow very rapidly over the forecast period: the most important of these are India and Viet Nam.

Although there is no question that this trade was hit particularly hard by the Asian crisis, it is difficult to obtain definitive estimates of the impact. Based on Standard and Poor's World Sea Trade Service data, it would appear that the trade was effectively stagnant over the period 1996 to 1998. However, it appears that the intra-Asian trade witnessed a return to solid growth during the late 1990's and early 2000's, although at levels somewhat lower than those of the early 1990s.

Drewry Shipping Consultant Ltd. (Drewry, 2003) made an attempt to compile a series of detailed intra-Asian trade matrices for the period 1999 to 2001, covering country-to-country container cargo exchanges among 13 Asian economies including China (with Hong Kong, China and Taiwan Province of China, separately), Indonesia, Japan, Malaysia, Myanmar, Philippines, Republic of Korea, Singapore, Thailand and Viet Nam. It was estimated that the total trade between Asian countries increased from 12.8 million TEU in 1999 to 15.9 million TEU in 2001, with an annual average growth rate of 12 per cent. However, it should be noted that this includes around 3 million TEU of domestic traffic, mainly in China, Indonesia, Japan and Philippines. The Drewry analysis also excludes the South Asian market whcih has recently been growing rapidly.

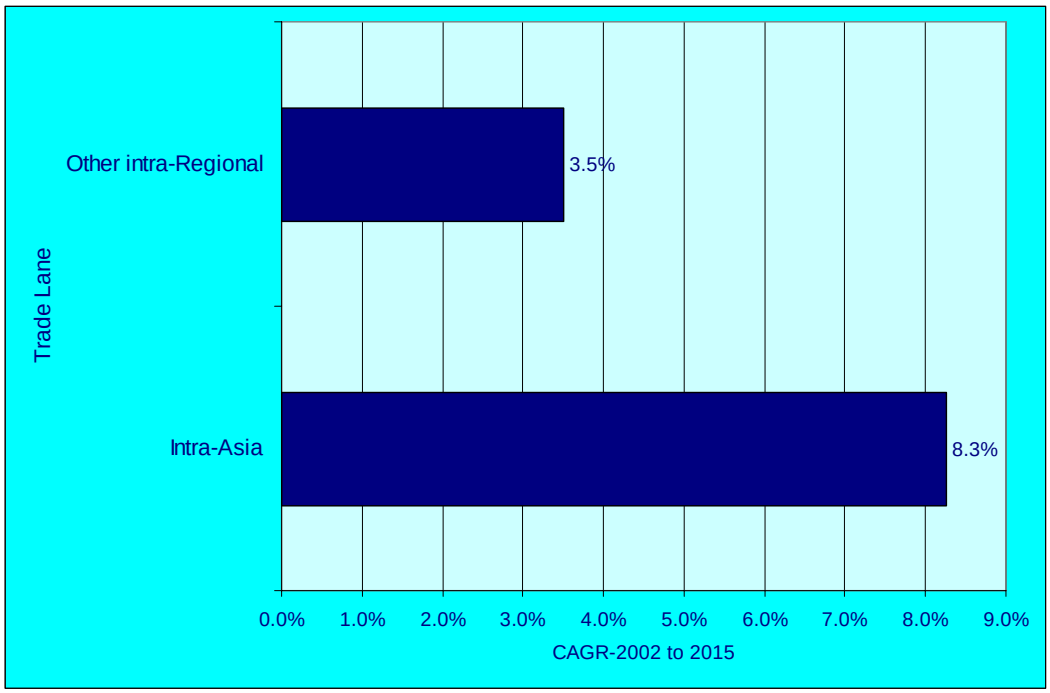
The MPPM study attempts to provide a comprehensive picture of the intra-Asian container trade covering the whole ESCAP region, which is estimated to have reached 22 million TEU in 2002.

A number of factors suggest that long-term growth prospects for the intra-Asian trade remain strong:

- Sound medium to long term growth prospects for most Asian economies;
- Close proximity of a number of economies at very different levels of economic development;
- The continued importance of more economically advanced Asian economies as sources of FDI for the less developed economies of the region;
- Regional free trade agreements such as ASEAN's Common Effective Preferential Tariff Scheme (CEPT).

The study forecasts suggest that the intra-Asian trades are set for sustained solid growth, with a compound average growth rate of 8.3 per cent per annum over the period 2002-2015. This can be compared with merely 3.5 per cent, the average growth rate for other intraregional trade (Figure 4-4).

