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Intermodal Logistics
Unlocking Value

ASIAN INSTITUTE OF TRANSPORT DEVELOPMENT

Intermodal Logistics: Unlocking Value

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Preface

For about 25 years now, national barriers to trade and investment have been dismantled at an unprecedented pace, leading to a degree of integration of product and financial markets that is reminiscent of the pre-twentieth century global economic arrangements. One of the consequences of this has been the spread of production facilities across national borders. Thus, what was started by US multinational firms in the 1960s in Europe has now become a global trend. The result is hugely enhanced volumes of international and regional trade as firms look to the cheapest sources of supply in an increasingly competitive world.

Given its lower labour costs, its imperatives for catching up, its need to raise the levels of domestic prosperity and a host of other reasons, Asia has emerged as the world's manufacturing centre and a significant absorber of capital. Forty-five of the world's top 100 container ports are in Asia. More than half of world's export containers are shipped from Asia and 65 per cent of world container traffic is attributed to Asian ports. Asia, in short, is where the world's economic future lies.

But the improved competitive climate that has been generated has also led the firms to look for maximum possible reduction in costs. And one of the major areas where such reduction has been achieved is the supply chain management. By making the cost of acquisition of goods as low as possible, a virtual cornucopia of value has been unlocked. Reducing costs by 1 per cent on $500 billion of trade means a saving of $5 billion.

Much of this has been achieved by a new science that is called logistics. Integrated intermodal transport is a key element in logistics. It consists, at its core, of efficient supply management, in which transport management plays the central role. At present, logistics cost account for 10-20 per cent of GDP, depending on the state of infrastructure in different countries. The problem for the emerging countries is that whereas freight cost as a percentage of import value in developed countries averages 2.9 per cent, in developing countries it is around 6 per cent. Clearly, reductions in logistics costs represent huge savings. As the management guru Peter Drucker has said, “The last frontier of management to conquer is logistics and supply chain management.”

This volume focuses our attention on intermodal logistics. It covers, inter alia, the spectrum of change in worldwide transport sector across shipping, ports, roads and railways. It brings out the efficacy and benefits of modal integration, and the need to percolate its advantages to remote hinterlands and landlocked regions. It then suggests that a network of dry ports and freight nodes as well as concomitant facilitation measures and institutional frameworks would help in this regard.

The monograph is the outcome of painstaking research of Raghu Dayal, Director (Logistics) in the Institute. In this task, he bring to bear his long years of rich experience in ministries of railways and commerce in India before moving over to the Container Corporation of India as its founder managing director. He has an abiding interest in the subject and dwells on it in various forums. This publication is indeed a continuum of his efforts of years.

I am confident that the publication will contribute hugely to the understanding of a subject that has not received enough attention and will thereby encourage governments in the region to take such necessary steps as are needed to improve the logistics in their own countries. In fact, this publication is in response to a need keenly expressed by a conclave of the BIMSTEC-Mekong-Ganga Cooperation countries. This, I believe, will help their economies achieve meaningful savings in costs which, in turn, will enable them to compete more effectively in the global markets.

K. L. Thapar

Abbreviations

ACP	-	Accredited Clients' Programme
ADB	-	Asian Development Bank
AGV	-	Automated Guided Vehicle
AH	-	Asian Highways
AITD	-	Asian Institute of Transport Development
ALTID	-	Asian Land Transport Infrastructure Development (Project)
AMBDC	-	ASEAN Mekong Basin Development Cooperation
APEC	-	Asia-Pacific Economic Cooperation
ARX	-	ASEAN Rail Express
ASA	-	American Standards Association
ASEAN	-	Association of Southeast Asian Nations
BG	-	Broad Gauge
BIMSTEC	-	Bangladesh-Myanmar-Sri Lanka-Thailand Economic Cooperation
BR	-	Bangladesh Railways
CAGR	-	Compound Annual Growth Rate
CAR	-	Central Asian Republics
CES	-	Container Freight Stations
CHA	-	Customs House Agents
CIS	-	Commonwealth of Independent States
CONCOR	-	Container Corporation of India Ltd.
CTD	-	Combined Transport Document
DGFT	-	Directorate General of Foreign Trade
DPW	-	Dubai Ports World
ECO	-	Economic Cooperation Organisation
ECT	-	Europe Container Terminal
EDI	-	Electronic Data Interchange
EDIFACT	-	Electronic Data Interchange For Administration, Commerce & Transport
ERTW	-	Equatorial Round the World
ESCAP	-	Economic and Social Commission for Asia and the Pacific
FDI	-	Foreign Direct Investment
FEDAI	-	Foreign Exchange Dealers Association of India
FMC	-	Federal Maritime Commission, USA

OBL	-	Ocean Bill of Lading
GDP	-	Gross Domestic Product
GMS	-	Greater Mekong Subregion
GTPL	-	Global Transport Partner Label
HRD	-	Human Resource Development
ICC	-	International Chamber of Commerce
ICC	-	Inter Commerce Commission, USA
ICD	-	Inland Container Depot
ICEGATE	-	Indian Customs and Exercise Gateway
ICF	-	Intercontainer-Interfrigo
ICRIER	-	Indian Council for Research on International Economic Relations
ICP	-	Integrated Check Post
ICTT	-	International Container Transhipment Terminal (Vallarpadam)
IGM	-	Import General Manifest
IMC	-	Inter Ministerial Committee
IPA	-	Indian Ports Association
IR	-	Indian Railways
IRU	-	International Union of Railways
ISL	-	Institute of Shipping Economics and Logistics (Bremen)
ISO	-	Indian Standards Organisation
IT	-	Information Technology
JNP	-	Jawaharlal Nehru Port
KITA	-	Korea International Trade Association
KMI	-	Korea Maritime Institute
KTMB	-	Keretapi Tanah Melayu Berhad
Lao PDR	-	Lao People’s Democratic Republic
LC	-	Letter of Credit
LCL	-	Less than Container Load
MG	-	Metre Gauge
MGC	-	Mekong-Ganga Cooperation
MLB	-	Main landbridge
MPPM	-	Maritime Policy Planning Model
MSE	-	Mediterranean Shipping Company
MT	-	Multimodal Transport
MTGA	-	Multimodal Transport of Goods Act
MTO	-	Multimodal Transport Operator

NMDP	-	National Maritime Development Programme
NSICT	-	Nhava Sheva International Container Terminal
NVO-MTO	-	Non-Vessel Operating Multimodal Transport Operator
OECD	-	Organisation for Economic Cooperation and Development
PPP	-	Public Private Partnership
PSU	-	Public Sector Undertaking
RFID	-	Radio Frequency Identification Device
RITES	-	Rail India Technical and Economic Services Ltd.
RMG	-	Rail-Mounted Gantry
RMS	-	Risk Management System
RORO	-	Roll-on Roll-off
SAARC	-	South-Asian Association for Regional Cooperation
SKRL	-	Singapore Kunming Rail Line
SPA	-	Singapore Port Authority
SRT	-	State Railway of Thailand
SSCP	-	Sethusamudram Ship Canal Project
TAMP	-	Tariff Authority for Major Ports
TAR	-	Trans-Asian Railway
TCR	-	Trans-Continental Railway
TEU	-	Twenty-foot Equivalent Unit
TIR	-	Transports Internationalaux Routiers (UN Road Transport Protocol)
TKR	-	Trans-Korean Railway
TOFC	-	Trailor on Flat Car
TSR	-	Trans-Siberian Railway
TT Club	-	Through Transport Club
ULD	-	Unit Load Device
UNCITRAL	-	United Nations Commission on International Trade Law
UNCTAD	-	United Nations Conference on Trade & Development
UNECAFE	-	United Nations Economic and Social Commission for Asia and the Far East
UNESCAP	-	United Nations Economic and Social Commission for Asia and the Pacific
USEC	-	United States East Coast
USWC	-	United States West Coast
VO-MTO	-	Vessel Operating Multimodal Transport Operator
YOY	-	Year-on-Year

Contextual Information

Economy

World Economy

GDP (estimated: 2005)	US$ 43.92 trillion
GDP (PPP) (estimated: 2005)	US$ 59.38 trillion
GDP per capita	US$ 5,755
GDP per capita (PPP)	US$ 9,300
Annual growth of GDP per capita (PPP)	1950-2003: 2.1%, trailing ten years: 4.0%

Source: Compiled by AITD

World Economic Growth: 2002-05*

	2002	2003	2004	2005
World	1.8	2.7	4.1	3.6
Developed countries	1.2	2.0	3.1	2.7
Developing countries	3.8	5.1	7.0	6.2
Developing economies excluding China	2.6	3.9	6.2	5.3

Source: UNCTAD ** Percentage change over previous year*

World's Top 15 Economies: 2004*

	Population (million)	GDP ($ million)	Merchandise Trade ($ million)	
			Exports	Imports
World	6,345.1	40,887,837	9,122,837	9,338,667
United States	293.5	11,667,515	819,026	1,526,380
Japan	127.8	4,623,398	565,490	454,530
Germany	82.6	2,714,418	914,839	717,491
United Kingdom	59.4	2,140,898	345,610	461,983
France	60.0	2,002,582	451,034	464,094
Italy	57.6	1,672,302	346,060	349,049
China	1,296.5	1,649,329	593,369	561,423
Spain	41.3	991,442	178,960	249,813
Canada	31.9	979,764	321,967	275,799
India	1,079.7	691,876	72,530	95,156
Republic of Korea	48.1	679,674	253,910	224,440
Mexico	103.8	676,497	188,627	206,423
Australia	20.1	631,256	86,582	107,763
Brazil	178.7	604,855	96,474	65,904
Russian Federation	142.8	582,395	183,185	94,834

Source: The World Bank: World Development Report, 2006
** Top 15 economies, in order of GDP*

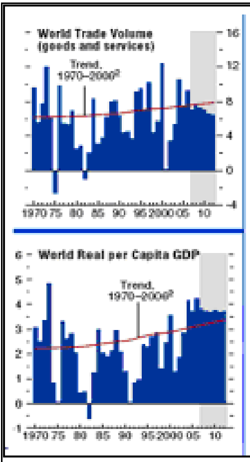
Indices of Selected Countries

Country	Area (km²)	Population	GDP (PPP): US$ million	GDP (PPP): US$ per capita
USA	9,631,418	300,000,000	12,980,000	43,500
China	9,596,960	1,306,847,624	10,000,000	7,600
Japan	377,873	128,085,000	4,220,000	33,100
India	3,287,590	1,102,600,000	4,042,000	3,700
Germany	357,050	82,438,000	2,521,699	30,579
Russia	17,075,200	143,782,338	1,723,000	12,100
Brazil	8,514,877	188,078,261	1,594,482	9,108
Canada	9,984,670	32,507,874	1,165,000	35,200

Source: CIA World Factbook 2005, IMF WEO Database: 2004
Data for China does not include Hong Kong, Macau and Taiwan

Trade

World Trade and GDP Growth



	2000	2001	2002	2003	2004	2005	2006
World Trade Volume	12,3	0,2	3,4	5,4	10,6	7,4	9,2
World Real per Capita GDP	3,6	1,3	1,9	2,8	4,1	3,7	4,2

Source: IMF, World Economic Outlook: Spillovers and Cycles in the Global Economy, April 2007 (goods and services, by PPP)

figures represent percentage growth over previous year

Growth of Merchandise Trade (volume)*

	Exports 2004	Exports 2005	Imports 2004	Imports 2005
North America	8.0	6.0	10.5	6.5
European Union (25)	7.0	3.5	6.0	2.5
Africa + Middle East	7.0	7.5	13.5	12.0
Latin America	12.5	10.0	18.5	14.0
Asia	14.0	9.5	14.0	7.5
Japan	10.5	1.0	7.0	2.5
China	24.0	25.0	21.5	11.5

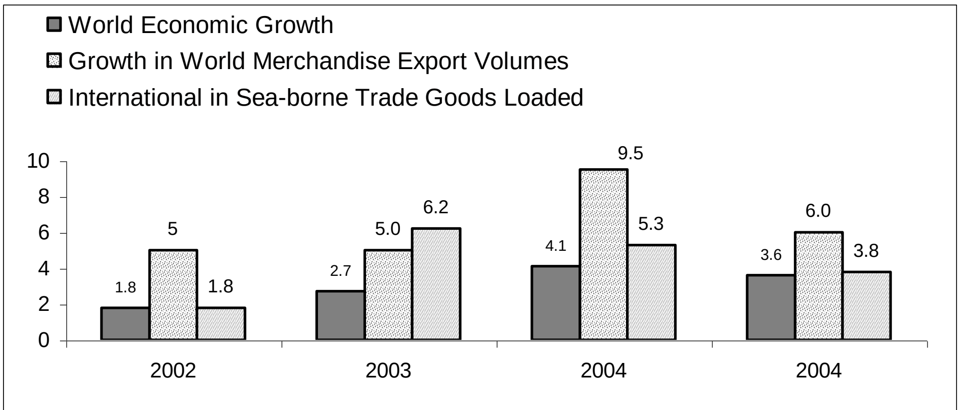
Source: WTO * *Percentage Share*

International Seaborne Trade*

Year	Tanker cargo		Dry cargo				Total (all goods)	
			Total		of which main bulk commodities			
	million tons:'000	% change	million tons:'000	% change	million tons:'000	% change	million tons:'000	% change
2002	2139		3981		1352		6120	
2003	2226	4.1	4274	7.4	1475	9.1	6500	6.2
2004	2318	4.1	4528	5.9	1587	7.6	6846	5.3
2005	2422	4.5	4687	3.5	1701	7.2	7109	3.8

Source: UNCTAD * *Goods carried*

Trade Trends*



Source: UNCTAD - Review of Maritime Transport, 2004, 2005, 2006
* *Percentage change over previous year.*

Ocean Carriers

Types of Vessels

Category of Vessels	Period	Average DWT	Average TEU	Average LOA*	Average Beam*
Panamax	2003-04	53,587	4,359	363.10	32.20
	2007-08	46,417	3,842	-	-
Post Panamax	2003-04	79,758	6,425	298.36	41.09
	2007-08	99,000	8,100	-	-
Bulk Vessel	2003-04	68,366	-	201.00	31.60
	2007-08	76,214	-	-	32.30
Tanker	2003-04	91,841	-	214.00	36.30
	2007-08	107,927	-	208.00	37.10
LNG	2003-04	69,125	-	279.80	43.80
	2007-08	76,210	-	284.50	48.10

Source: G.E.C. Inc. based on Clarkson Register, 2004 * *Metre*

Classification of Container Vessels

Small Feeder Vessel: Ship of less than 1,000 TEU capacity. It has a beam generally of less than 23 m. (normally for short container transportation)

Feeder Vessel: Ship with a capacity between 1,000 and 2,500 TEU. It has a beam generally of 23-30 m.

Panamax Vessel: Ship which has the dimensions considered maximum to pass through the Panama Canal – width (beam): 32.3 m; maximum overall ship length: 294.1 m; maximum draught: 12.0 m. The vessel can carrying up to 2,500-4,500/5,000 TEU. For bulk carriers and tankers, Panamax size is defined as 32.2/32.3 m (106 ft) width, length:225.0 m for bulk carriers and 229.6 m for tankers, and draught of 12.0 m.

Post-Panamax Vessel: Ship with a capacity of 4,500/5,000-10,000 TEU. (The first post-Panamax container ship was built in 1988 with a width of over 32.3 m)

Suezmax Vessel: Ship with a capacity of 10,000 – 12,000 TEU (Ultra large container ship – ULCS – carrying about 12,000 TEU; the ship size width: 50 m/57 m; draught: maximum 16.4 m for passing through the Suez Canal).

Post-Suezmax Vessel: Ship with a capacity of some 18,000 TEU – width: 60 m; draught: maximum 21 m. A post-Suezmax ship has its cross section too big for the present Suez Canal.

Malaccamax Vessel: A draught of 21m is maximum permissible through the Malacca Straits; hence the term Malaccamax.