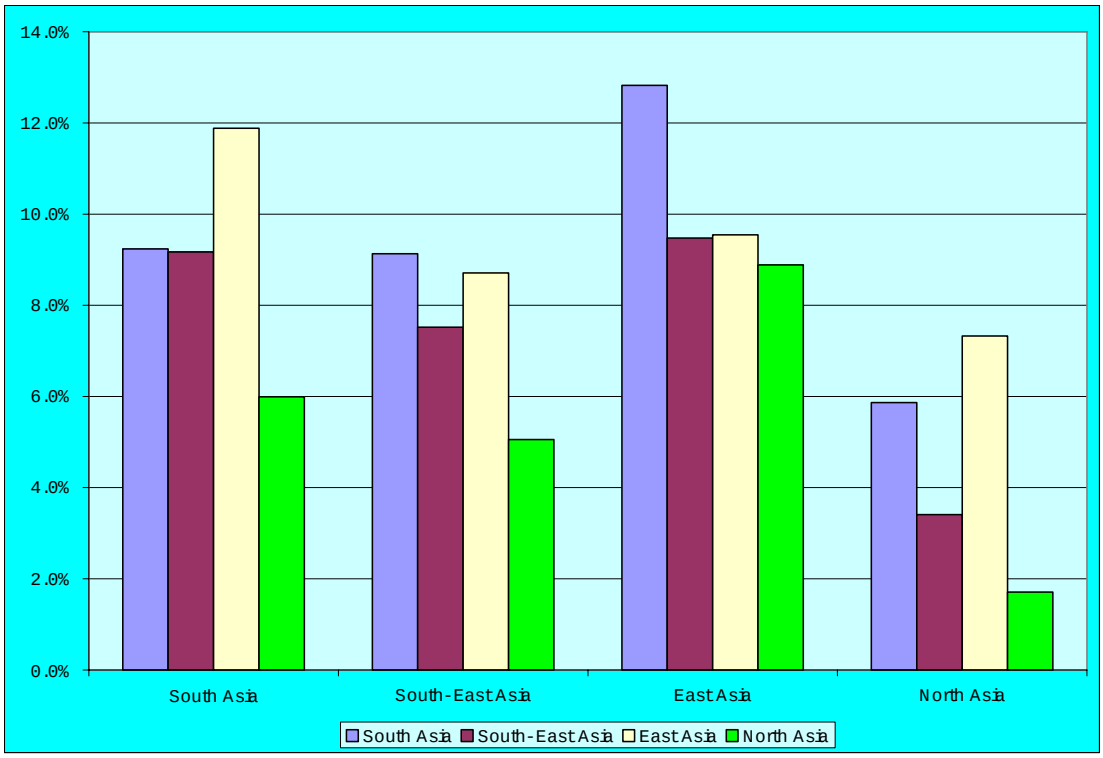
Figure 4-4: Intraregional Trade Growth (2002 - 2015)



Within the intra-Asian trades, growth of trade to and from East Asia and South Asia hold out great promise for the future. China, including Hong Kong, China and Taiwan Province of China, will continue to dominate the intra-Asian trade with an expected growth rate of 9.3 per cent per annum during the period 2002-2015. The study estimates show that the South Asian countries trade with other Asian countries will increase at an average rate of 10.4 per cent over the same period. In particular, the trade between these two subregions is expected to increase at more than 12 per cent per annum.

Meanwhile, growth of trade between North Asia and South-East Asia is likely to be slow, with an expected growth rate of around 4 per cent per annum over the coming decade. This trade component, which was the star performer of the early 1990s, has been hard hit first by the slowdown in the Japanese economy and then by the 1997 crisis.

Figure 4-5: Intra-Asian Trade Growth (2002 - 2015)



4.5 Minor Routes

North-South routes are articulated around the major production and consumption centres of Europe, Asia and North America, and link these centres with developing countries and flows expands and contracts in line with economic conditions prevailing at both ends. It is estimated that in 2002, the container trade volume carried on the North-South routes was around 15 million TEU, of which 7 million TEU was Asian related trade.

Asia's container trade with Africa and Latin America and Australia is expected to grow at rates well in excess of the world average throughout the forecast period, averaging over 8 per cent per annum. This reflects improved economic performance and a greater acceptance of containerization in these partner regions.

5. CONTAINER PORT VOLUMES

5.1 From Container Flows to Port Volumes

The forecasts discussed in previous chapters refer to the volume of containerized cargo that is shipped internationally. This information is difficult to obtain, and the values are subject to considerable measurement error. The most commonly quoted statistics on the size of the global container market refer to the number of container handling movements in ports, which is a more readily observable magnitude.

Port cargo handling volumes differ from the number of container movements because:

- Each container is counted at least twice, once at the port of export and once at the port of import;
- Some containers are trans-shipped at intermediate ports en route to their destination, is which case the container is counted twice more in port statistics: once as it is taken off the vessel and once as it is put back on;
- Port statistics also include empty containers loaded and unloaded in the port;

In addition, port statistics also include the movement of domestic containers, which are not included in the current study.

5.2 Empty Containers

Empty container movements at present constitute approximately 20 per cent of the world total international container port throughputs.

Excess capacity is likely to be a feature of liner shipping for the foreseeable future. This will continue to place pressure on operating margins, and provide a strong incentive for shipping lines to minimize logistics costs, of which empty container movements are a major component. At the same time, increasingly sophisticated container tracking and management procedures should provide opportunities for realizing economies in this area.

In the MPPM models, the approach to estimating the volume of empty containers handled in each port is simple. This approach is illustrated diagrammatically in Figure 5-1.

- The major direction for container movements is identified at each port: these may be either import direction, or the export direction.

- A percentage of empty containers is added to this major flow. The MPPM models have the capacity to vary this percentage from port to port. However, in previous studies we have found this to be a particularly unstable variable, and therefore difficult to predict with confidence. In this study, we have therefore chosen to apply a global average percentage to most ports: this was set at 3.5 per cent.

- Thirdly, the number of empty containers in the minor flow direction is estimated by subtracting the number of full containers in the minor flow direction from the total number of containers in the major flow direction. The assumption is therefore that total flows (full plus empties) are balanced in each port. This assumption is unrealistic with regard to any particular port in any particular year. However, given the difficulty of predicting the actual ratio in future years, the minor impact that imbalances have on overall volumes, and the fact that globally a balance must be maintained, the simplifying assumption was felt to be justified.

Figure 5-1: Estimation of empty container movements: MPPM models

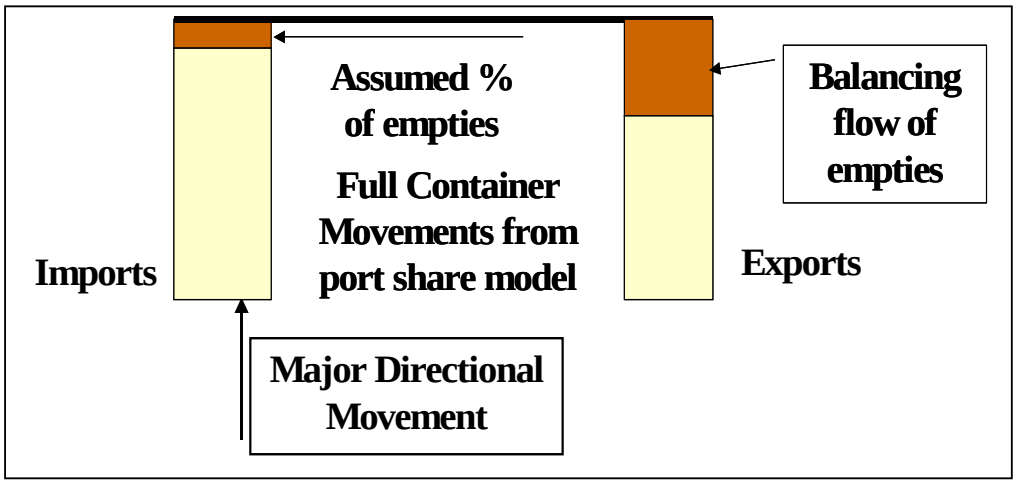


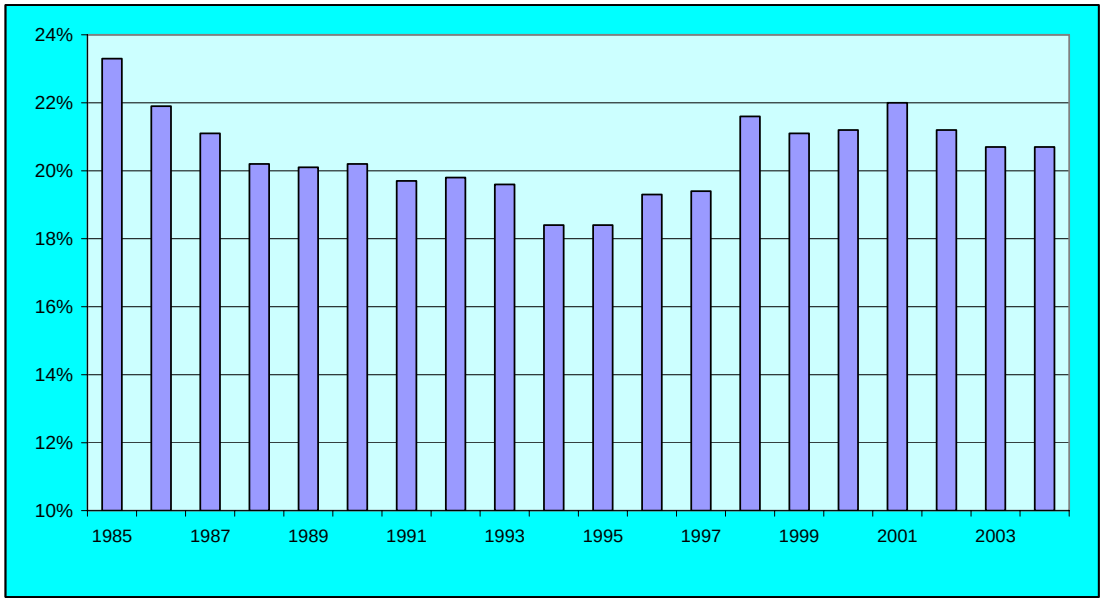
Figure 5-2 shows the ratio of empty containers to the total container port throughput over the last 20 years. It can be seen that up to around 1996 there was a clear declining trend in this ratio, and increasingly sophisticated container logistics gradually reduced the number of 'unproductive' empty container movements. The empty container incidence has exceeded 20 per cent since 1998, due to the emergence of very pronounced imbalance in the two main Asian trades with Europe and North America caused by the Asian currency crisis. As a result, the past imbalance of

container flows continued and repositioning of empty containers remained a major concern for carriers. [13]

In fact, in spite of rising trade imbalances on those two key routes, carriers have well managed to restrain the global empty incidence over the last few years. While this is partly due to more balanced flows in intraregional trades – especially intra-Asia, but it is more likely because carriers have been devoting considerable energy and investment to better matching of equipment flows and to sophisticated yield management systems.

Figure 5-2: Share of empty container movements (1985–2004)

(Percentage of total port handling)



Source: Drewry Shipping Consultants.

As discussed in the Chapter 4, trade imbalances on the trans-Pacific and Asia-Europe routes are expected to be worsening as the Asian export growth continues to outstrip import increases. It would therefore seem inevitable that carriers are going to be hard pressured to reduce the empty incidence through various means of improving equipment management systems.

[13] There are considerable costs associated with repositioning of empty equipment including an allowance for terminal handling, the costs of restowage, administration, container storage, ship's time, equipment per diems and repair, it is estimated that this cost carriers somewhere in the region of US$ 14.9 billion in 2004. In addition, there is overland repositioning, too, and while necessarily speculative, inland (intra-zonal) imbalance costs are estimated at another US$7.7 billion, for a total empty container cost – direct and indirect – of an estimated US$22.6 billion. (Drewry, 2003)

Our estimates of empty container movements in 2015 suggest that the previous declining trend will plateau. They are consistent with the assumption that carriers will do well to hold the empty incidence at current levels of under 21 per cent, but that the significant reduction in unproductive movements that characterized the 1985-1995 period is unlikely to be repeated.

5.3 Container Port Volumes: World and ESCAP Region

Containerisation International Yearbook reports that the total port handling movements in 2002 were 276.5 million TEU, out of which 242.5 million TEU was international movement excluding domestic cargo - that is, just over three times the total number of international containers shipped.

The study forecast that the total volumes of world international container handing will increase to 576.4 million TEU by the year 2015. This implies an annual average growth rate over the period of 6.9 per cent per annum, which is somewhat higher than the rate at which the global containerized cargo market is expected to grow.