Generation of Container Vessels

	Length (m)	**Draught (m)**	**Capacity (TEU)**
First Generation (1956-1970)	135*-200**	Below 9	500-800
Second Generation (1970-80) (Cellular Containership)	215	10	1,000-2,500
Third Generation (1980-1988) (Panamax Class)	250-290	11-12	3,000-4,000
Fourth Generation (1988-2000) (Post-Panamax)	275-305	11-13	4,000-5,000
Fifth Generation (Post Panamax +)	335	13-14	5,000-8,000

* *Converted cargo vessel* ** *Converted tanker*

Containers

Container Types - ISO

Type	**Outside Dimensions**	**Inside Dimensions**	**Top Opening**	**Cubic Capacity**
20’ dry	6.045 m 2.438 m 2.438 m	5.918 m 2.337 m 2.210 m		31 cbm 1078 cu ft
20’ dry high cube	6.045 m 2.438 m 2.591 m	5.918 m 2.337 m 2.413 m		33 cbm 1178 cu ft
20’ refrigerated	6.045 m 2.438 m 2.438 m	5.385 m 2.159 m 1.956 m		23 cbm 803 cu ft
20’ open top	6.045 m 2.438 m 2.438 m	5.918 m 2.337 m 2.286 m	L: 541 m W: 221 m	32 cbm 1416 cu ft
20’ flatrack	6.045 m 2.438 m 2.438 m	5,639 m 2.413 m 2.311 m		
20’open side/top	6.045 m 2.438 m 2.438 m	5,918 m 2.337 m 2.210 m	L: 541 m W: 221 m	31 cbm 1078 cu ft
40’ dry	12.192 m 2.438 m 2.591 m	12.040 m 2.337 m 2.338 m		67 cbm 2392 cu ft
40’ dry high cube	12.192 m 2.438 m 2.896 m	12.040 m 2.337 m 2.692 m		78 cbm 2675 cu ft
40’ reefer	12.192 m 2.438 m 2.591 m	12.040 m 2.235 m 2.159 m		58 cbm 2052 cu ft
40’reefer high cube	12.192 m 2.438 m 2.743 m	12.040 m 2.235 m 2.311 m		62 cbm 2197 cu ft
40’ reefer high cube	12.192 m 2.438 m 2.896 m	12.040 m 3.286 m 2.489 m		69 cbm 2419 cu ft
40’ open top	12.192 m 2.438 m 2.438 m	12.040 m 2.337 m 2.261 m	L: 11.58 m W: 2.16 m	64 cbm 2246 cu ft
45’ dry cube	13,716 m 2.436 m 2.896 m	13.564 m 2.286 m 2.692 m		85 cbm 304 cu ft

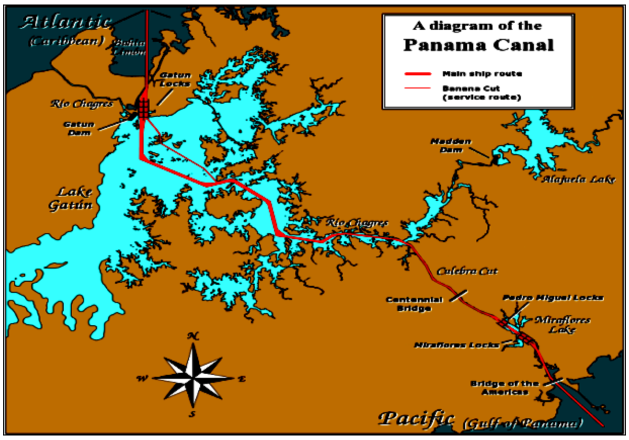
Container Standards*

Nominal Length	Nominal height	Nominal Width	Gross Weight
40 ft	8 ft	8 ft	30480 kg
40 ft	8 ft 6 in	8 ft	30480 kg
30 ft	8 ft	8 ft	25480 kg
30 ft	8 ft 6 in	8 ft	25480 kg
20 ft	8 ft	8 ft	20320 kg
20 ft	8 ft 6 in	8 ft	20320 kg
10 ft	8 ft	8 ft	10160 kg

** Approved by ISO TC 104 for dry freight – Series one*

Waterways

Panama Canal: The 80 km Canal connects the Atlantic and Pacific Oceans traversing the Isthmus of Panama in Central America. It helps avoid the long route via the Cape Horn located at the southernmost tip of South America. A ship sailing from New York to San Francisco via the canal has to cover sail a distance of 9,500 km as against 22,500 km via the route around Cape Horn.



The lock chambers of the Canal are 30.5m long and 33.5m wide; the maximum depth is 12.5-13.7m. The passage takes eight hours. It has two lanes; a third lane with an increased lock chambers is contemplated for ships of up to 12,000 TEU.

Malacca Straits: One of the world's oldest and busiest shipping lanes, Malacca Straits is situated between the coastline of Thailand, Malaysia and Singapore to the east and the Indonesian island of Sumatra to the west. Linking the Indian and Pacific Oceans, the straits of Malacca is the shortest sea route between India, China and Indonesia. At its shallowest, it has a reported depth of 25 metre. More than 50,000 vessels transit annually the 990 km long strait, and transport about 30% of the world's trade and 80% of Japan's oil needs.

Suez Canal: The canal is about 163 km long and 80-135m wide. It has no lock chamber. Most of the canal has a single traffic lane, with several passing bays. An increase in its depth is intended before 2010, in order to capture the larger container ships to be built.

Land and Sea Bridging

Minibridge: An intermodal movement of cargo involving a vessel leg from one country to a port in another country, and then a movement via truck or rail to another port in that country, and there the voyage is terminated. The traversing of the land in the second country from discharge port to destination port is the "minibridge" portion of the movement. There could be a similar but opposite combined "minibridge" movement in the other direction. The minibridge offers the consignor a through container rate inclusive of the rail freight up to the final port in the country of destination. Railways may be paid a flat rate per container by the ocean carrier for the rail transit. This system is in operation in certain routes covering the trade between the United States and the Far East, Europe, Australia, etc.

Landbridge: concerns itself with shipment of containers overland as a part of a sea-land or a sea-land-sea route. Railways may be paid a flat rate by the ocean carrier who issues the through bill of lading. This system is in operation for the movement of containers

– between Europe or the Middle East and the Far East via the Trans-Siberian landbridge

– between Europe and the Far East via the Atlantic and Pacific coasts of the USA, continental USA being used as a landbridge.

Piggyback: is a combination of transport by road and rail. It combines the speed and reliability of rail on long hauls with the door-to-door flexibility of road transport for collection and delivery. Goods are packed in trailers and hauled by tractors to a railway station, where the trailers are moved on to railway flat cars; the tractors which stay behind are then disconnected. At destination, the tractors again haul the trailers to the consignee premises.

The system is undergoing refinement by the introduction of the “trailer train”, which uses the same trailer as a vehicle on the road and a rail vehicle on the rail. The trailer moves on its wheels as a truck on the road but the wheels can be retracted by an air suspension system and connected to a wagon bogie for movement by rail. At the end of rail journey, the conversion back to the road vehicle is effected for delivery of the goods to the customer.

Seatrain: Another innovation in the multimodal transport system involves the use of rail and ocean transport. It was originally adopted in the USA. It is similar to the Roll-on, Roll-off system except that, in place of the ro-ro vehicle, a rail car is used so that geographically separated rail systems can be connected by the use on an ocean carrier.

Regional Bodies

ASEAN

Association of Southeast Asian Nations (ASEAN) was formed in 1967. The present membership includes: Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar Philippines, Singapore, Thailand, Vietnam. Its aims include the acceleration of economic growth, social progress, cultural development among its members, and the promotion of regional peace. The Association includes about 8% of the world's population; in 2003, it had a combined GDP of about US$ 700 billion.

ARF

The ASEAN Regional Forum (ARF) is an informal multilateral dialogue in Asia Pacific region. Its objectives are to foster dialogue and consultation, and promote confidence-building in the region. Its current participants include ASEAN, Australia, Bangladesh, Canada, China, European Union, India, Japan, North Korea, South Korea, Mongolia, New Zealand, Pakistan, Papua New Guinea, Russia, Timor-Leste, United States and Sri Lanka.

SAARC

The South Asian Association for Regional Cooperation (SAARC) is an economic and political organization of eight countries in Southern Asia. It was established on 8 December 1985 by India, Pakistan, Bangladesh, Sri Lanka, Nepal, Maldives and Bhutan. Afghanisatan is the latest member to join. In terms of population, its sphere of influence is the largest among regional organizations with almost 1.5 billion people, comprising the population of its member states. The average population density of this region, 310 persons per sq. km, is nearly seven times the world average.

BIMSTEC

Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) was established in 1997. The present membership includes: Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, Thailand. The regional body has emerged as an important geo-political factor, as a natural bridge between South Asia and South East Asia.

MGC

Mekong-Ganga Cooperation (MGC) was established in 2000. Its membership includes: Thailand, Myanmar, Cambodia, Lao PDR, Vietnam, and India. The emphasis of the cooperative arrangement is on four areas namely, tourism, culture, education, and transportation linkages.

SCO

Shanghai Cooperation Organization (SCO) was set up in April 1996. Its members include China, Kazakhstan, Kyrgyzstan, Russian Federation, Tajikistan and Uzbekistan.

ECO

Economic Cooperation Organization (ECO), is an intergovernmental regional organization for the purpose of promoting economic, technical and cultural cooperation among the Member States. The current membership includes: Islamic State of Afghanistan, Azerbaijan Republic, Islamic Republic of Iran, Republic of Kazakhstan, Kyrgyz Republic, Islamic Republic of Pakistan, Republic of Tajikistan, Republic of Turkey, Turkmenistan and Republic of Uzbekistan. The Secretariat of ECO is based at Tehran, Iran.

OECD

Organisation for Economic Cooperation and Development (OECD) is an international organisation of those developed countries that accept the principles of representative democracy and a free market economy. It originated in 1948 as the Organisation for European Economic Cooperation (OEEC) to help administer the Marshall Plan for the reconstruction of Europe after World War II. Later, its membership was extended to non-European states also and, in 1961, it was re-formed into the Organisation for Economic Cooperation and Development. The OECD headquarters are located in Paris, France. The present membership includes: Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland , Ireland , Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, Japan, Finland, Australia, New Zealand, Mexico, Czech Republic, Republic of Korea, Hungary, Poland, and Slovakia.

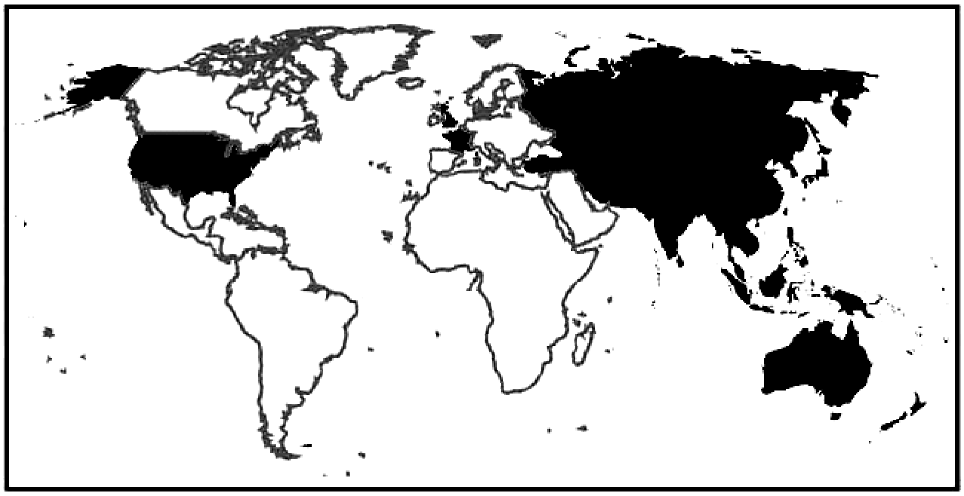
APEC

The Asia-Pacific Economic Cooperation (APEC) headquartered at Singapore is an economic forum for a group of 21 Pacific Rim countries to discuss matters of regional economy, cooperation, trade and investment. Its membership includes: Australia, Brunei, Canada, Chile, China, Hong Kong, Indonesia, Japan, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, Philippines, Singapore, Republic of Korea, Taiwan, Thailand, United States, and Vietnam.

UN and the Region

ESCAP

The Economic and Social Commission for Asia and the Pacific (ESCAP) is the regional development arm of the United Nations and serves as the main economic and social development centre for the United Nations in Asia and the Pacific. Its mandate is to foster cooperation between its 53 members and 9 associate members. ESCAP provides the strategic link between global and country-level programmes and issues. The ESCAP office is located in Bangkok, Thailand.



The shaded areas of the map are ESCAP Members and Associate Members

Chapter 1

Globalisation and Logistics: The Container Revolution

An unstoppable wave of globalisation encompassing, among others, opening of borders and lowering of trade barriers and tariffs has compelled nations to redesign and restructure their economic and logistics strategies. The key features include a high degree of integration of national and international production systems with commensurate logistics support for attaining speed, efficiency, reliability, and cost-effectiveness. Globalization itself is driven by the integration of various kinds of networks, leading to seamless, fast and affordable connections, and an extended market size which allows for a high level of international specialization.

Globalisation is reflected in an ever wider geographical sourcing of supplies and wider distribution of finished products. Measures to improve the efficiency of information and transport systems have played a major role in the development towards globalisation, making it less expensive, quicker and safer to purchase goods from remote supplier markets and distribute goods to remote customer markets.

Globalisation, as a rule, refers to the reduced impediments to the movement of goods, people, information, and finance across national boundaries. Two major contributory factors of globalisation are: (i) a substantial decline in transportation costs in real terms as also costs of communication; and (ii) a shift in national-level trade tariffs and policies, facilitating international trade and investment. Containerisation of general cargo transport that allows for extensive use of automation has helped cut its unit costs dramatically. Increased economies of scale have combined with the build-up of vibrant global networks.

Dynamics of Change

Globalisation and the restructuring of logistics systems, involving concentration of production and inventory facilities, lead to increases in the distances over which goods are transported, which, in turn, favours the use of intermodal transport. The change towards a greater use of freight integration in many countries is compelled by the worsening congestion on the roads, and the rising distances over which goods are being transported, rendering intermodal transportation desirable.

Conducive to the globalisation process are the two technological 'revolutions': information and transportation. During the second half of the 20th century, two 'revolutions' occurred, affecting the business of transport and freight forwarding industry: one, the advent of containerisation; and the other, the switchover from paper handling procedures to electronic data interchange (EDI).

The container, or the 'box' has lent a new dimension to logistics, and provided meaning and substance to integrated intermodal concept. The shippers of producer goods not only look for speed, reliable door-to-door services, but also for a complete logistics solution, which necessitates multimodal integration.

The genesis of the current phase of containerised goods transit was the pioneering initiative of Malcom Purcell McLean's sailing of *Ideal-x* on 26 April 1956 from Newark, New Jersey, to Houston in the United States with 15,000 tonne of bulk petroleum and 58 large metal boxes containing cargoes unloaded directly onto trucks. Containerisation is the technique or practice of stowing freight in reusable containers of uniform size and shape for transportation. Containerisation also enables intermodal transport, i.e., total movement by different modes from origin to destination.

> As Malcom McLean recalls, the idea that revolutionised cargo handling the world over that forever changed the nature of shipping came to him one day back in 1937 on a pier in Hoboken, New Jersey. "On board the ship, every sling would have to be unloaded by the stevedores, and its contents put in the proper place in the hold. What a waste in time and money! Suddenly the thought occurred to me; wouldn't it be great if my trailer could simply be lifted up and placed on the ship without its contents being touched? That's when the seed was planted."

It brought about new kinds of cargo ships and dockyard machinery, changed the look of port cities, challenged organised labour, altered domestic transportation methods, and even affected the patterns of world trade. In the words of a former Citicorp chairman, Malcom McLean is one of the few men who changed the world. As a German writer put it, containerisation was the greatest stride in packaging since the paper bag.

Malcom McLean was a North Carolina road haulier, a farmer's son who became a truck driver and later set up the McLean Trucking Company. By the 1950s, he had more than 1,700 trucks, all of which he sold for $6 million, and diversified into shipping with the purchase of the Pan-Atlantic Steamship Corporation, followed by the purchase of Waterman Steamship Corporation. The conversion of six Waterman C2 cargo ships into containerships followed in 1957-58 after which the tankers ceased to carry containers. In 1960, Pan-Atlantic was renamed Sea-land Service Inc. and continued to develop as a major force in the international container field.

On 31 August 1958, *Hawaiian Merchant* sailed from San Francisco with the first shipment of containers, whilst in 1960, her sister *Hawaiian Citizen* became the first full containership in phase II of the programme.

Container – A Standard Unit of Cargo

Unheard of until the 1960s, the container is now widely accepted as the standard unit of cargo for just about every form of manufactured item. Containerisation helps ensure safety of goods, reduce packaging costs, minimize multiple handling risks, and improve speed of transportation. Standardisation of containers has promoted mechanized cargo handling systems. Multimodal transport system reduces loading/unloading costs, besides increasing capacity available at ports.

Break bulk cargo unitization has increased not only in the forms of unitization used but also in the types of cargo subjected to unitization. Lumber, construction materials, project cargo, machinery, automobiles and automobile parts, processed foods, and semi-finished materials are now unitised and subjected to integrated intermodal transportation.