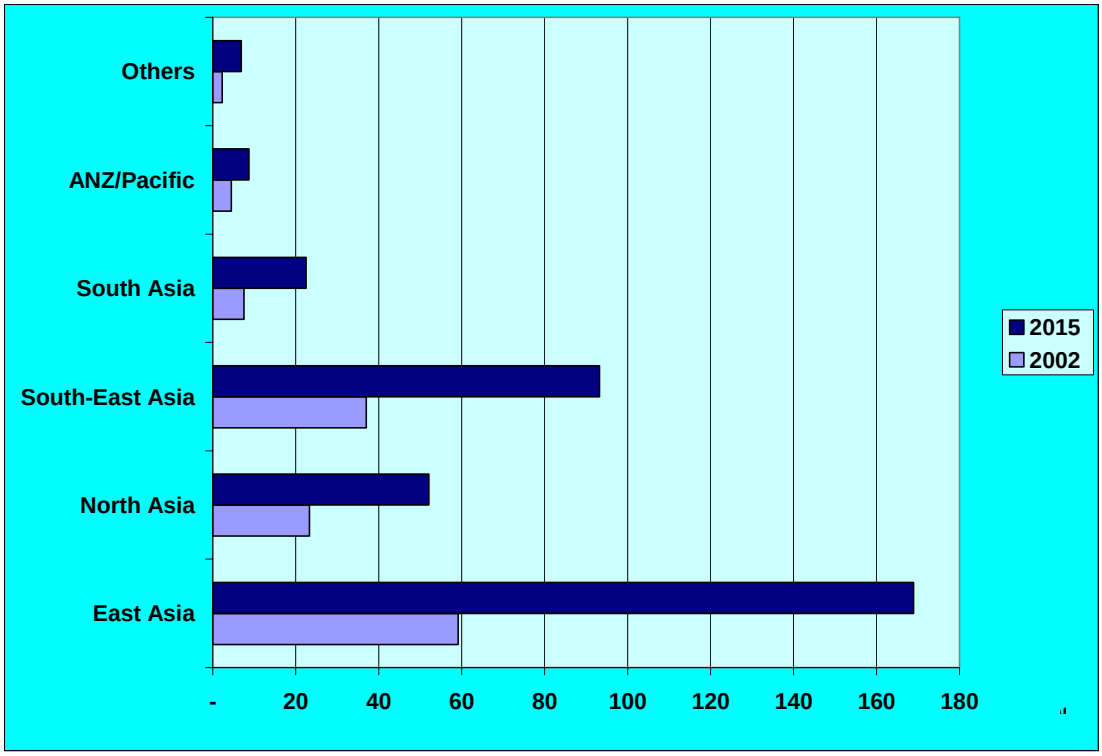
The total volumes of international container handling in the ports of ESCAP countries will increase from 133.7 million TEU in 2002 to 352.3 million TEU in 2015 at an annual average growth rate of 7.7 per cent. It appears likely on this basis that Asian ports share of the world container volumes will continue to grow to 61 per cent in 2015 compared to 55 per cent in 2002.

Figure 5-3 shows subregional container port throughput. The most obvious feature of the figure is the increase in China's share of total port throughput including Hong Kong, China and Taiwan Province of China, accounting for 48 per cent of total container throughput of the ESCAP region in 2015. To a large extent, this is simply a reflection of the expansion of Chinese imports and exports discussed in Chapter 3. This is buttressed by the development of a major trans-shipment business in China and Hong Kong, China.

South-East Asia's share of the total market is forecast to remain at a similar level over the period, while the North Asian share is expected to decline. This is consistent with the trend of recent years.

Countries in the South Asia subregion are also expected to experience a high increase rate of port container throughputs during the period from 2002 to 2015, i.e. 8.8 per cent, compared to 7.7 per cent for ESCAP total.

Figure 5-3: Asian container port throughput by subregion (2002–2015)



5.4 Patterns of Trans-Shipment

5.4.1 New Global Trans-shipment Centres

As size of container ships have increased, and the volume of containers have grown, container shipping networks have increased in complexity as well as in scale. The key development has been the evolution of hub-and-spoke systems with large mainline vessels serving a limited range of major ports to which cargoes are carried from tributary ports by feeder vessels.

Asia has led the world in this type of development. Singapore emerged in the late 1980s as the first port in the world that was dependant primarily on trans-shipment cargoes for its existence. Since then it has been joined by other ports in Asia, including Colombo, several ports in the Persian Gulf, and the new ports of Salalah, Aden and Tanjung Pelepas. In addition, a number of ports that have substantial volumes of hinterland cargo also play a major role in the trans-shipment system: these include ports of Hong Kong, Kaohsiung, Busan, Tokyo, and Port Klang.

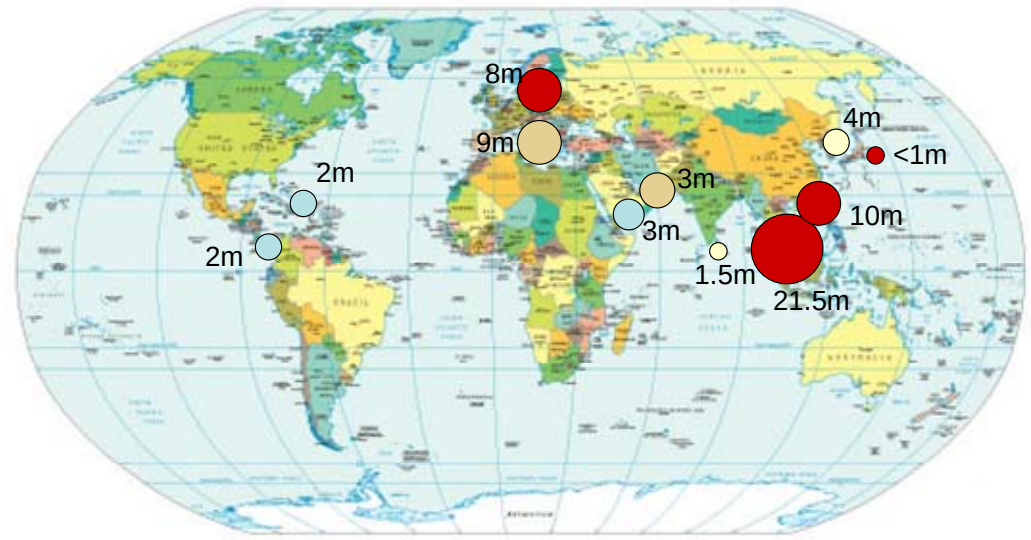
Trans-shipment cargoes offer port authorities and terminal operators an opportunity to develop their businesses at a faster rate than the development of their economic

hinterlands would permit. It is therefore not surprising that the competition for this business is fierce and also can be very volatile.

It is therefore particularly useful to obtain some assessment of both the overall scale of this important market sector, and the extent to which individual ports are likely to be successful in it. The study has attempted to explore these issues. It should be borne in mind, however, that it is possible to do so only in so far as the competitive position of individual ports is determined by their quantifiable characteristics, such as location and cost structure. Policy variables, such as the priority that a terminal is willing to accord a shipping line or willingness to make dedicated terminals available to shipping lines, are likely to have an equally important bearing on eventual outcomes.

The study expects major changes in this sector, with patterns of trans-shipment changing rapidly as lines adapt their operating strategies to take full advantage of new opportunities. Well-established feeder operations in some areas will shrink, as volumes grow to the extent that large-scale direct services become viable. However, new opportunities will emerge as secondary ports that at present handle few containers begin to contribute to the feeder pool. This dynamic opportunities will offer opportunities for new emerging trans-shipment hubs: the study suggests that the new ports of Gwangyang (Republic of Korea) and Tanjung Pelepas (Malaysia) and the trans-shipment hub emerging in Shanghai will all capture substantial trans-shipment volumes. The traditional port centres of Singapore, Kaohsiung and Hong Kong are expected to retain their importance throughout the period.

Figure 5-4: Trans-shipment ports included in model



5.4.2 Modelling Restriction and Biases

While the MPPM suite allows a fairly detailed representation of the liner shipping system, the network as presented by the MPPM remains a simplified representation of reality.

This simplification has some consequences for the estimation of trans-shipment volumes. The MPPM requires that all of the cargoes generated in the ESCAP region are loaded onto the network. However, some of the smaller services – particularly those that carry a mix of break-bulk and container cargoes – are not included in the network. Therefore, where very small-scale or semi-container operations provide the only direct shipment connections between two ports, the simplified representation of the network in the MPPM cannot capture the direct movement of cargo between the pair of ports. The model must however find a way to reflect this movement, and this route is usually via a trans-shipment port. As a consequence, the MPPM has a tendency to overestimate trans-shipment volumes by a modest amount.

Past experience in using the MPPM indicates that this impact appears to be most pronounced at the ports of Singapore and Hong Kong, both of which are located in regions crisscrossed by networks of minor shipping services. In the case of these two ports, trans-shipment volumes in the calibration year were over-estimated by approximately 10 per cent.

5.4.3 Trans-shipment Volumes

The study estimates that the world total trans-shipment volume of containers will increase from 58 million TEU in 2002 to 152 million TEU in 2015 at an average growth rate of 7.7 per cent per annum.

Figure 5-5 shows the MPPM's estimates for trans-shipment volumes by subregions within the ESCAP region. The study estimates that the total volume of containers trans-shipped within the ESCAP region will increase from an estimated 42.2 million TEU in 2002 to 109.6 million TEU in 2015. The share of trans-shipment in total port volume is expected to remain at around 31 to 32 per cent until 2015. These estimates reflect the underlying assumption used in the study that main features of existing container shipping system, including the traditional role of hub ports in the regions, will continue to be characteristics of the future shipping system through the forecast period.

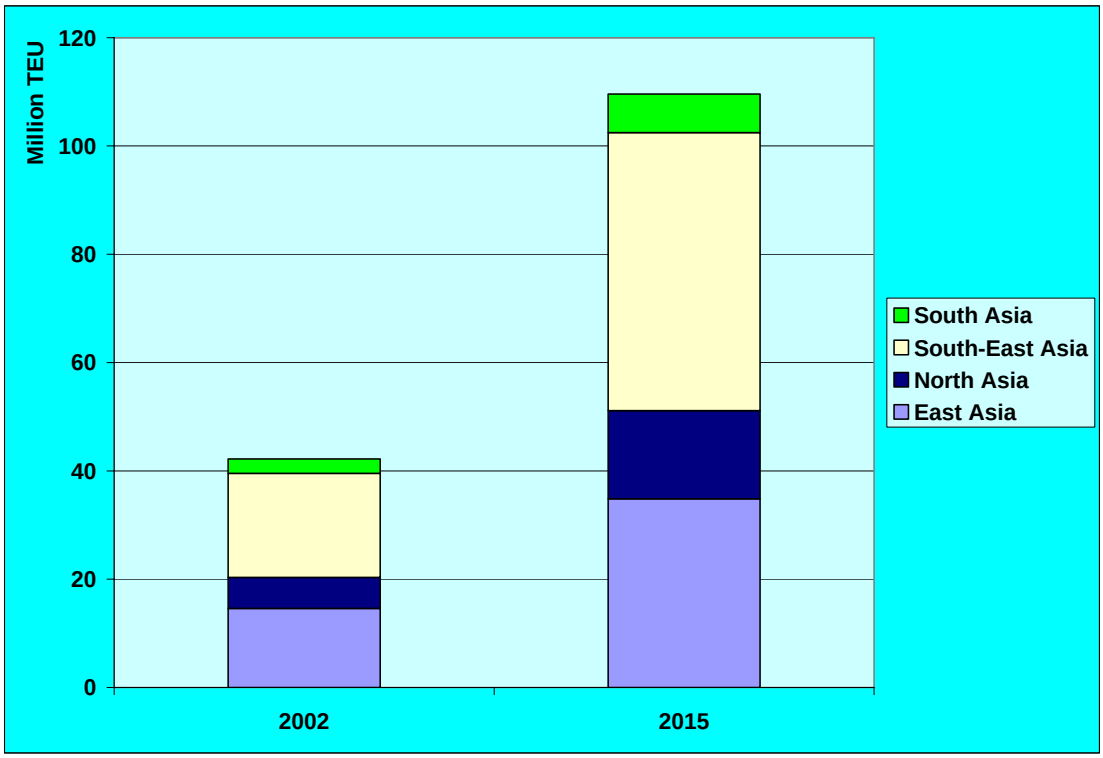
The most robust conclusion from the analysis is that the South-East Asian ports, such as Singapore, Port Klang and Port of Tanjung Pelepas, are likely to gain significantly from the introduction of very large ships operating on highly streamlined routes and the reduction in direct calls at other neighbouring ports in the subregion.