Even dry and liquid bulk cargo moves today in a continuous flow with little port storage and handling. This is achieved by matching rail, water, land or pipeline availability and throughput capacity with ship arrivals.

With growing incidence of outsourcing and offshore manufacturing, the market for containerizable cargo in intermodal transport has changed radically in recent years. Major manufacturers now go farther and farther offshore to capture low labour cost, low taxes, better market accessibility, and other advantages. This has resulted not only in a large increase in containerizable intermodal cargo but also in a significant increase in the distances between origin and destination of intermodal cargoes.

In addition, many developing countries have become large importers of high technology equipment and consumer goods. This has resulted in a major change in the structure of both modal and intermodal transport.

Intermodal and Multimodal Transport

In the context of freight transport, a number of related terms are used: multimodal transport, intermodal transport, and combined transport. The concept of intermodal transport goes a step further than multimodal transport; it implies the use of a standardized loading unit, vehicle or 'container', that can be transferred from one mode of transport to another. The term 'intermodality' has been used to describe a system of transport, whereby two or more modes of transport are used to transport the same loading unit or truck in an integrated manner, without unloading the cargo, in a door-to-door transport chain.

International multimodal transport is defined as " … the carriage of goods by at least two different modes of transport on the basis of a multimodal transport contract from a place in one country at which the goods are taken in charge by the multimodal transport operator (MTO) to a place designated for delivery situated in a different country". *(Article 1 of the United Nations Convention on International Multimodal Transport of Goods).*

The United Nations Economic Commission for Europe defines intermodal transport: *"The movement of goods (in one and the same* *loading unit or a vehicle) by successive modes of transport without handling of the goods themselves when changing modes.*

Unlike multimodal transport, which is characterised by essentially separate movements, involving different transport modes, *intermodal* transport is the integration of shipments across modes. Its goal is to provide a seamless transport system from point of origin to the final destination under one billing and with common liability. In such a system, the relative advantages of each mode of transport are exploited and combined in order to provide the most efficient door-to-door service.

Modern intermodal transport was born with the emergence of railways. On the first railway in the 1830s, horse-drawn carriages were detached from their wheels and loaded onto flat wagons or attached to bogies, to save the travellers the trouble of changing from carts to wagons. Unitization or 'containerisation' on railways was practised in France even prior to World War I, where 2x2x2 metre wide wooden boxes were used which were called 'cadres'. At the same time, an early road-rail-sea tri-modal transport service was operated between Paris and London through Calais and Dover. In 1933, these international ventures led to the establishment of the International Container Bureau.

Pickfords, established in 1646, began their long and close association with railways on 22 November 1830, when their offer of a trip for one contract wagon was accepted. This wagon had a movable body which was transferred between a horse drawn dray and a flat railway truck at each end of the line.

In 1845, Captain Henry Powell was granted a British patent for a system of roller guides for the transfer of containers from road to rail, whilst in the United States, Joseph Woodbury patented his 'freight-cab' (a container system) in 1869.

The need for intermodal capability was earlier addressed by the household removal trade, handling goods highly susceptible to damage and having a complete lack of homogeneousness. They introduced, in the second half of the nineteenth century, furniture *lift vans* capable of being lifted on road off railway wagons and placed on horse drawn drays for road transit. Although this provided a true door-to-door ability, there still remained the problem of versatility due to lack of standards.

The Lancashire and Yorkshire Railway (L&YR), and some Lancashire collieries, employed open containers for coal traffic. The L&YR were also joint owners, with the London and North Western Railway (LNWR), of a shipping service from Fleetwood to Ireland for which containers were introduced in 1920, carrying 1.5 tonne each from London to Ireland. The following year, the LNWR introduced boxes on their service to Ireland via Holyhead.

In the United States, similar development took place. Early in the nineteenth century, the trade in ice from Boston to the West Indies was reportedly carried in containers. A national and international container service commenced in 1906 and, five years later, featured an advertising campaign, depicting a container being loaded onto ship using the vessel's own gear, captioned: "lift-vans can be provided for immediate loading in any city in the United States or in Europe. Their use ensures a minimum of handling, security for small packages and least possible risk of damage."

The container was surprisingly modern, of steel construction measuring 18ft x 8ft and owned by the Bowling Green Storage and Van Co., New York. In 1917, Benjamin Fitch introduced containers in Cincinnati to expedite the economic handling of less than car load (LCL) traffic between the various railroads and their terminals in the city, a service which continued until 1962.

To enable rail to retain trade, the *piggy-back* concept was developed, road semi-trailers being loaded up circus ramps and along railway flat wagons. While there were many early attempts at making multimodal systems, the experiments of the US railways with 'piggy-back' were the most notable precursors of modern intermodal systems. In the 1920s, facing growing competition from the trucking industry, several US railroads began to offer services in which truck trailers were put on rail flat cars for delivery between distant cities. These services mirrored the much earlier practice of Barnum and Bailey's circus of driving circus wagons onto flat cars via ramps. The term "circus ramp" is still used to refer to a method of loading road trailers.

The trailer on flat car (TOFC) became the principal service by which US railroads sought to confront the growing competition of the trucking industry. Firstly, this service failed to obtain the cooperation of the trucking industry, which saw TOFC as a competitor. Secondly, it developed a reputation for slowness. The use of circus ramps scattered in every rail centre resulted in long delays in assembling flat cars and hauling them to their destinations. Thirdly, the railroads themselves never gave to TOFC their full endorsement, seeing it as an expensive hybrid that diverted them from their core business, which was the shipment of bulk freight. Finally, Interstate Commerce Commission's restrictions on competitive rates hamstrung the TOFC providers until the 1970s.

Having transformed the world shipping industry, the container was slower to enter other modal systems. Railroads continued to ship general freight using their large fleet of covered wagons or box cars. In the early 1980s, deregulation in the USA removed the former limits placed in the past on international control, and several shipping lines, most notably American Shipping Lines (APL), leased locomotives from US railroads and, by providing their own cars, offered intermodal rail services from the west coast ports to inland markets. It was at this time that the double-stack concept was introduced. The shipping lines were also leaders in the use of rail-hauled containers for freight shipped between markets within North America.

TOFC persists on the railways, but with an increasingly smaller market share. Another system, which at one time was considered as an alternative to the container, is roll-on roll-off (RORO) – in which road trailers are driven onto a ship and parked between decks during onward shipment. Other cargoes such as lumber can be handled in palletised or strapped form. Its biggest problem is the wasted space between the decks. A container ship, by comparison, is able to realize much greater stacking densities.

Occupying a small, but very lucrative intermodal market niche, is the roadrailer, a truck unit that can be placed directly onto rails by a set of retractable steel wheels incorporated on the trailer. It has found use in high-value shipments, where speed of delivery and safety are paramount. In the USA, where it is used most extensively, the roadrailer is employed by the automobile industry to ship components and parts between plants on a JIT basis.

Diversity appears to be the hallmark of the intermodal industry. Roadrailer continues to serve markets where reliability and dependability are paramount. Pallets are important for smaller lot sizes, particularly in the air freight sector. In Europe, the swapbody, an intermodal unit with non-rigid sides, maintains an important intermodal market share. The intermodal transport industry continues to evolve, and, in so doing, it involves supply chain management. As the chains become ever more global, through wider sourcing, intermodal solutions assume even greater importance.

Early Days

Intermodalism was born on land and largely involved the movement of highway trailers and specially designed rail containers on flatbed wagons to move inter-city freight over long distances. In North America, *piggyback* (trailer on flatcar) transport flourished during the 1950s and 1960s.

In World War I, the Americans transported their ammunition to Europe in containers. From 1928 onwards, the European railways used them for door-to-door transport to facilitate the exchange between train and lorry. The Dutch door-to-door forwarder Van Gend & Loos, for example, transported goods to and from the train, first in wooden containers and, later, in metal ones. After World War II, the emphasis turned back to the sea once again. The English railway companies transported containers across the English Channel, and ‘boxes’ were transported by shipping companies between European ports.

In 1958, the New York Central railroad introduced *flexi van* containers to its network. By 1965, the train-operating company was moving more than 125,000 of these vans annually. Similarly, developments were taking place in northern Europe. In 1967, trans-Europe road rail express used similar side-loading flexi vans to launch a twice-a-week Rotterdam/Antwerp-Milan rail shuttles. Swiss combined transport operator/freight forwarder, MAT Transport, had begun regular box services between Switzerland and Japan via the trans-Siberian Railway (TSR).

In June 1967, railways of UK, France, the Benelux countries, Germany, Sweden, Switzerland, Italy and Spain met in Paris and formed Internationale Transcontainer Gesellschaft, forerunner of Intercontainer, which was officially incorporated in December 1967. Intercontainer, merged with Interfrigo as Intercontainer-Interfrigo (ICF) in 1993. Its service network has expanded from the core northern Europe (Benelux/Germany) to northern Italy sector to encompass Scandinavia, central and eastern Europe. ICF also operates regular services between Spain and Portugal and between the Iberian peninsula and Italy and Germany.

In Australia, special containers had been used successfully in the main freight corridors linking Sydney and Adelaide and Sydney and Melbourne since the 1950s. It was the US-based Seatrain lines that pushed the multimodal capability of the freight container in the early years of containerisation to its fullest extent. Seatrain offered its customers full intermodal rates. Consignments were moved through Seatrain's hub in Oakland. Seatrain's service was seven days quicker than United States Lines' all-water link apart from the convenience of door-to-door pricing. As a result, the traffic volumes grew quickly. There was approximately 70,000 TEU a year moving between Asia and the US East Coast (USEC), and Europe and the US West Coast (USWC) and that this traffic could be moved intermodally.

A Major Push

The first major effort to apply containerisation on a large scale was when the US army first introduced the conex container. The conex, a metal reusable shipping box, 75 inches wide, 102 inches long and 82.5 inches high (roughly 6ft x 8ft x 7ft), with a gross weight of 10,500 pounds (4.6 tonne), was the product of a post World War II logistics study conducted by military logisticians. Over 200,000 conex containers were purchased by the US army and air force throughout the world. The conex still had the serious drawback of being transported aboard break bulk ships, which required lengthy port turnaround times. During the initial stages of logistical support for the effort in Viet Nam, container utilisation was limited to the conex. Once in Vietnam, these containers were used by the units as bunkers, storage facilities, command posts and in a multitude of other roles.

In December 1971, Seatrain filed its first intermodal rates with the FMC and ICC, encompassing through service from the UK to USWC and Japan/USEC. Seatrain had pioneered the mini-landbridge (MLB) concept. Leading trans-Pacific liner operator APL was very active; its micro-bridge rates from Asia covered a wide range of inland cities including Atlanta, Chicago and Dallas. The Staggers Act of April 1981, which deregulated the railroad industry, paved the way for confidential pricing and service contracts between the railroads and their customers. Train-operating companies negotiated volume deals with the ocean carriers to lock in valuable, and relatively high value, intermodal traffic to their systems.

Meanwhile, research work on a new revolutionary *double-stack* rail car was taking shape. Tests carried out on the California/Texas route indicated that productivity was 65% better than conventional single-stack system. APL and its rail partner, Union Pacific Railroad, soon followed suit. In 1984, APL's first stack-train was handled in Chicago. There followed a period of extensive tunnel clearing and track upgrades by the main railroads so that double-stack services could be run on all the main east/west corridors. North/south links, particularly to/from Mexico, followed in the early 1990s.

In addition to APL and Sea-land, the Japanese majors (K Line, Mitsui OSK lines and NYK line), Maersk line, OOCL and US lines all started to move containers inland by double-stack train. Separate intermodal transport companies were established, including American President Domestic – renamed APL Land Transport Services in 1991 – MOL Intermodal, Express System Intermodal (OOCL), and Railbridge in the case of K Line.

Traffic volumes built quickly but so did the problem of empty container repositioning. APL introduced 45ft x 9 ft 6in containers in the late 1980s and interchanged these between its international and domestic stack-train services. But, by the early 1990s, dedicated domestic container equipment was being built, including 48 ft and 53 ft truck compatible boxes. In late 1992, CN and APL teamed up to create a system of providing seamless transport throughout North America and Mexico.

In November 1990, VEB Deutrans-Transcontainer, of former eastern Germany, merged with Transfracht, a subsidiary of Deutsche Bundesbahn, to create a single German intermodal container transport entity. In September 1992, Transfracht joined the Rhine container barge grouping Fahrgemeinschaft Niederrhein. Transfracht reached agreement with the Russian Railway Ministry and the rail authorities of Lithuania and Belorussia for rail service in the CIS and Baltic States. In 1991, Sea-land set up Trans-Siberian express service (TSES) as a 50:50 joint venture with the Soviet Ministry of Railways.

The other major factor affecting the future of intermodal transport developments is the *channel tunnel*, which opened in late 1994. In the UK, Freightliner – the British Rail subsidiary handling the maritime container haulage business – was being readied for privatisation. The company was split from Railfreight Distribution in 1995. Operators on the Rhine River haul well over 900,000 TEU a year, principally between Rotterdam, Antwerp, the industrial heartland of Germany and Basle.

The incursion of containers from ocean into land markets has been more variable in some parts of the world other than in Europe. The European Commission is promoting "combined transport" (the term used to refer to intermodal transport) and, since the 1990s, there has been a significant increase in the number of services offered, some by the railroads themselves (e.g., Intercontainer), some by rail-trucking groups (e.g., IURR), some by the shipping lines and forwarders (e.g., the consortium comprising P&O, Nedlloyd, Dan, Dubois, and Saimo Avendero), and some by the barge services on the River Rhine.

Standardisation: A Critical Element

During McLean's voyage on container carrying vessels on the north-south routes, he encountered many problems because of each state's varying stipulations on the dimensions and axle weight of his vehicles. From April 1956 onwards, he used containers on a converted tanker, the 'Ideal X' with 58 containers, in a service from Newark (near New York) to Houston (Texas). Initially, these containers were transported complete with chassis, but later without, so that some stacking was possible. MacLean used a container 35 feet long, derived from American standard unit of measurement. Since the Far East and Europe were also transporting goods by container, a more universal length needed to be developed.

The need for standards was clear, and was called for in 1953 by the United States Federal coordinators of transport. In 1959, work started in America and, two years later, the American Standards Association (ASA) adopted an 8ft x 8ft cross section with length of 10ft, 20ft, 30ft and 40ft. The same year, 1961, the international organisation for standards (ISO) established technical committee 104 on freight containers.

According to ISO, a freight container is “an article of transport equipment intended to facilitate the carriage of goods by one or more modes of transport”. The ISO, in 1964, at the prompting of the USA, established common dimensions for containers of 20 or 40 feet long and 8 feet wide. Several shipping lines have, however, started using the 45-foot container. The width of a standard container remains 8 feet, and the standard height 8.5 or 9.5 feet, the latter being termed as ‘high cube’. There has been a growing diversity of dimensions, providing units of varying lengths and heights for particular market sectors, e.g., 28, 45, 48 and 53 feet long boxes, and high cube units.

There is also a view held, particularly in Europe, that the ISO standardisation does not fully comply with the European intermodal transport. Therefore, a further standardisation of these loading units would be desirable, adjusting and improving them to match real intermodal loading devices and being able to hold the common Euro-pallets.

Shipping Industry Adopts the Container

The shipping industry rapidly adopted the container for the shipment of non-bulk cargoes. The first ship employed in international commerce, a vessel *Fairland* owned by the company established by Malcom McLean, Sea-Land, sailed from Port Elizabeth (New Jersey) and paid its first visit to Rotterdam on 3 May 1966. It loaded and unloaded 35-foot containers with its own on-board cranes. Together with three sister ships, all with a capacity of 226 containers, the *Fairland* operated a weekly container service between North America and Northwest Europe.

Other US companies such as Matson followed quickly, forcing European and Japanese carriers to begin container services by operating joint services. While Matson pioneered the trans-Pacific route in 1967 with the 464 x 24 ft capacity whip – *Pacific Trader*. Seal-Land entered the trans-Pacific in 1968, closely followed by New York. By 1970, world ocean container traffic had reached 6 million TEU. Since then, growth has been explosive.

Sea-Land did not invent the container, nor was it the first shipping company to transport them across the Atlantic Ocean. It was, however, the first to load its vessels solely with containers and commence a fully containerised trans-Atlantic service.

Originally seen as a solution for the shipment of break-bulk cargoes (freight that is packaged in odd shapes and dimensions), containers now hold an extremely wide range of goods, including even bulk commodities such as cereals and lumber, liquids such as chemicals, and refrigerated articles such as meat and vegetables.

> Drewry Shipping Consultants has analysed that the average container (TEU) today moved weighs 8.9 tonne (excluding tare) compared with 10 tonne in 1990 and well over 12 tonne in the early 1980.