In East Asia, Shanghai is an obvious candidate for a trans-shipment hub in mainland China with its massive hinterland volumes expected by the end of the forecast period.

Recent opening of Yangsan Container Terminal is expected to lead to a reduction in the number of direct calls by major services at other ports of mainland China, contributing to the increased trans-shipment opportunity at Shanghai.

Port of Hong Kong is also to command very large gateway volumes, and has a well-established trans-shipment role that could be further enhanced.

Figure 5-5: Trans-shipment volumes by subregion (2002 – 2015)

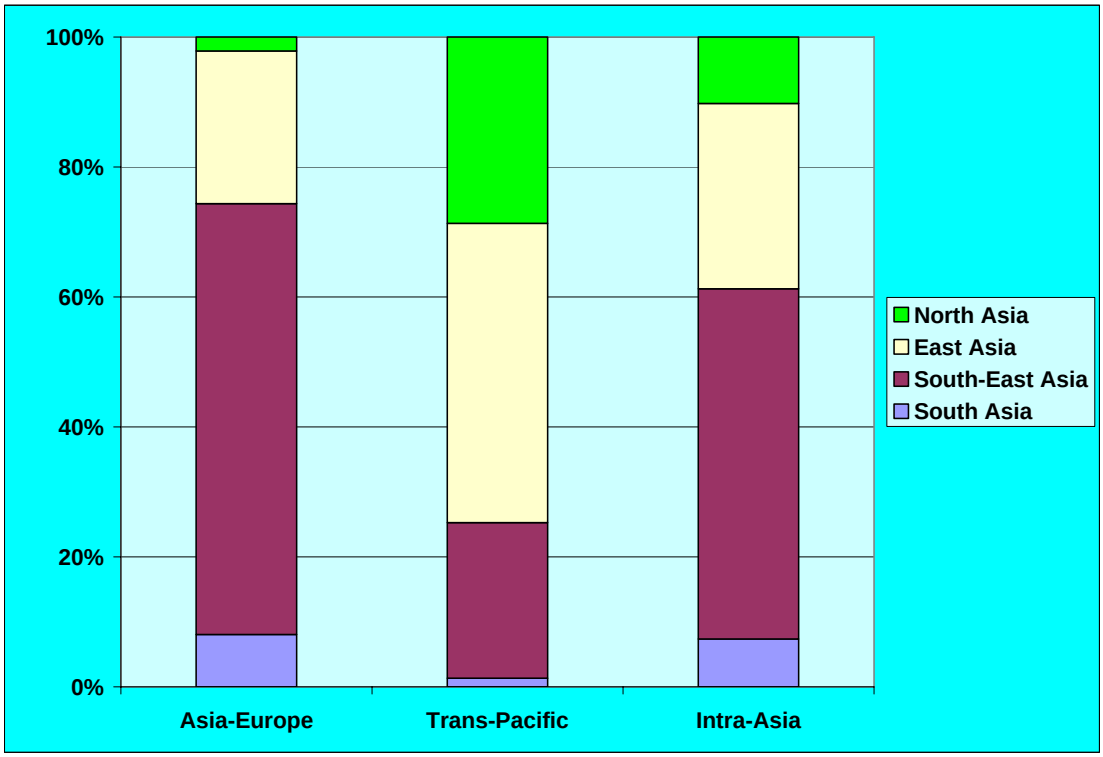


In North Asia, ports of the Republic of Korea are most likely to gain. The study estimates show that although the emergence of Shanghai as a major trans-shipment hub could be a threat, Busan will continue to play an important role in trans-shipment business.

There also appears to be some potential for an increase in volumes at Colombo. It should be noted that the model does not take into account physical constraints in the port: implicitly, it has been assumed that the dredging and other works required to accommodate the largest vessels will be undertaken. The model suggests that, as South Asian volumes grow, the additional of a Colombo call to services between Asia and Europe will become increasingly attractive to lines seeking to fill very large vessels on a streamlined service. The deviation involved in making the call is minimal, and provides access to a range of markets on the West Coast of India and Pakistan.

Figure 5-6 shows the market share of individual trans-shipment ports by trade route. In the Asia-Europe route, ports of Singapore, Hong Kong and Tanjung Pelepas are expected to continue to dominate the trans-shipment business. In the trans-Pacific route, ports of Hong Kong and Busan will handle around 60 per cent of the total trans-shipment volume. In intra-Asian trade, Singapore will dominate the trans-shipment. The study estimates show that ports of Singapore and Hong Kong will remain as the main trans-shipment ports of the region.