Modal Shares

An OECD (Organisation for Economic Cooperation and Development) report – *Decoupling the Environmental Impacts of Transport from Economic Growth* – shows the modal split has changed a great deal in recent years. Road transport has increased; rail and inland waterways have declined. Bulk commodities, more suitable for rail and inland waterway transport, have broadly become less important to the economy.

Modal split is dominated by passenger cars in the US (87%), the EU (76%), and Japan (63%), while the other modes have minor shares of less than 10%, except for aviation in the US (10%) and railways in Japan (20%) of total passenger km (kilometres).

The modal split for freight transport is similar in the EU and Japan, with a high share going to (i) short sea shipping; 41% in Japan and 31% in the EU-15; and (ii) road freight: 44% in the EU and 55% in Japan. The US has a more balanced modal share, with rail taking the highest share (39%) followed by road (31%) and pipelines, inland navigation and short-sea shipping: (7-8%). On account of relatively short distances for freight movement in Europe, road has been a predominant mode.

A concerted strategy is currently being devised in European Union to promote rail-borne transport networks and 'combined' transport culture. With rail freight transport in the EU now fully liberalised, there is a plan formulated for a rail transport network in which goods would have priority over passengers.

The 60 tonne gigaliner (or Eurocombi) – a modular truck consisting of a tractor cab with a trailer and a second trailer extension – poses a threat for rail freight. A mid-term review of the EU 2006 White Paper has stressed, "Transport is fast becoming a high-technology industry making research and innovation crucial to its further development…. To overcome the current and future (transport) problems, Europe's transport system needs to be optimised by means of advanced logistics solutions that can increase the efficiency of individual modes and their combinations…."

Since trade is becoming more global, logistics chains are becoming more complex and need to be managed globally. The European Network 2020 will be a network of networks, each one centred on a hub, and connected among themselves by seamless railway links or deep-sea services. Large container carriers will connect the deep-sea hubs, whilst shuttle trains, new generation feeders, and barges will guarantee the transfer both from the sea to the inland network, and between the different land hubs.

- A European railway network with separate tracks dedicated to freight, where long, double deck, heavy axle loaded, multi-locomotive trains could be operated.
- New and efficient inland waterway services will work in tandem with road and rail.

- Tri-modal land-hubs will provide fast transshipment between rail, inland waterways and road services.
- Similar transshipment points will evolve at major international air hubs connecting air freight services to regional road and rail networks.
- Electric locomotive will no longer need to be detached from trains, as transshipment could be done under the overhead catenary.

A network size and reach will facilitate seamless transition of cargo between the backbone and regional networks.

Multimodal Transport Operator

Multimodal transport (MT) is a service innovation by which the MTO (multimodal transport operator) assumes a contractual responsibility to move goods from origin to destination under a transport contract, for an agreed price with possibly a pre-established time-limit for delivery. Not only must the goods comply with specific import and export regulations at each end of the trade, but the MTO must also be recognized as a carrier in its own country as well as in the trading partner's country. The MTO concludes a contract with the shipper in his own name, and assumes responsibility for the whole transport operation as specified in the contract. The MTO is a common carrier since he directly undertakes to perform, or to ensure the performance of, international MT operations and accepts responsibility for any damage or loss that the goods may suffer during transit.

Such a transport operator can be a vessel-operating multimodal transport operator (VO-MTO) or a non-vessel-operating MTO (NVO-MTO) who may or may not provide cargo consolidation services. The MTO makes his own contractual arrangements with his sub-contractors of individual modal services, including the ocean carrier, where appropriate.

The UN definition of a Multimodal Transport Operator is equivalent to the idea of a Freight Integrator as a person organising international multimodal transport. As the Study on Freight Integrators in Europe carried out by ELA-Kravag-Logistics for European Union informs, the idea of Freight Integrators was first explained in the *White*

Paper on the European Transport policy until 2010, which referred to them as organisers of intermodal full load transport. "Freight integrators are transport service providers who arrange full load, door-to-door transportation by selecting and combining without prejudice the most sustainable and efficient mode(s) of transportation."

> According to the definition in the Multimodal Transport Convention, a multimodal transport operator is: "… any person who on his own or through another person acting on his behalf concludes a multimodal transport contract and who acts as a principal, not as an agent, or on behalf of the consignor or of the carrier participating in the multimodal transport operations, and who assumes responsibility for the performance of the contract"

The transport share of full loads, the main market of Freight Integrators in Europe, was estimated at about 477 billion tkm (tonne kilometre), corresponding to about one-fifth of total European transportation. More than half of these are effected by road, one-third by short sea shipping, and the rest mainly by rail. Although a clear definition of the term, full load, does not exist, it definitely is not bound to a specific weight limit. Bulk and liquid cargoes are, no doubt, excluded. In the White Paper, where for the first time the idea of a Freight Integrator was introduced, a minimum weight limit of 5 tonne was proposed for the definition of full load.

Rail service quality problems in Europe, e.g., reliability and journey time, and a lack of co-operation has been complicating international transport. Monopolistic structures of national railways are seen as the reason for high prices and the lack of a competitive approach. A lack of awareness of the possibilities of intermodal, along with difficulties to get the necessary information, has also retarded the growth of freight integration. Other main barriers are seen as the lack of incentives, lack of information, infrastructure problems, adverse image of intermodal transport, in addition to difficulties concerning liability and documentation.

Integrators

In the door-to-door service, the express and parcel distribution service providers or Integrators are the nearest approximation of intermodal operators. Based on a highly developed logistics system with a focus on flexibility, reliability and door-to-door service, they operate in a multimodal environment. They use more than one transport mode. One of the big advantages these service providers offer is a sort of one-stop-shopping solution. The customer is able to get all the necessary information from one contact person; even customs clearance is handled by the Integrators in different countries; the customer does not have to get in contact with unknown persons in different countries to get information on his shipment; very few documents are required. Besides the officially required customs documents, the papers needed to transport the goods are limited to only one way-bill, no matter how far the shipments are transported or how many modes are involved in the process.

Almost every journey time can be achieved, whether it is the next morning delivery for large parts of the world or simply the Just-In-Time delivery on a certain day. Also through its structure, integrators in general are building their systems on the hub-and-spoke architecture, allowing the consolidation of shipments.

The intermodal environment in which the integrators conduct their business is mainly speed-orientated. Modes other than air and road are not taken into consideration. The closed system they operate is another point acting against their further development into a Freight Integrator. Again, they concentrate on certain types of goods they transport, limiting the type of goods to only a small share, namely, parcel sized goods, and not dealing with full loads, as demanded in the White Paper.

Role of Container Shipping in International Trade

Worldwide, transport growth has been consistently higher than the economic growth. Shipping is being increasingly integrated in worldwide logistically aligned transportation networks. With the increasing intensity of trade, demands for efficient sea and air transport have also risen. This is most clearly reflected in container shipping.

Table 1.1: Containerisation of General Cargo Trade: 1980-2000
Estimated Development: Million Tonne

	1980	1985	1990	1995	2000
Global General Cargo	527	552	673	740	780
Containerised Cargo	120	172	269	408	543
% Containerised	23	31	40	55	70

Source: Intermodal Shipping

World trade continues to grow, and more and more of it is containerised. Over 70% of the global general cargo volumes generated are shipped in containerised form. Containers currently account for over 50% of the world merchandise trade. The volume of containerised trade is likely to continue to grow faster than the world economy. While the worldwide GNP increased from 1990 to 2003 by about 50%, world container turnover tripled in the same period. Starting with 50 million TEU in 1985, world container turnover reached more than 350m TEU in 2004.

The global economy recorded a year-on-year (YoY) growth of 4.3% (by value) in 2005; global merchandise trade rose by 8.9% (by volume) in 2004; global sea-borne trade rose by 6%. World seaborne trade in containerised cargo is estimated to have more than doubled, during the period 1997 to 2006, to around 1 billion tonne, at an annual growth rate of 9%. The size of the world container fleet grew by 9% in 2005, to reach 21.6 million TEU.

The global cargo mix has been changing rapidly: general cargo recorded 5% CAGR (compounded annual growth rate) between 1991 and 2001, whereas container cargo grew at 10.4%. A recent joint study of UNESCAP, APEC and KMI, utilizing the *Maritime Policy Planning Model (MPPM)*, estimated the annual average growth rate of the world container trade at 6.5% during the period 2002 to 2015 compared to 8.5% during 1980 to 2002.

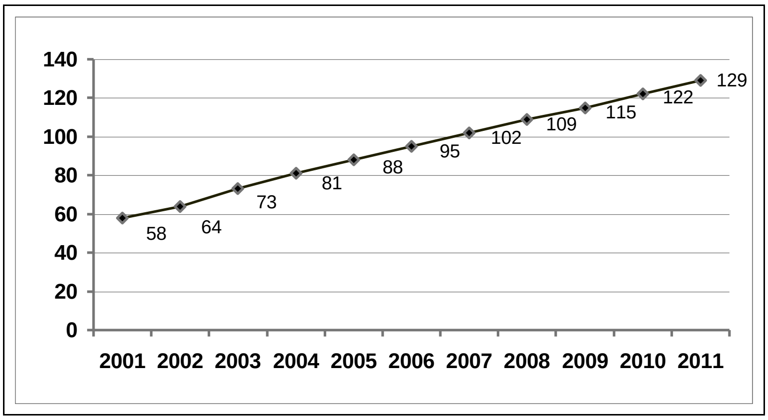
Table 1.2: Sea-Borne Cargo Mix, Growth

Commodity	CAGR: 1991-2001: %
Oil	1.3
Gases	5.1
Chemicals	3.7
Dry bulk	2.5
General Cargo	5.0
Containers	10.4

Source: India Infrastructure Research: Ports in India- 2004.

According to GlobalInsight, global containerised trade rose at a CAGR of 11% during 2001-2005. The growth rate projected for the period 2005-2011 is 6.5%. In 2011, the global containerised trade will thus amount to 129 million TEU, 2.2 times of the 58 million TEU in 2001. (The data only shows maritime traffic of full containers, not the port throughput or the movement of empty containers.)

Figure 1.1: Containerised Trade: Million TEU, 2001- 2011 (forecast)



Growth Catalysts of Container Trade

The dynamic growth in the container trade has mainly resulted from:

- Increasing exchange of goods in the course of the growing integration of national economies and stronger international division of labour.
- Increasing share of manufacturing, and value-added products in trade.
- Movement of production facilities to overseas locations.
- Reduction in transportation costs for containers and consequent increase in the suitability of containerisation for lower value exports.
- Continuing increase in cargo deliveries to the large seaports by means of feeder vessels, which necessitates additional handling operations.

From 1950 to 1990, relationship between economic growth and growth in the value of international trade remained almost constant: the value of trade grew approximately 1.5 times the rate of growth of the world economy. The last decade (1991-2000), however, saw a major change in this ratio: the value of trade is now growing at around 2.2 times the rate of growth of the world economy. During the 1980s, a large portion of the growth could be attributed to 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 develop the infrastructure and acquire the handling equipment needed to cater for container vessels, goods that had previously been shipped as loose cargoes gradually converted to containers. The change in the composition of international trade, with a shift away from basic commodities towards processed primary products and manufactured goods, also favours growth in container volumes.

Container volumes worldwide are projected to grow by 7.3% CAGR by 2010 and 5% CAGR by 2015, to a level of 177.6 million TEU. The shift towards a greater proportion of high-valued commodities may tend to dampen container growth rate.

Table 1.3: Worldwide Projections of Container Traffic

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: UNESCAP

Container Brings Great Benefits

Containerization has helped globalise the world economy. It has been a key enabler of the rapid industrialization and globalization seen in the world today. Intermodal transportation has facilitated a substantial growth in global trade. During the period 1970-2000, US's international trade in goods and services increased from 10.7% to 26.9% of GDP.

Overall, transport costs and transit time have been falling over the decades. Advanced economies have attained a gradual and remarkable reduction in transport costs since the 1950s. Deregulation has increased competition and spurred international cooperation between trucking and rail lines. In addition, larger capacity has increased payloads and better highways have reduced transit times. During the thirty years from the mid-1970s, when containerisation was gradually introduced in international commercial trade, the cost of international transportation has dwindled, in some cases, to less than a quarter of what it used to be, in real USD terms. Air transport has seen similar huge reductions in the cost and availability of new integrated cargo concepts and products.

As shipping lines built large vessels specially designed to handle containers, ocean freight rates plummeted. And as container shipping became intermodal, with a seamless movement of containers among ships and trucks and trains, goods could move in a never-ending stream from Asian factories directly to the shelves and stockrooms of retail stores in America or Europe. The most important was the saving in time for the loading and unloading of vessels. Capital costs, although higher than for traditional ships, were not exorbitant, because old vessels refitted with cells to hold containers made up most of the container fleet. Container berths at ports cost ten times as much to build as conventional berths, but they could handle twenty times as much cargo per man-hour, so the cost per ton was lower.

Among the gains and advantages of multimodal transport are:

- Loss of time and risk of loss, damage, pilferage and contamination incidental to conventional segmented transport is reduced to the minimum.
- To the trader, the faster transport of goods reduces the disadvantages of distance from the market and of capital being tied up.
- The burden of documentation and other formalities connected with segmented transport is reduced to the minimum.
- The resultant cost savings tend to reduce the through freight rates and the cost of cargo insurance.
- The consignor has to deal with only one agency, viz, the MTO, in all matters relating to the movement of his goods including settlement of claims.

- The through rates offered by the MTO make it easier for the exporter to negotiate sales contracts with foreign buyers on the basis of delivered prices.
- The MT document issued by the MTO at an inland point enables the exporter to negotiate it with a bank and realise the money for his exports quickly.

These advantages result in the reduction of the cost of exports and improve their competitiveness in international markets.

A great proponent of the container, Marc Levinson who has studied the genesis and evolution of the box in its entire perspective, extols the great contribution of the container[1]: "the container made shipping cheap and by doing so changed the shape of the world economy". Bringing about 'a new economic geography', the container turned the economics of location on its head. Not only has it helped lower freight bills, it has saved time. Combined with the computer, it has made it practical for companies to develop just-in-time (J-I-T) manufacturing.

Stimulating trade and economic development, the container has enabled the volume of international trade in manufactured goods to grow much faster than the volume of global manufacturing production and global economic output. It has enabled the ready availability of inexpensive imported consumables, improving living standards around the world, ushering in highly integrated world economy. Integration has been one of the dominant themes in the development of logistic management.

Echoing similar sentiments and, like Levinson, Brian Slack[2] has hailed the container having brought about such profound changes that they constitute a 'revolution'. Every part of the system – ports, ships, cranes, storage facilities, trucks, trains, and the operations of the shippers themselves have changed. Globalisation, logistics, supply chains, and hubbing, some of the main developments in contemporary freight transportation, depend at least in part on the advances that have been made

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1. *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger* (Princeton University Press).
2. *Concordia University, Montreal, in his essay, International Transportation.*

over the last forty years in bringing together separate modal systems into intermodal structures.

The container has made shipping cheap, and by doing so changed the shape of the world economy. When McLean had *Ideal-X* sailed in 1956, cargo in his box on board the ship cost less than 16 cents per tonne against cost of loading cargo on to a ship then was as much as $5.83 per tonne (Marc Levinson's *The Box*)

"This new economic geography allowed firms whose ambitions had been purely domestic to become international companies, exporting their products almost as effortlessly as selling them nearby." Multinational manufactures transformed themselves into international manufactures, integrating once isolated factories into networks so that they could choose the cheapest location in which to make a particular item, yet still shift production from one place to another. High costs of moving goods to and from ports were the ones the container affected first.

Impact Across the Entire Logistics Chain

Before the advent of container, transporting goods was expensive – so expensive that it did not pay to ship many things halfway across the country, much less halfway around the world. Shipping had always experienced the highest terminal costs of any transport mode. Ships spent most of their time in the port, as an average of 25 days were required to turn round a ship in the early 1960s. The delays were caused by the difficulties of lifting and stowing each item of cargo. Furthermore, large gangs of dockers were needed to carry out these activities. These were the workers who were among the most militant in the labour force.

An enormous containership can now be loaded with a minute fraction of the labour and time required to handle a small conventional ship half a century ago. J-I-T manufacturing, outsourcing, precision in logistics were unimaginable without the container, which led to cheaper transport, less pilferage, less damage, and lower insurance rates.

In a Working Paper 9886, NBER, July 2003, economists Edward L. Glaeser and Janet E. Kohlhase suggest, "it is better to assume that moving goods is essentially costless than to assume that moving goods is an important component of the production process”. Levinson reckons, before the container, such a statement was unimaginable.

In 1961, before the container was in international use, ocean freight costs alone accounted for 12% of the value of US exports and 10% of the value of US imports. American Association of Port Authority data shows below the cost of shipping one truckload of medicine from Chicago to Nancy, France (c.1960):

Table: 1.4: Cost of Shipping a Truckload

	Cost $	Cost %
Freight to US port city	341	14.3
Local freight in port vicinity	95	4.0
Total port cost	1,163	48.7
Ocean shipping	581	24.4
Inland freight in Europe	206	8.6
Total	2,386	100.0

Containerisation of general cargo transport that allowed for extensive use of automation has dramatically reduced unit cost: increased economies of scale, mainly by applying ever larger container vessels; combined with the build-up of vibrant and coherent global networks (usually based on the hub-and-spoke principle).

Larger sizes and higher speeds of the new ships allowed them to move far more freight than earlier vessels; each one of these new ships could carry six or seven times as much cargo as a conventional vessel. In the early 1970s, shipping machinery from southern Germany to New York cost one-third less by containership than by break-bulk freight. A case study of Ballentine Beer handled from Newark to Miami throws good light. Analysts for the port of New York Authority calculated that sending the beer on board a traditional coastal ship, including a truck trip to the port, unloading, stacking in a transit shed, removal from the transit shed, wrapping in netting, hoisting aboard ship, and stowage would cost $4 a ton, with unloading at the Miami end costing as much again. The container alternative – loading the beer into a container at the brewery and lifting the container aboard a specially designed ship was estimated to cost just 25 cents a tonne. UNCTAD concluded in 1970 that shipping lines’ costs of moving freight on containerships were less than half those on conventional ships.

In the days before *Ideal-X*, loading loose cargo on a non-container carrying ship in 1956 cost US $5.86 per ton. The costs came down significantly when container ports started loading vessels for just under 16 cents. Industry sources estimate that it costs about US $10 to send a TV set from China to the UK or just US 10 cents to deliver a bottle of wine from Australia to America. The container has enabled substantial reduction in the cost of maritime shipping and associated logistics. Today, it is estimated to be 1% or less of retail value of consumer products compared to as high as 10-20% in the 1960s, e.g., it now costs US $0.34 to ship a $ 45 pair of shoe, or US $12.50 to import a $2,500 TV set.

Table 1.5: Average Cost of Handling One Cubic Metre of US Freight, 1970: US$

	Capital cost	Operating cost	Cargo handling	Total cost
Conventional ship	2.30	3.81	17.00	23.11
Containership	2.50	2.47	5.90	10.87

The container not only lowered freight bills, it saved time. Quicker handling and less time in storage translated to faster transit from manufacturer to customer, reducing the cost of financing inventories. The development of modern transportation solutions has generally reduced transit times for international transport. Containerisation, better logistics operations in general, economies of scale, improved technologies – for trucks, trains, vessels and terminals – and the creation of coherent transportation networks have shortened transit times.

An essential offshoot as well as a crucial trigger of globalisation, outsourcing has been greatly facilitated by the container. To quote Levinson again, “low transport costs help make it economically sensible for a factory in China to produce Barbie dolls with Japanese hair, Taiwanese plastics and American colourants, and ship them off to eager girls all over the world”.

No doubt, containerisation has reduced international transport costs for some, much more than for others. Landlocked countries, inland locations in countries with poor infrastructure may have a tougher competitive situation now than in break-bulk days. Within China, World Bank reported in 2002, transporting a container from central city to a port cost three times as much as shipping it from the port to America.

The Important Sustainability Factor

Sustainability is understood in the same way as in the World Commission on the Environment and Development (Brundtland Commission) Report, 1980, i.e, as a way of “meeting the needs of the present generation without compromising the ability of future generations to meet their needs”. Multimodal transport is viewed to automatically lead to a better workload of transport modes other than road, namely, rail, short sea-shipping, and inland waterways, i.e., surface transportation, rather than air and/or pipeline transport. These modes usually have less impact on the environment than trucks or aircraft. At the same time, mutlimodal transport would relieve the roads especially from transit and long distance truck traffic. Even when looking at typical bottlenecks such as the transit traffic through the Alps, a multimodal transport solution can enormously relieve environmental stresses in these areas.

Intermodality plays an important role in freight integration; it is one of the main criteria for the definition of the Freight Integrator. The main idea behind the whole approach is to encourage intermodal transport and, at the same time, boost the neglected modes (in Europe) such as rail or waterborne transportation. Sustainability implies that not only the environmental sustainability must be considered, but also economic sustainability. When calculating transportation costs, the costs of congestion should also be considered.

The spatial concentration of production, i.e., a concentration of product capacities in fewer locations, results in maximising economies of scale in the production operation but at the expense of making their logistics systems more transport-intensive and of lengthening the lead-time to customers. For example, it leads to an increase of the average length of haul in road transport for food and beverage, machinery, chemicals and fertilizers as well as a decrease in water transport for chemicals and fertilisers. Stock reductions by spatial concentration of inventory can yield large financial benefits. By reducing the number of stockholding points in their logistics systems, firms can cut the amount of contingency stock required to provide a given level of customer service and take advantage of economies of scale in warehousing.

Section I :
Maritime Transport Logistics

Chapter 2

Maritime Transport Networks and Container Shipping Development

Quest for Scale

World shipping has witnessed a technological, operational and structural transformation. Developments in containerisation have been dictated by demands of global trade, namely, scale, transit time, cost, coverage and regularity. In recent years, there has been a growing trend towards carrier alliances on a global basis. Strategic alliances in container shipping are a result of globalization, as the deployment of larger vessels on the trunk routes in intercontinental trade, especially in the Europe-South East Asia and the South East Asia-North America trades, also ties in with an increase of ships in inter-regional feeder services.

Asian family-owned lines like Evergreen, OOCL, Hanjin, Wan Hai adopted an ambitious growth path, and China's state controlled COSCO, Taiwan's Yangming and Singapore's Neptune Orient expanded aggressively. A wave of mergers and acquisitions between 1996 and 1998 has resulted in the share of the top twenty lines increasing dramatically. This has also led to the reshuffling of partners across alliances. The top 20 carriers controlled 26% of the world slot capacity in 1980, 41.6% in 1992, and about 58% in 2005. Today, the containerised cargo shipping fleet is concentrated in a few shipping lines. Leading global alliances are:

Figure 2.1: Major Global Alliances

Grand Alliance *Constituents:* – Hapag-Lloyd Container Line GmbH – Malaysia International Shipping Corp – NYK Line (Nippon Yusen Kaisha) – Orient Overseas Container Line Ltd. – P & O Nedlloyd *Total Slot Capacity: 919,904 TEU*	– The *Grand Alliance* was structured from the former *Global Alliance* in January 1998 following the arrival of OOCL and MISC, the merger of P&O Containers with Nedlloyd, and the departure of NOL. – Their services encompass trans-Pacific, trans-Atlantic and Asia-Europe trades. MISC only participates in the Europe-Far East trade. – ACL, Americana Ships (Lykes and TMM) and the Cosco/K-Line/ Yangming consortium have agreements with them covering the trans-Atlantic trades.
New World Alliance *Constituents:* – APL Ltd. – Hyundai Merchant Marine Co. Ltd. – Mitsui OSK Lines Ltd. *Total Slot Capacity: 538,698 TEU*	– The *New World Alliance* covers the trans-Pacific, Asia-Europe and Asia-Mediterranean trades, cooperating with Yangming in the latter. – APL and MOL were members of the *Global Alliance* until the replacement *New World Alliance* was formed in 1997 – The *NWA* additionally has a slot charter agreement with Evergreen, covering the US-Asia market.
CHKY/United Alliance *Constituents:* – Cosco Container Lines Ltd. – Hanjin Shipping Co., Ltd. – Kawasaki Kisen Kaisha Ltd. – Yang Ming Marine Transport Corp. – United Arab Shipping Co. *Total Slot Capacity: 915,589 TEU*	– This grouping is of two separate alliances: *CHKY*, of which UASC is not a member, and *United Alliance*, which consists only of Hanjin/Senator and UASC. – Cosco and K-Line both slot charter on the *United Alliance* services.

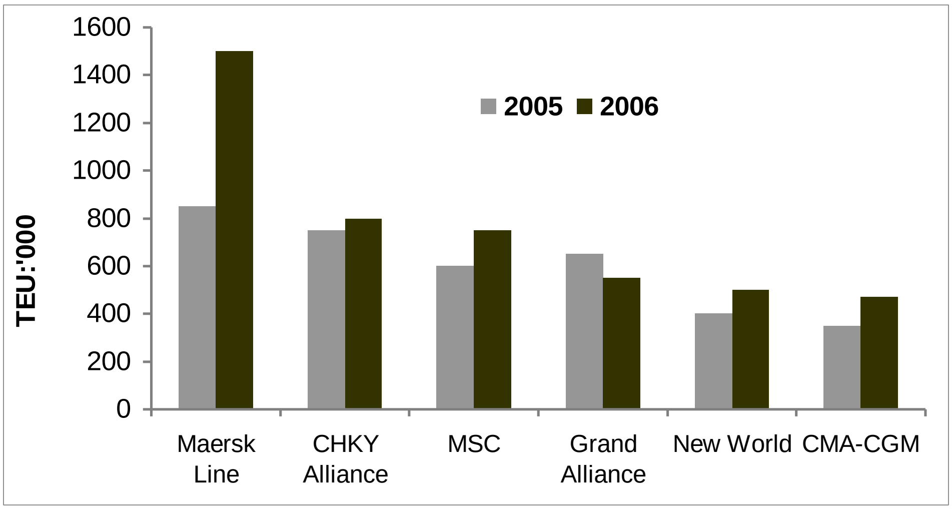
Concentration in Liner Shipping

According to Clarkson's *Container Intelligence Monthly* (CIM), the process of concentration in liner shipping has continued apace. In January 2003, the ten largest container ship operators accounted for 44.4% of global container carrying capacity. In September 2006, this share had arisen to 54.8%. In terms of capacity, the top 20 container carriers controlled over 83% of the cellular fleet. Amongst these, Maersk, Sealand, MSC (Mediterranean Shipping Company), and Evergreen remain the largest independent global players.

Not only has there been a concentration of carrying capacity, this trend has continued in the ship size also. Indeed, in the category of ships exceeding 1,000 TEU, 15 carriers account for overwhelming control.

The increase in container ship capacity has occurred both on account of mergers and alliances as well as organic growth. In 2005, two major acquisitions took place – Maersk's takeover of P&O Nedlloyd and Hapag Lloyd's takeover of CP Ships. The following figure shows the growth of capacity of world's leading container carriers during the years 2005-2006:

Figure 2.1: TEU-Capacity of Leading Container Carriers



Source: ISL based MDS Transmodal

Sharp shifts in the ocean container business as a result of merger and takeover consolidation are reflected in the two tables below (Tables 2.2 and 2.3):

Table 2.2: Top 20 Ocean Carriers: 1990

(TEU)

Evergreen	130,916
Sea-Land Service	115,367
Maersk	94,703
NYK	78,148
Mitsui OSK Lines	70,334
APL	66,380
OOCL	58,117
K Line	55,462
Cosco Shanghai	54,505
Hapag-Lloyd	53,178
Hanjin Shipping	49,621
P&O Containers	49,368
Yangming	46,817
Zim Israel Navigation	44,916
Nedlloyd Lines	40,335
Baltic Shipping Co.	36,760
Neptune Orient Lines	35,294
ScanDutch	32,948
CGM	29,040
Delmas Vieljeux	31,204
Total	1,173,413
Top 20 share	**38.80%**

Table 2.3: Top 20 Ocean Carriers: 2006

(TEU)

AP Moller-Maersk (1)	1,600,012
Mediterranean Shipping Co	937,145
CMA CGM (2)	597,677
Evergreen (3)	539,801
Hapag-Lloyd	448,840
Cosco	385,368
China Shipping Container Lines	339,545
Hanjin Shipping (4)	328,307
APL	323,319
NYK (5)	313,049
Mitsui OSK Lines	284,848
OOCL	268,502
CSAV (6)	249,885
K Line	241,772
Yangming	223,192
Hamburg Sud (7)	217,018
Zim Integrated Shipping Services	213,795
Hyundai Merchant Marine	153,850
Pacific International Lines(8)	141,391
Wan Hai Lines	117,767
Total	7,925,083
Top 20 share	**72.70%**

Notes:

1. includes Portlink and Safmarine
2. includes ANL, Delmas, FAS, MacAndrews, OT Africa Line
3. includes Hatsu, Italia Marittima
4. includes Senator Lines
5. includes TSK
6. includes CSAV Norasia, Libra, Montemar
7. includes Alianca, Ybarra
8. includes Advance Container Line

Source: Containerisation International (CI)

The table at the next page shows the total world fleet both in terms of TEU capacity and the number of vessels at the beginning of 2005. It also shows the same position of top 20 container carriers for the same period.

Table 2.4: Top 20 Container Liner Operators: As on 01.01.2005

Company	Total: TEU	No. of Container Ships
World Fleet	**8,471,343**	**7,335**
Maersk Sealand	789,129	291
Mediterranean Shipping Co SA	545,294	215
P&O Nedlloyd Ltd	390,766	143
Evergreen Marine Corp (Taiwan)	354,719	123
Hanjin Shipping Co.	280,075	70
CMA-CGM SA	278,992	108
APL	278,853	85
Cosco Container Lines	249,686	130
NYK Line	223,517	67
Mitsui OSK Lines	204,126	63
Orient Overseas Container Line	198,638	58
Kawasaki Kisen Kaisha	195,235	65
China Shipping Container Lines Co.	193,608	92
CP Ships Group	187,978	80
Hapag-Lloyd Container Group	174,834	44
Yang Ming Marine Transport Corp	151,312	56
Hyundai Merchant Marine Co	143,409	38
Zim Israel Navigation Co	139,337	55
Hamburg Sudamerikanische	113,267	57
Wan Hai Lines	97,657	70

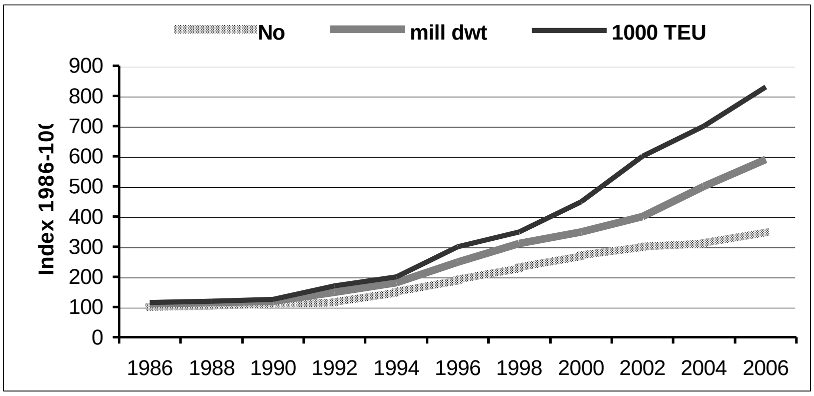
Source: Containerisation International Online

The formation of alliances has enabled carriers to offer more direct all-water connections and shorter transit times for most principal trade areas. Between 1992 to 1998, the number of direct port calls increased from 15 to 25 in trans-Pacific trade, and from 12 to 21 in Asia-Europe trade. Over the same period, the average number of calling ports decreased from 6.4 to 5.5 in trans-Pacific trade, and from 8.4 to 6.3 in Asia-Europe trade. The maximum frequency of weekly sailings increased from 5 in 1992 to 9 in 1998 on trans-Pacific routes, and from 2 in 1992 to 6 in 1998 on Asia-Europe routes.

The container, as a unit of transport, permits much higher stacking densities, particularly for ships, leading to an explosion of vessel capacities. The average size of vessels employed in Asian container trade increased from 2,433 TEU in 1992 to 3,562 TEU in 1998. The emergence of large alliances, with 70-100 container vessels of different sizes at their disposal, enabled the number of service routes in the Asian region to increase from 29 in 1992 to 35 in 1998. As reported in UNCTAD's *Maritime Transport Review, 2006*, by the beginning of 2006, there were 3,494 ships with an aggregate capacity of 8,120,465 TEU, an increase of 8.9% in the number of ships and 13.3% in TEU capacity over the previous year.

During the year 2005, the fully cellular container fleet grew by 13.5%. Compared with 1996, the fully cellular container fleet has more than doubled its TEU capacity (+ 203%). During the period 2002-2006, the TEU-capacity of the world container fleet grew on average by 11.4% per year, the number of the container vessels rose by 6.6% and the deadweight tonnage by 10.0%. As of 1 January 2006, the fully cellular container fleet aggregated 3,514 ships with 111.6 million dwt equal to 8.1 million TEU. The general cargo fleet comprised 16,544 ships with 97.4 million dwt equal to 2.0 million TEU.