Figure 5-6: Trans-shipment shares by trade route (2015)



6. CONTAINER BERTH REQUIREMENTS

The study estimates that the number of containers handled within the ESCAP region will more than double over the next decade. While there remains room for productivity improvements in some ports of the region, in many instances port productivity in Asian ports – as measured by throughput per metre of berth provided – in already very high. The expected increase in port throughput will therefore demand considerable investment in additional container berths.

The study attempts to estimate the number of berths that would be required. Estimating port capacity is a complex and often contentious issue, and precise estimates require the application of detailed simulation models and data on vessel arrival patterns and service times. Such detailed analysis is clearly beyond the scope of the present study. However, it is possible to obtain a good overall appreciation of the scale of the task that will be faced by port managers of the ESCAP region using a simple methodology.

In general, the throughput that can be achieved per berth at a particular port will increase with the size of the average container exchange, the average size of ships visiting the port, and the level of port equipment. In general, there is a systematic correlation between the 'status' of the port and these factors: global hub ports tend to handle large ships discharging high box numbers at well-equipped terminals. Local ports tend to handle small, often semi-container ships discharging modest volumes of containers at multi-purpose berths. It is not difficult to derive reasonable indicative performance benchmarks for each type of port. Applying these benchmarks to the expected increase in container volumes provides a reasonable estimate of the number of additional berths that will be required over the next decade.

On the other hand, because berths at major hubs need to provide extensive land backing, deep water alongside the berth, and sufficient cranage to handle large volumes in a short period, the cost of providing an additional berth at such ports is generally higher.

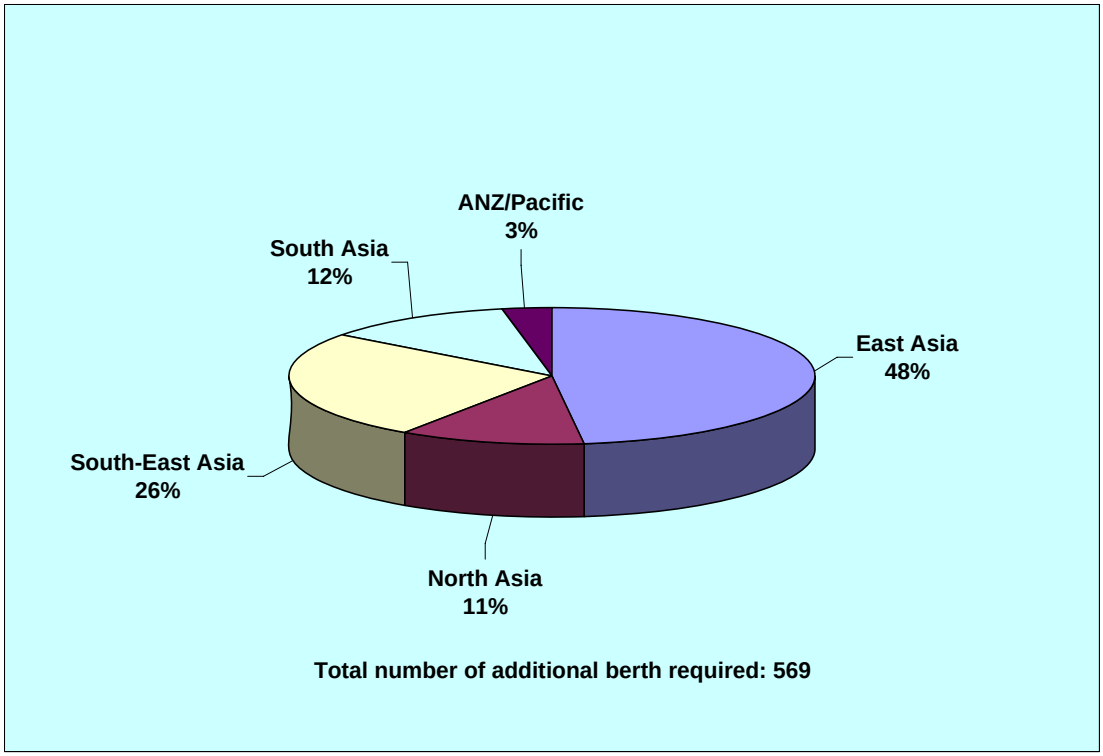
For the purpose of estimating future berth requirements, ports were divided into five different classes, and an indicative throughput per berth and construction cost per berth assigned to ports in each class.

Table 6-1: Port classification and indicative throughput per berth

Port Class	Description	Throughput per berth	Indicative Cost per berth
1	World class hub port	500,000 TEU	US$80m
2	Major port with many mainline services	400, 000 TEU	US$60m
3	Important secondary port	350,000 TEU	US$60m
4	Feeder or regional port	250,000 TEU	US$40m
5	Minor port using multipurpose facilities	150,000 TEU	US$40m

The study estimates that, in total, 927 new container berths will be required to meet anticipated world demand in 2015, of which 569 berths will be for the ESCAP region. The biggest share of this total is accounted for by East Asia (China including Hong Kong, China and Taiwan Province of China), which will require over 270 new berths by 2015. South-East Asia and North Asia will require 148 and 65 new berths, respectively. It is estimated that 66 additional berth will be needed in the South Asia subregion including Islamic Republic of Iran and Turkey.