Figure 2.2: Container Fleet Development 1986-2006: (Index 1986 = 100)



Source; SSMR, June 2006

The top 25 routes between pairs of destinations in terms of the TEU capacity have been analysed by UNCTAD. The route with the highest number of assigned vessels and TEU capacity is China–Hong

Kong with 1,028 vessels, and 3,839,910 TEU, deployed by 68 carriers. None of the top 25 pairs of countries includes an African, Latin American or South Asian country. Seventeen of these top 25 routes are intra-regional, which means that these routes are either between Asian countries (11 routes) or between European countries (6 routes). Of the remaining eight inter-regional routes, the most important one (in terms of TEU) is China-USA, followed by Asia-Europe and Hong Kong-USA. The average vessel size is the highest on the eight inter-regional routes. In contrast, the 17 intra-regional routes have smaller average vessel sizes, because they include coastal and feeder services.

Seventeen of the top 25 routes referred to above entail vessels that are larger than 9,000 TEU each. The erstwhile largest vessel, of the size of 9,449 TEU is deployed on 15 of the top 25 routes. Among the eight inter-regional routes, the two Asia–North America routes are those with the smallest average and maximum vessel sizes. This may partly be due to the vessel size restriction of the Panama Canal.

Table 2.5: Some of the Top 25 Routes: Assignment of Vessels and Their Capacity

Route	TEU	Vessels No.	Maximum vessel size: TEU	Average vessel size	Carriers No.
China-Hong Kong	3,839,910	1,028	9,449	3,735	68
China-United States	2,027,659	458	8,238	4,427	30
China-Singapore	1,948,345	514	9,449	3,791	50
China-Taiwan	1,936,339	496	8,073	3,904	45
Hong Kong, Taiwan	1,914,258	581	8,073	3,295	51
China-Republic of Korea	1,914,018	574	9,200	3,335	61
Hong Kong, Singapore	1,812,848	517	9,449	3,506	50
China-Germany	1,662,922	296	9,449	5,618	27
China-United Kingdom	1,571,199	266	9,449	5,907	24
China-Japan	1,467,611	481	8,204	3,051	51

Source: UNCTAD; Transport Newsletter No.32

The number of carriers offering services at individual ports has continued to increase in spite of the global process of concentration. No doubt, concentration of market power may be far higher on individual routes or in individual ports than the global figures might suggest. Mergers and acquisitions have implied that there are fewer carriers today than ten years ago, but the same global carriers have continued to expand into new markets. The number of carriers providing services to a specific port has thus actually increased in the majority of countries. As the deployed TEU capacity per country and the average vessel size continues to increase, the average number of companies which provide services to ports has decreased from 22 (July 2005) to 20 (July 2006).

In addition to the increase in the size of ships, consolidation of shipping companies is a second constant factor in the development of the container sector. Scores of shipping companies have already disappeared through mergers, a couple of bankruptcies and, above all, through takeovers. Only about twenty large companies remain, but the market can still be regarded as fragmented. For example, the market leader, Maersk Line still has a market share of less than 20%. It is only logical to expect further consolidation.

Projections made by IBM's Institute for Business Value suggest that 80% of the global liner market will be controlled by the ten largest container shipping companies by 2015. These companies had led with a share of 53% in 2006. The next twenty carriers are likely to control 15%, and the rest being fought for by the remaining some 300 operators.

Cooperation between container shipping companies in many different forms of partnership, such as slot purchase, slot exchange, vessel-sharing agreements or joint services has, of late, been an essential feature of the industry. To seek ways to 'add value' through diversification and enhancement, many lines have sought to establish seamless intermodal services, extending their operations to include inland haulage and offering door-to-door transportation.

Liner Shipping Companies: At the beginning of 2007, the top 25 container carriers controlled 84% of the world's TEU capacity. Maersk accounts for 16.8% of operated slots, followed by MSC, with 9.8%. The combined market share of the top four companies is 38.4%. Compared to three years ago, i.e., the beginning of 2004, this market share has increased by 7%.

Mergers between shipping lines do not automatically lead to a simple addition of the combined market shares. Soon after Maersk-Sealand purchased P&O-NeLloyd, the market share of the merged company became lower than the combined share of the two previously independent companies. At the beginning of 2006, Maersk still commanded a market share of 18.2%; one year later it was reduced to 16.8%.

Table 2.6: Liner shipping companies, TEU carrying capacity, January 2007

	TEU:'000	Share: %
Maersk Line (Denmark)	1,760	16.82
MSC (Switzerland)	1,026	9.81
CMA-CGM (France)	685	6.55
Evergreen (Taiwan)	548	5.24
Others	6,445	61.59
Total	10,464	100.00

Source: Data from Dynamar, calculations by UNCTAD.

A study by UNCTAD suggests that, up to the beginning of 2005, the number of carriers offering services at individual ports had continued to increase despite the global process of concentration. While globally there are fewer carriers today than 10 years ago, the same global carriers continue to expand into new markets. As a result, the number of carriers providing services to a specific port actually increased for the majority of countries, although since mid-2005, the average number of carriers per country has started to decline.

Containership Ownership: The ownership of containership is less concentrated than its operation. Operators tend to charter a large proportion of their vessels, which tend to be owned by "non-operating" owners, such as NSB Nordelbe (Germany).

Table 2.7: Containership Ownership, TEU carrying capacity, May 2007

	TEU:'000	Share: %
Maersk (Denmark)	972	10.30
MSC (Switzerland)	566	6.00
Evergreen (Taiwan Province of China)	380	4.03
NSB (Germany)	354	3.75
Others	7,164	75.92
Total	9,436	100.00

Source: Data from CRS, calculations by UNCTAD

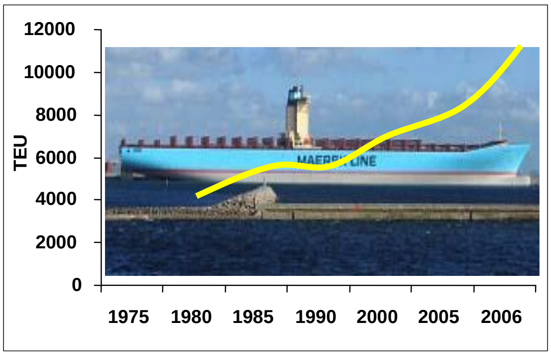
Ship Size Continues to Increase

Two clear trends that significantly affect the future of maritime business are: formation of carrier alliances and mergers, and a steady growth in the size of vessels. Mergers help cut costs by way of decrease in the number of containers used, fewer empty containers to be balanced, rationalization of agency network, integrated computer systems and volume purchases. Alliance agreements lead to aggregation of cargo, increased service frequencies, and improved asset utilization. Major shipping lines are redefining their strategies to stay competitive and to remain relevant amidst dynamics of new business environment. To carry more cargo faster, cheaper, and to offer more frequent services, shipping lines have adopted two broad strategies:

– building bigger ships: this helps reduce per unit cost of long-haul segments; and

– building feeder networks: since the big ships cannot profitably ply at all the ports along the way.

Figure 2.3: Rising Ship Size



Forty years ago, ships carried at best a few hundred containers each. By the mid-1970s, the 1,000-1,500 TEU ships of the first and second generation were being replaced by ships of over 2,000 TEU capacity, a trend that led eventually to the 4,000 TEU-plus Panamax vessels, which most major lines were ordering in the early 1990s. American President Lines (APL, now part of the NOL Group) did not use the Panama Canal and introduced the first post-Panamax 4,340 TEU vessel in 1986. By 1996, vessels of around 6,000 TEU had appeared on the scene.

Maersk Line's *Regina Maersk* broke all containership records: it was the first container vessel to load more than 6,000 TEU, the first to have the capability to load 1,400 reefer TEU, the first to load 17 containers across the weatherdeck and 14 underdeck, the first to have a beam of over 43m, and also the first to have a length of 300m.

The average size of container ships increased from 655 TEU in 1970 to 1,750 TEU in 2000. The average size of the post-Panamax vessels deployed in maritime service increased from 4,340 TEU in 1986 to 5,523 TEU in 2000.

The decade of the 1990s also saw a return to higher speeds, with ocean carriers viewing 25 knots as the standard for most east-west services.

Table 2.8: Capacity and percentage split of fully-cellular fleet by size range (2007)

Size range (TEU)	No of ships	No of ships (%)	Capacity (TEU)	Capacity (%)
8,000+	117	2.90	1,011,867	10.26
5,000 – 7,999	417	10.32	2,484,406	25.20
2,000 – 4,999	1,301	32.20	4,175,063	42.35
Below 2,000	2,204	54.55	287,211	22.19
Total	4,040	100	9,858,547	100

Source: Liner Intelligence

With COSCO's vessels, the *Cosco Guangzhou* and the *Cosco Ningbo*, at 9,500 TEU, a type of new standard has emerged, for the two major routes: Asia-Europe and Asia-North America. The traditional cargo ships could make a round trip between Europe and Asia four times a year, carrying a total of about 80,000 tonne of cargo. The modern ship shuttles back and forth six times and transports one million tonne or more of cargo.

The 9,600 TEU *Xin Los Angeles*, built by Korea's Samsung Heavy Industries (SHI), and owned by China Shipping Container Lines (CSCL), can carry a maximum of 18 rows of containers by eight tiers on the weather deck and 16 rows in the holds. With 336.7m length overall, 45.6m beam, and 15.0m draught, it is more than three times the size of the Titanic, and has a crew of only 19. Another of the largest containerships that entered into service in the latter half of 2005 included the 9,200 TEU *MSC Bruxelles*, and, in early 2006, the 9,500 TEU *CISCI Guangzhou*. In

2005, containerships ranging from 4,000 to 7,499 TEU represented 17% of the containership fleet.

SHI has orders to build 10,000, 11,000, 12,000, even 14,000 TEU vessels. The first in a series of eight being built by SHI, *Xin Los Angeles* will operate between China and Europe initially, eventually to also sail to US ports.

Figure 2.4: Emma Maersk

Likewise, Maersk Lines' latest new build – by AP Moller-Maersk's Odense shipyard in Denmark – the eighth generation largest containership afloat, *the Emma Maersk* (397m long with a beam of 56m), world's largest sailing container ship today with a capacity of 13,500-14,500 TEU is deployed on the Maersk's Asia-Europe-I service – including calls at the Danish port of Aarhus, as well as Scandinavia's largest container port of Gothenburg along with Bremerhaven, Rotterdam and Felixstowe before moving to the major ports of Asia, like Singapore, Kobe, Nagoya, Yantian, Hong Kong and Tanjung Pelepas. Both Aarhus and Gothenburg have become new hubs to serve the fast growing markets of the eastern Baltic. Most carriers tend to hub Russia-bound cargo through Rotterdam and Hamburg.

For a competitive wherewithal to be acquired, the Marseille-based world's third largest shipping company, CMA CGM placed an order with the Hyundai shipyard for eight vessels, each of 11,400 TEU capacity.

A recent ESCAP study estimates that 490 very large container vessels will be in service globally by 2011, of which some 130 will be of over 10,000 TEU capacity each. Whereas some of the shipyards, for example, Hyundai Heavy Industries in South Korea and AP Moller–Maersk Odense in Denmark, are already building mammoth 10,000-13,000 TEU capacity super post-Panamax ships, concepts for still larger vessels of up to 18,000 TEU are on the drawing board. Mega ships currently ordered by Maersk Line will have an average capacity of 13,640 TEU. Most of the post-Panamax vessels on order will be constructed in North East Asia.

Economies of Scale

While the volume of a 10,000 TEU vessel is 2.5 times greater than a 4,000 TEU vessel, its total annual operating cost is reckoned to be higher only to the extent of 55%. Using a 10,000 TEU vessel can result in savings of over 35% operating cost compared to a 4,000 TEU vessel. Drewry Shipping Consultants point to potential cost difference of as much as 50% between a Panamax ship of 4,000 TEU and a mega post-Panamax 10,000 TEU vessel. In a study by Boston Consulting Group, it has been assessed that a 50% increase in the vessel size leads to 21% reduction in operating and voyage costs. The major carriers will attempt to exploit further economies of scale, and deploy vessels of 10,000-12,000 TEU on the major trade lanes.

Some analysts believe the gains from each increment in size become smaller as vessels grow larger, and argue that the industry has already surpassed the point at which additional feedering and inventory costs would outweigh any further savings in slot costs on main line vessels. Shipping lines try to balance the slot cost reductions available from larger vessels with the cost and marketing advantages of maintaining a wide network of direct port calls. Other pressures – notably environmental opposition to dredging and resistance to ever-increasing concentration of containers on the land transport system – may tend to limit ship size growth.

The development of modern transportation solutions has helped reduce transit times for international trade cargoes. Containerisation, economies of scale, improved road vehicles, vessels, and terminals, besides the creation of coherent transportation networks, have shortened transit times. Containerisation of general cargo transport has significantly reduced unit cost. By April 2006, rates on the leading shipping lines had dropped by 20-30% compared to the beginning of the year, in spite of rising fuel costs.

Martin Stopford, managing director of the Clarkson Research suggests that some shipping lines may have been taken in by the 1999 study ‘Malacca-Max: the ultimate container carrier: “The Malacca-max design (18,000 TEU ship) has an overall lower cost level of approximately 16% over the current largest ships of 8,000 TEU”. The upper limit for container vessels would seem to be 18,000 TEU – the maximum size, according to calculations, for passage through the Malacca Straits.

Many ocean carriers sought to achieve economies of scale. There are many components involved in this strategy, some of which may be negative. According to Stopford, the average cost of a 6,000 TEU ship is about US$64 million compared to $12 million for a 735 TEU vessel. Whilst the average *pro rata* cost per 1,000 TEU falls from $18 million to $12 million for a 1,700 TEU ship, there is only marginal reduction beyond that, and a 6,200 TEU ship still costs $10.3 million per 1,000 TEU.

Similarly, operating costs, which include crew, insurance and maintenance costs, offer few opportunities for economies of scale. Hull insurance increases significantly with the size of the vessel. Bunker costs do not offer much potential cost saving to ocean carriers. The net result of Stopford’s study is that ocean carrier strategy should concentrate on increasing ship size from 1,000 TEU to 2,000 TEU, 20% was saved in the per unit cost of transport: from 2,000 TEU to 4,000 TEU, 7% was saved, but most interestingly, from 4,000 TEU to 6,000 TEU only 4% was saved.

Jim Brennan, a partner in the US consultancy firm Norbridge, advised: ‘One trans-Pacific string of megaships (over 6,000 TEU capacity) requires a 40% market share of the China/ USWC trade to achieve proper economies of scale. This equates to at least 90% vessel utilisation. Additionally, Brennan pointed out that terminals need to turn the vessels round in only 22 hours. Container lines today face the severe imbalance in global trade flows on account of the increasing export streams from China, e.g., the east-west imbalance in the trans-Pacific trade almost doubled in ten years, between 1995 and 2004, and the gap is still widening. Almost half of the containers moving from North America or Europe to Asia are empty.

Infrastructure constraints, particularly in ports, ICDs and rail transfer centres in North America bedevil ocean carriers to meet customer demands for low prices and reliable services. Port productivity in several regions has now become a significant factor, while elsewhere, restrictions imposed by unions impede efforts towards efficiency in the supply chain.

According to Henrik Anker Olesen, now with IBM Global Business Services after his eight year stint with AP Moller-Maersk, container shipping lines are vulnerable to attack from integrators like UPS, Fedex, DHL, TNT, which may even target container shipping lines as potential acquisitions.

While ongoing liberalization and globalisation fuel further growth, deregulation will expose the container shipping industry to greater market forces and eliminate cartel-like negotiating practices. Simultaneously, consolidation will enable the liners to gain greater scale, improve flexibility and enhance customer-orientation, all of which, with assistance of appropriate IT support, will help them better manage the yield and, in turn, improve profitability.

At the same time, because ship-related costs are less than one quarter of the total service cost, the financial benefits of size diminish rapidly as the ships get bigger. Constraints on the business may well encourage direct services to local ports. It is now being argued that it is inefficient from a socio-economic point to have very large volumes being handled by just one port.

In Europe and North America, roads are clogged with lorries carrying containers. In the US, intermodal shipping has drawn the road and rail operators more closely together: truck trailers carry consumer goods and spend part of their journey on trains, containers from 280 trucks fitting on one freight train. There will be mounting pressure to divert distribution of containers from land to a waterborne option, or at least divert the traffic as much as feasible from road to rail. Furthermore, well-established feeder operations in some areas will shrink, as volumes grow to the extent that large-scale direct services become viable.

Over the last 35 years or more, corporate restructuring in the shipping industry has been striking: as reported by *Containerisation International*. “Almost overnight, proud lines with histories spanning centuries formed consortia with rivals, scrapped or rerouted conventional vessels and became door-to-door experts”.

One Evolution, Three Revolutions

A parallel evolution will take place in the emergence of new Panamax ships with twice the capacity of the existing largest ships of about 15,000 TEU; and pure trans-shipment ports to serve them, with some incredible annual throughputs of up to 30-40 million TEU.

> Succinctly described by Dr. Asaf Ashar of the US National Waterways Research Institute, the recent history of liner shipping is of ‘one evolution and three revolutions’. The evolution refers to the growth in the size of the system’s two major components, ships and ports. The first revolution in the ship-to-shore transfer was the invention of containers, while the second was in the ship-to-rail transfer, the intermodal revolution. The third was in the ship-to-ship transfer, the trans-shipment revolution. The long-term future of liner shipping is predicted to be shaped by a fourth revolution, which is expected to be in service or shipping pattern, triggered by the expansion of the Panama Canal's locks. It will result in the emergence of equatorial-round-the-world (ERTW) services and a grid of supporting feeder services.

Fast Ships

As for the mega containerships, there is a place for the ‘fast ship’. The fast ship concept has been on the drawing board. Developed by the Fast Ship Inc., USA, these Jet Ships of around 1400-1600 TEU capacity can travel at speeds of 30-45 knots, i.e., twice the speed of conventional surface freight and would provide per unit shipping costs that are 70% lower than the typical air freight. Designed to be able to transport cargo across the Atlantic in about 90 hours, the ship would integrate with terminals using a link-span and AGVs (Automated Guided Vehicles), a technology which obviates the need for crane loading. It will be possible to integrate fast ship operations into a general purpose marine terminal, providing port flexibility. This concept requires a different terminal layout, of a long narrow yard of at least 2,500 metre in length. Discharge/loading systems have to perform at twice the speed of conventional ship-to-shore gantry cranes. The project could thus pose a new challenge for ports. The project has evoked worldwide attention for its high speed 1400-1600 TEU freighter on the North Atlantic.

The US based fast ship project has evoked worldwide attention for its high speed 1,400 TEU freighter on the north Atlantic. Australia's fast ferry builders see logistics potential extending well beyond speedy sea legs. Two fast ferry pioneers, Tasmania's InCat and Western Australia's Austal Ships, have turned their attention to possibilities in the cargo market. InCat 050, the first of the 96m versions of the famous wave piercing catamaran design, was built with the cargo market in mind, albeit principally aimed at wheeled freight.

Stena Line introduced two of its £65 million, high-speed Stena HSS 1500 super ferries, into service on the Irish Sea, at 126m long and 40m wide, travelling at a service speed of 40 knots. A third such vessel was envisaged for the Harwich-Hook of Holland service in 1997. Fast ships contemplate drawing business from several areas, including cargo that currently does not travel at all across the Atlantic, as airfreight is too expensive and sea freight too slow, or, cargo being airfreighted, i.e., from shippers who currently have no option but to send freight by air.

AV-shaped hull in the bow widens to a very broad stern that is concave under water. This creates a high-pressure zone, lifting the stern and overcoming the pressure drag that restricts conventional container ships from exceeding about 25 knots. Powerful water jets can then drive the ship to a top speed of 40 knots.

The 265m long, with a payload of 10,000 tonne (1,400 TEU), Fastship's promise is of a time-definite, door transit in seven days between Philadelphia and Cherbourg.

TTS Technology of Norway has designed a new system using automated vehicles with rubber tyres to carry double-stacked ocean containers on and off the vessels.

There are other versions being experimented with for faster shipping. A prototype built jointly by Mitsui Engineering and Shipbuilding and Mitsubishi Heavy Industries in Japan, Hisho (flyer) is a freighter, a catamaran lifted up like a hovercraft on a cushion of air. It has water jets driven by gas turbines, enabling it to achieve a cruising speed of 50 knots (93 kmph). A full size version, 127m long, is estimated to carry 1,000t of cargo, 500 nautical miles without refuelling.

A shipyard in Cairus, Australia, has been running trials on a freighter it calls Fast Sea Truck. Australia's fast ferry builders see logistics potential extending well beyond speedy sea legs. Known as Topcat, the vessel came in 2000 in twice-daily service between the North and South Islands of New Zealand and captured a significant amount of inter-island freight traffic from conventional ferries.

Chapter 3

A New Ports Structure: Asia Moves Ahead

Traffic concentration and the emergence of load centres is a significant feature of containerisation. To justify capital costs of the system, the shipping, air freight, and rail freight industries have developed a hub network structure. An ESCAP *Maritime Policy Planning Model, 2001*, revealed that there were no insurmountable technical barriers to the future increase in the size of containerships. These large vessels will, in turn, drive a radical reduction in the number of port calls on major routes, and lead to the development of global megaports served by fully integrated global networks. These ships may operate on radically simplified routes, calling at only one or two ports in Asia.

Ports Need to be Reconfigured

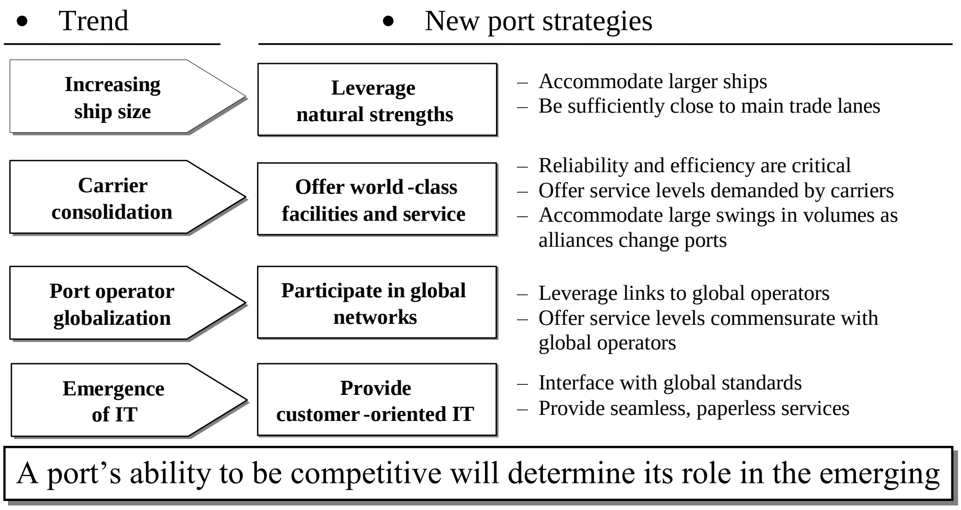
The need for automated stevedoring and increased demand for cargo handling in port areas are the reasons for a continuous increase in port size. The number of ports with a 14-metre draught has been growing steadily. For ports to successfully meet the challenges stemming from bigger vessels, they must invest a great deal in the improvement of terminal facilities and landside intermodal access. Accommodating mega vessels means that some technical challenges need to be met. These super-large vessels will be the most important determinants of port development. A 15,000 TEU vessel may require deeper draught of up to 18 metre and berths to be operated from both sides.

To tide over the problem of draught, new ships are now being designed to be broader and longer. The post-Panamax vessels now tend to be so designed that most of the increased capacity is provided by increasing the beam rather than the length or draught of the vessels: the first post-Panamax vessels were actually shorter than the first Panamax vessels, and required less draught.

As the container liner industry continues to get concentrated through carrier alliances for ports, this means fewer and larger vessels. The liners will call only at ports that offer marketing advantages, such as the fastest container movement through efficient and adequate intermodal support facilities, superior service, and the most sophisticated information system. The real potential for future cost savings lies in the landside of the shipping operations, estimated at 75% of a carrier's total costs. 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.

Changing Role of Ports: Today, ports have evolved from simple modal gateways to critical nodes in international supply chain networks. Until 1960, ports played a simple role as the junction between sea and inland transportation systems. Those built between 1960 and 1980 had expanded activities, ranging from packaging, labelling to physical distribution. From 1980, new intermodal transport system emerged and, as a result, the role of ports enlarged, to include logistics and distribution services. There is thus a constantly changing role of ports: from traditional services to value-added logistics services. Most productive ports will now be those that are equipped to handle large cargo volumes and/or significantly reduce unit costs through efficient management.

Figure 3.1: New Port Strategies



Source: Boston Consulting Group.

Mega Ports: The leading world container ports, which are gateways of foreign trade and act as the interface between production and consumption areas, are investing extensively for augmentation of their facilities. According to the Institute of Shipping Economics and Logistics (ISL), Bremen, in 2003, around 85% of the world container port traffic, measured in TEU, was concentrated in the top 100 container ports. About 4,600 ports are in operation worldwide, but only less than 100 ports have a global importance. A still further concentration of ports can be expected. The development of container trade has already led to concentration of a few but highly specialised ports (hub ports) in Asia, Europe and North America. These ports have developed into logistics centres within the respective regions. Ports as hubs in international trade are determined not only by import/export flows in overseas regions but also by intra-regional traffic patterns. The ship size determines the competitive power in the shipping industry; it also constitutes a significant criterion in determining the size, contours, and character of a port.

Great Impact: Modern and efficient ports are necessary and powerful tools for facilitating and fostering trade and development. The future lies with the ports that can meet the requirements of emerging large vessels, which necessitate not only a deeper channel, but also higher productivity levels and higher capacity cranes. With a cargo capacity of 8,500 TEU, when fully laden, the ship requires a depth of over 14.5 m. The vessels are getting bigger – say, 350 metre long and 43 metre wide. As such, many ports need to upgrade their facilities to ensure that their harbours are deep enough, docks long enough, and cranes tall enough to handle these *monsters*.

New Benchmarks: The leading ports are gearing up to increase productivity levels, say, to 200 moves per hour and to turn round an 8,000 TEU vessel in a matter of few hours. If a 10,000 TEU vessel generates up to 5,000 discharge TEU and another 5,000 TEU to be loaded, even at 250 berth moves/hour, the vessel will get tied up alongside for as long as two days, occupying not only the berth but an entire yard. The task can indeed be daunting, as at current productivity levels even in the most efficient ports, only half the job is done. World port container throughput, i.e., the number of movements taking place in ports, grew from zero in 1965 to 224.3 million moves in 2000. Container traffic is forecast to more than double by 2010, i.e., about 500 million moves.

Large shipping lines increasingly establish their own terminals and handling centres at large ports. For larger vessels, many ports have had to develop their inland waterways, as also rail and road networks in the hinterland. Channels and berths have to be dredged deeper as the new vessels draw more draught than their predecessors. Quay cranes also have to go beyond even the post-Panamax size, as the beam of vessels increases. The arrival of a mega containership demands an enormous fleet of handling equipment in order to transship thousands of containers within a few hours. Mega containerships require mega container cranes with longer back reach, more outreach, and faster operating speeds. The crane will thus have an average of over several hundred lifts per hour, also multi-quay cranes operating in parallel on the vessel. Berths can allow dual mode of ship loading, vertical and horizontal, at the same time.

New landside connectivity will indeed be a critical factor. A report *Landside Access to US Ports* by the US Department of Transportation in 1993 lucidly brought out "the weakest link in the transport chain is often at the port's own back door" where congested roads or inadequate rail linkages to marine terminals, and sometimes both, cause delays and raise transportation costs. Tri-modal hubs will need to provide fast transshipment between rail, road and inland/coastal waterway services. In addition to new generation feeder vessels, these services will, in a way, constitute arterial routes to connect the sea-hubs to the regional networks. The bulwark of land services, especially in countries like India and China, will be provided over the respective networks, which will admit long double-deck, heavy axle-loaded, multi-locomotive trains. A score of trains, of which each one may carry up to almost 500 TEU (in the US, for instance), are needed to empty a 350-m ship. This spells an increasing importance of hub ports, as carriers move to larger vessels on arterial routes and seek to fill these by relaying boxes to/from lesser trades.

Ship calls have become more punctual from monthly non-fixed to weekly fixed day to fixed time slots. It will increasingly become more costly to ignore the benefits of maintaining strict discipline in fixed schedules. Container terminals will thus need to either upgrade or risk limiting their ability to accommodate these bigger ships. Shipping lines will be selective in their choice of port calls in order to optimise their asset deployments.

These changes in ship technology require:

- larger, faster, and more sophisticated cargo handling transfer and storage technology,

– new generation of integrated fleet, container and feeder routing, scheduling and sequencing systems,
– real time systems information management and cargo-vehicle tracing system (GPS, etc.),
– new integrated paperless electronic operations management, marketing, finance, accounting, procurement and collection systems. These systems must be accessible by customers, services providers, and various control staff.
– Changes in management systems which automatically adjust hard and soft components of the system and their operations to changes in requirements.

Large Cranes: Ports which recently received (or ordered) cranes of 'extra-large' post-Panamax dimensions include the US ports of Hampton Roads, Miami and Seattle, besides Felixstowe, Dubai and Hong Kong. They have all opted for units of minimum 62m outreach, with Dubai receiving cranes rated at 68m, which are amongst the largest ever to be built. However, the majority of these largest capacity cranes have been installed in China to cope with the burgeoning demand there for additional terminal capacity.

A mainline port of call will thus need to deploy cranes with an outreach of 65-68m, able to go across 23 rows of containers, and a trolley speed of 240m per minute. Twin-lift spreaders will also be required, tandem lift spreaders to be able to simultaneously lift two 40-foot containers. Eight such high capacity cranes will become necessary to handle each mega vessel with terminal tractors transferring containers to an RMG-operated yard. Besides, 20 RMGs will need to be provided at the rate of two and a half RMG per quay crane, and 56 trucks to be deployed per seven trucks per quay crane.

Terminals are increasingly adopting twin-lift spreaders in their yard operations, while new ship-to-shore gantry cranes are at any rate delivered with twin-lift capability. In fact, there is already a buzz for the next stage in spreader development – the quad-lift. Industry estimates the market for twin-lift spreaders to be of the order of 700-800 units annually. It is maintained that all terminals with cranes that can handle a maximum weight of 50 tonne under the spreader are suitable for use with twin-lift spreaders. Each spreader is fitted with hydraulically retractable twist lock housings mounted on the main centre section. When additional twist lock housings are used, the spreader can handle two 20-foot boxes.

New Logistics Paradigm: Globalization in production and distribution will significantly affect the future of shipping and port systems. It will lead to steady growth in the size of vessels, and the formation of carrier alliances and mergers. Advances in technologies constantly impact ports. Electronic commerce will spur demand for shipping and port services by increasing trade.

Globalisation has encouraged global companies to concentrate production into fewer locations. Global firms have been steadily reducing their number of national warehouses, consolidating them into regional distribution centres. Postponement, or delayed configuration, is another logistics strategy that can be effective in achieving the cost-reduction benefit in standardization while maximizing marketing effectiveness through localization. In this context, the ports need to develop services to take a bigger responsibility in the chain, such as cross-docking solutions, picking and packing, warehouse management and distribution. This has become necessary because of the large deep-sea volumes carried by large vessels.

Value-added Services: Time-based competition is intensifying. Shippers have become more attuned to sophisticated supply chain management. Value-added services refer to the process of developing relationships with customers through the provision of an augmented offer, which may encompass many aspects of the value-added activities. An ideal port should provide a diverse range of services that are highly integrated. Global firms have been searching for new production and logistics architectures. Improving logistics performance, in turn, requires an information system that can provide complete demand visibility from one end of the pipeline to the other.

Until the 1970s, most ports provided the same basic package of services to customers. Today, ports find it is no longer possible to compete effectively only on the basis of basic, traditional operations. Ports are seeking out new means of gaining a competitive edge.

Customers now look for value-added logistics services as an integral part of their supply chain. As global firms strive to attain a competitive advantage in the marketplace, new logistics and distribution systems emerge based around centralized, regional value-added distribution centres that enhance speed-to-market and enable more rapid and flexible customer service. Concepts like those of freight villages, logistics parks, etc. have come in vogue.

Central to a freight village is an intermodal terminal that is connected to major road freight corridors and a nearby seaport to enable flexible, quick movement of cargo between wharf, warehouse, and its ultimate destination, by using both road and rail modes. The juxtaposition of the intermodal terminal with facilities such as full and empty container storage and handling areas, and warehouses that are linked to the railway and intermodal terminal reduce cargo handling costs and time

A freight village also offers a shared access to some of the facilities, equipment and services. While some of the operators would use their own facilities and services and others would hire facilities and pay for services from other providers, some facilities such as customs and quarantine services, a truck cleaning area, post office and conference and training rooms would be used on a common access basis. As well as providing opportunities for sharing operational facilities, some freight villages cater for routine needs of people working there, e.g., bus services, parking facilities, and amenities such as cafes and canteens, recreation and creche.