Figure 6-1: Subregional shares of new container berth requirements (2002–2015)

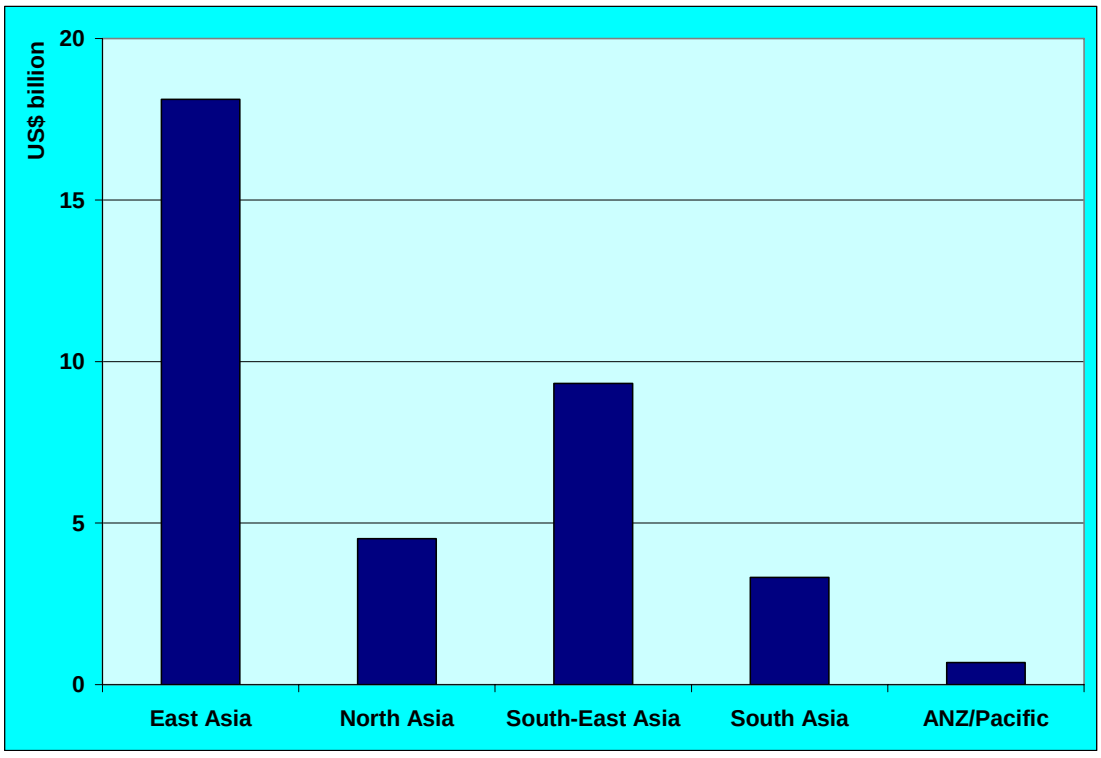


Obviously, this will entail very significant capital expenditure. Precise investment requirements will depend on the particular conditions that prevail at each new

development site. However, based on typical costs to develop new infrastructure and procure the handling equipment required to allow the terminal to operate at a satisfactory level of efficiency, the total capital required has been estimated at approximately US$55 billion, of which US$36 billion for the ports in the ESCAP region.

It should be noted that the costs presented in Figure 6-2 include only the cost of developing the terminals themselves. Substantial additional investment will also be required to secure adequate access to the terminals by road, rail and inland waterways, which will be essential for the effective distribution of containers to expanded port hinterlands. The additional costs of dredging, the provision of breakwaters and the establishment of land transport links and intermodal interchanges could easily double this total. Devising appropriate strategies to mobilize this investment will be a major challenge for the governments of the region over the next decade.

Figure 6-2: Estimated cost of additional berth provision by subregion (2002–2015)



REFERENCES

American Shipper, various issues

Ashar, Asaf (1999), "The fourth revolution", *Containerisation International*, December 1999.

Brooks, M (2000), "Sea Change in Liner Shipping: Regulation and Managerial Decision-Making in a Global Industry".

BRS (2004), *Cellular Fleet Growth 2004-2007.*

BRS (2005), *The Containership Market in 2004.*

Butz, D. A. (1998), "Seize the Day!", *American Shipper*, October.

Calderwood, J. A. (1999), "Shipping Reform: The Prospects", *Transportation and Distribution*, Volume 40 Issues 8.

Containerisation International, various issues.

Containerisation International Yearbook, various issues.

Drewry Shipping Consultants (2001), *Post-panamax containership: the next generation.*

Drewry Shipping Consultants (2003), *Intra-Asia Container Trade: Dynamism Beyond Bounds.*

Drewry Shipping Consultants (2005), *The Drewry Annual Container Market Review and Forecast 2005/06*

ESCAP (1992), *Prospects for Container Shipping and Port Development (ASAEN Subregion)*

ESCAP (1993), *Prospects for Container Shipping and Port Development (South Asia Subregion)*

ESCAP (1993), *ESCAP/UNDP Maritime Policy Planning Model: Manual and Computer Software for Regional Container Flows and Shipping Requirements.*

ESCAP (1994), *Prospects for Container Shipping and Port Development (East Asia Subregion)*

ESCAP (1997), *Prospects for Container Shipping and Port Development (Intraregional Study)*

ESCAP (2001), *Regional Shipping and Port Development Strategies under a Changing Maritime Environment.*

European Liner Affairs Association (2004), "Response to the Commission White Paper on the Review of Regulation 4056/86", December 2004 (http://europa.eu.int/comm/competition/antitrust/others/maritime/white_paper/elaa_european_liners_affairs_association.pdf)

Fearnleys (2005), *Review 2004*

Harrington, L. (1999), "A new era dawns", *Industry Week*, 4th January, Volume 248 Issue 1.

IMF (2004), *World Economic Outlook April 2004.*

Notteboom, Theo E. (2004), "Container Shipping and Ports: An Overview", *Review of Network Economics*, June 2004, vol. 3, no. 2.

OECD (2004), *Report on Container Transport Security across Modes – Executive Summary*, May 2004 (http://www.oecd.org/dataoecd/29/8/31839546.pdf)

UNCTAD (2004), *Review of Maritime Transport 2004*

WTO (2004), *International Trade Statistics 2004*

WTO (2005), *World Trade Report 2005*.