Logistics Centres/Distriparks: While the 'freight village' concept is a European model, the ESCAP region has some well-established logistics centres and distriparks that share many of the features of the freight village. Many ports of the ESCAP region have shifted, or are shifting, their emphasis from traditional cargo-handling services to value-added logistics services in order to remain competitive in the regional and international markets. Both logistics centres and distriparks share the principle that they comprise not only infrastructure but also the services necessary to satisfy and respond to requirements.

A logistics centre/distripark is a large-scale, advanced, value-added logistics centre with facilities for distribution operations at a single location, typically with an emphasis on consolidation and deconsolidation of containerized goods. Distriparks are typically located close to container terminal and multimodal transport facilities. Customers are often able to choose among a variety of transport modes, which has the possibility of further reducing delivery time and costs. Distriparks are often located in Free Trade Zones.

In the 1980s, Government of Singapore launched on an active campaign to develop the city-state into a transshipment hub for products originating in Malaysia, Indonesia and Thailand, besides Singapore itself. In addition to developing the port, government used a range of incentive schemes including tax exemptions to actively encourage multinational corporations and international logistics service providers to locate in Singapore and to establish their regional or global distribution centres there. There are examples of Keppel and Pasir Panjang distriparks in Singapore, ATL Logistics centre in China, North Port – Port of Klang in Malaysia.

Port Operators Develop Global Networks

Since today's giant carriers consider it important to gain control of terminals, close cooperation between carriers and terminal operators will lead to cost reductions as well as value-added services required by the carriers. Some liners are trying to maximize their control over handling operations and costs by setting up their own terminal facilities. Emergence of global terminal management companies is changing the dynamics of business.

Securing Larger Pie: Today, global terminal operators within the container transportation industry worldwide are assuming an increasing role. Drewry Shipping Consultants project that terminals within the global terminal operators community will account for 61% of the total world capacity by 2011, compared to 58% in 2005. They also predict that, by 2008, the top four operators will control over one-third of total world container port capacity.

In 2005, container ports worldwide handled a total of some 399 million TEU, more than 11% up on the 2004 levels. The Dubai-based DP World, following its recent absorption of the P&O ports potfolio, has been the fastest growing container terminal operator. The Geneva-based Mediterranean Shipping Co. and CMA CGM have also been among the fast rising entities in this business.

The leading global container terminal operators' performance share is shown below:

Table 3.1: Leading Container Terminal Operating Companies (2006)

	2006 (mTEU)	2005 (mTEU)	% change
Hutchison Port Holdings	56.5	51.8	09.0%
PSA International	51.3	41.2	24.5%
APM Terminals*	47.1	40.0	17.8%
DP World	42.1	35.0	20.3%
Cosco Pacific	32.8	26.1	25.7%

Source: Containerisation International * CI estimate

Like in case of containerships, a recent UNCTAD analysis succinctly brings out the impact of the world's topmost container ports and container port operators.

Container Ports: The world's top four container ports in 2006 together moved one out of every five TEU of world port throughput.

Table 3.2: Container Ports Throughput: TEU: 2006

	TEU:'000	Share:%
Singapore (Singapore)	24,792	5.60
Hong Kong (Hong Kong, China)	23,548	5.32
Shanghai (China)	21,720	4.91
Shenzhen (China)	18,469	4.17
Other	353,871	79.99
Total	442,400	100.00

Source: Data from Dynamar, calculations by UNCTAD.

Container Port Operators: Two of the top seven port operating companies are linked to shipping lines (APM and Cosco Pacific). The others are Huchison, PSA, DP World, Eurogate and SSA Marine which started their development as local port operators in Hong Kong, Singapore, Dubai, Germany, and the Unites States, respectively. In 2006, the combined market share of the top four container port operating companies was 44.2 %. Their market share has experienced the largest increase of all major port and shipping industries in recent years. PSA in 2006 acquired a 20% stake in HPH's port division.

Table 3.3: Container Port Operators Throughput: TEU: 2006

	TEU:'000	Share:%
Hutchison (Hong Kong, China)	59,300	13.40
PSA Corp (Singapore)	51,290	11.59
APM Terminals (Denmark)	43,000	9.72
DP World (United Arab Emirates)	42,000	9.49
Other	246,810	55.79
Total	442,400	100.00

Source: Data from Dynamar, calculations by UNCTAD.

Large and Fast Growing Ports Have Transshipment Focus

Economies of scale in containerised cargo shipment have led to the emergence of a few global maritime entities controlling the allocation of transshipment business to selected hub ports. The world's top ten container ports handle over 40% of world container traffic. Transshipment of containers has emerged to be large business for terminal operators. Transshipment results in double handling of containers which, in turn, means additional income for the terminal operators. In 2004, world's total container lifts amounted to about 344 million TEU of which container trade was only 96 million TEU; about 152 million TEU, or approximately 44% of the total container lifts, were transshipped around the world.

Table 3.4: Global Container Activities: Million TEU

Container Activity	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	CAGR
Total lifts	151	164	177	205	226	238	275	303	344	383	10.9%
Total trade	50	54	57	60	66	68	76	84	96	107	8.8%
Transshipment	51	56	63	85	94	102	123	135	152	169	14.2%
Transshipment as ratio of total lifts	34%	34%	35.6%	41.5%	41.6%	42.9%	44.7%	44.6%	42.2%	44.1%	

Source: Clarkson Container Intelligence Monthly.

Asian Transshipment Ports

An ESCAP study demonstrates that the volume of containers transshipped within the region will increase – from about 40 million TEU in 2005 to 100 million TEU by 2015. The following table shows the quantum of transshipment business at some of the ports. In certain cases, transshipment constitutes an overwhelming share, as at Tanjung Pelepas, Singapore, Salalah and Colombo:

Table 3.5: Volume of Transshipment Business at Some Ports: Million TEU

	Transshipment	Domestic
Colombo	1.43	0.77
Dubai	3.22	3.21
Hong Kong	1.17	20.82
Jeddah	1.18	1.25
Klang	2.40	2.40
Salalah	1.75	0.45
Singapore	16.00	5.33
Tanjung Pelepas	3.82	0.20

Source: I-maritime Consultancy.

Transshipment market has become very competitive. Maersk shifted its operations from Singapore to Tanjung Pelepas. Port of Pelepas has been a beneficiary of diverted traffic from Singapore port.It currently holds the world berth productivity record of 340 gross berth moves per hour. While handling a Maersk vessel with more than 4,000 containers, which it shifted in less than 13 hours with peak production touching 480 moves per hour, port of Pelepas has enhanced its capacity to a large extent by improving its operational efficiency. The positioning of Tanjung Pelepas as a head-to-head competitor of Singapore is underscored by similarities in the composition of their transshipment cargoes. Tanjung Pelepas is also heavily dependant on the South-East Asian market – in fact, even more than Singapore. It is estimated that South-East Asian traffic will account for 86% of Tanjung Pelepas total transshipment traffic in 2011.

Nine global scale transshipment ports are expected to emerge in the region, each annually handling in excess of 3 million TEU of transshipment cargoes. There is considerable potential for the development of a substantial transshipment business at several new regional hubs: Busan and Gwangyang in the Republic of Korea, Port Klang and Tanjung Pelepas in Malaysia, and Shanghai in China, among others.

The hub of choice in the Middle East for most carriers remains Dubai's Jebel Ali terminal. Transshipment activity at the port of Dubai has been especially buoyant. Large volumes of containerised cargo to and from Dubai give the port an important edge, as does its reputation for operational efficiency and productivity. While productivity at Jebel Ali remains amongst the highest in the Middle East, feeder ships have suffered fairly long delays sometimes, due to the sheer volume of traffic. The United Arab Emirate's (UAE) other genuine multi-carrier hub is the Gulftainer-operated Khor Fakkan Container terminal. CMA CGM has introduced 6,500 TEU ships on its Europe-Asia services that call into Khor Fakkan.

Once a significant container transshipment centre, nearby Fujairah port is not faring so well in the container market. Although, it has been used as hub by APL, the carrier has been routing more traffic via Jebel Ali, as well as calling direct in Nhava Sheva. Fujairah hopes that a recent 600m berth extension will help breathe new life into its position as a container hub.

While Maersk Sealand volumes through Salalah Port Services (SPS) are said to be on the increase, Salalah has received a setback with MSC's decision to shift its business to Muscat. One of SPS' particular selling points is its high productivity – probably the best in the Middle East. Salalah has become established as the main hub for Maersk Sealand's Middle East operations. AP Moller subsidiary Safmarine has also started using Salalah.

In the Red Sea region, Jeddah's reputation as a regional container hub has steadily improved. In addition, Saudi Arabia's port authority has adopted a more flexible and commercial approach. The south container terminal handles most of Jeddah's container business. Transhipment business is one of SCT's fastest growing activities. The terminal also has to respond to the competitive challenges provided by the new northern container terminal set up in 2000. Both UASC and Evergreen have decided to transfer services to the NCT joining Maersk Sealand and Cosco/Uniglory as the terminal's mainline carrier customers. NCT, which is operated by Gulf Stevedoring, has benefited from substantial investment in new equipment. With a solid domestic cargo base, and a convenient location for vessels going through Suez, Jeddah is the obvious choice as Red Sea hub.

The development of a container terminal in Aden has given carriers yet more options to this region. Certainly, the PSA-managed Aden Container Terminal can genuinely claim hub port status after two years of exceptional rapid growth. Aden has two key customers, APL and PIL. Jeddah and Aden may face competition from a new source, the Suez Canal Container Terminal. The main advantage of SCCT is that of a terminal in an ideal geographical location, being managed by an international team, drawing best practice experience from both its main parent companies, ECT and APM terminals.

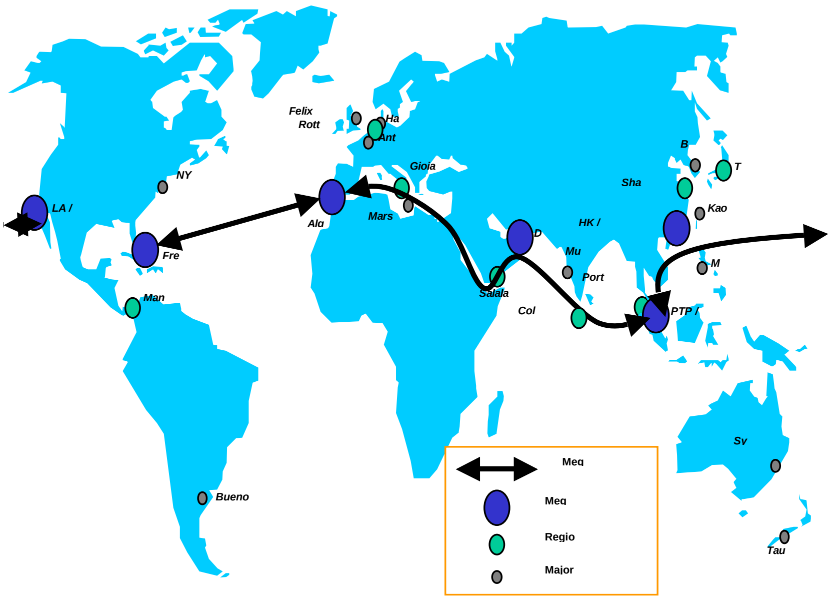
Hub and Spoke: Container shipping networks have increased in complexity as well as in scale. The key development has been the evolution of hub-and-spoke system. Asia has led the world in this development. Singapore emerged in the late 1980s as the world's first port dependent primarily on transshipment cargoes, to be joined by other ports of Salalah, Aden, Gioio Tauro, Tanjung Pelepas, etc. No doubt, a section of shippers/consignees express their opposition to transshipment services. Delays, damage, loss and pilferage in some cases are singled out as potential risks in a hub-and-spoke service network.

Singapore handles as much as about 75% transshipment business of its total traffic throughput. In 1985, Singapore's total throughput was 1.5 million TEU. In the same year, the traffic generated in the other four large ASEAN countries, which provide the primary catchment for Singapore trans-shipment, was 1.95 million TEU. By 1999, the volume generated by these four countries had risen spectacularly to 10.8 million TEU – more than five times the 1985 level. Singapore's volume, however, which was predominantly transshipment to/from these countries, had risen to 15.9 million TEU, or more than ten times its 1985 level. This is despite the introduction of direct mainline calls to ports such as Port Klang and Laem Chabang. Cargoes originating in or bound for South-East Asia will continue to dominate transshipment through Singapore. It is estimated that nearly 70% of total trans-shipment cargoes through Singapore will have a South-East Asian origin or destination.

A number of ports that have substantial volumes of hinterland cargo also play a major role in the transshipment system: these include ports of Hong Kong, Kaoshuing, Busan, Tokyo, and Klang. It is estimated that just over 5 million TEU of the Hong Kong port's total volume will be due to trans-shipment cargoes. Apart from China cargoes, the main transshipment business of Hong Kong port is as a relay centre for cargoes from South-East Asia and Oceania to North and Central America.

Busan and Gwangyang are located within close proximity, and allocation of shipping services between the two is to a very large extent speculative. Total transshipment volume at the two ports is expected to be approximately 9 million TEU by 2011. Cargo from Chinese ports will comprise the greater part of this volume: this cargo, mostly from the northern ports of China, accounts for approximately 65% of total transshipment volume. Most of the remaining volume is likely to be made up from other short sea feeder movements: from Japan, especially Kyushu and ports of the west coast, from North Korea, and domestic feeder services. Total transshipment volumes at the Japanese hub ports in 2011 are estimated at approximately 1 million TEU. As industrial activity within Asia gets more and more dispersed, the network of intercontinental shipping services, which was at one time concentrated almost exclusively on Japan, gradually becomes more diffused and extensive, eliminating the earlier need to tranship in Japan.

Figure 3.2: Projected Hub Ports



Source: Boston Consulting Group

Singapore Leads: The port of Singapore is often cited as a role model for a large-scale logistics centre. Korean ports have also been introducing this type of logistics centres. Many ports in China and Kaoshiung port in Taiwan have allowed production and manufacturing functions in the Free Trade Zone areas near the ports. In Japan, the use of value-added service facilities in port areas has seen a rapid increase. China has constructed logistics centres behind port areas, as are the logistics centres developed in the port of Tanjung Pelepas in Malaysia, the port of Kaohsiung in Taiwan, and the Subic Bay Freeport in the Philippines.

Significant gains in productivity have been achieved through advanced terminal layout, more efficient IT-support and improved logistics control software systems as well as automated transportation and handling equipment. For instance, in the port of Singapore, container turnover per employee quintupled between 1987 and 2001.

Asia Moves Ahead

Among the three major trade routes related to Asia, namely, the Asia-Europe, trans-Pacific and intra-Asian routes, intra-Asian trade is projected to show the strongest growth rate until the year 2015. *The Maritime Policy Planning Model* suggests that the total volume of international container handling in the ESCAP region ports is expected to increase from 142.7 million TEU in 2002 to 427.0 million TEU in 2015, an annual average growth rate of 8.8%.

Table 3.6: Container Throughputs of Selected Asian Countries and Ports

TEU: '000

Country or area/port	2004	2015	Annual average growth rate (percentage)
China	52556	159788	10.6
Shanghai	14557	37776	9.1
Shenzhen	13650	37893	9.7
Hong Kong, China	21984	29461	2.7
India	4267	11666	9.6
Mumbai/Jawaharlal Nehru	2589	6966	9.4
Japan	15987	26155	4.6
Tokyo/Yokohama	6076	10304	4.9
Kobe/Osaka	4186	7527	5.5
Malaysia	11264	33559	10.4
Port Klang	5244	14343	9.6
Tanjung Pelepas	4020	15139	12.8
Republic of Korea	14299	34917	8.5
Busan	11430	26383	7.9
Singapore	21311	48763	7.8
Thailand	4856	9895	6.7
Laem Chabang	3529	8439	8.2

Source: Lloyd's Marine Intelligence Unit, Containerisation International Yearbook 2006 (London, 2006). 2015 (forecast) – ESCAP study estimates.

Based on UNCTAD's *Review of Maritime Transport*, 2004, *i-maritime Consultancy's* analysis shows that the Asian countries have emerged as major players in world maritime sector: they account for 35.8% of containership ownership, 45.7% of containership operation, 60.4% of seamen, 62.3% of container ports throughput, 64.7% of container port operators, 83.2% of container shipbuilding, and 99% of ship breakage.

More than half of the full containers exported in the world today are shipped from Asia. Likewise, more than a third of the world's import container imports takes place in Asia. Since 1995, container exports from the Far East to the world tripled (including intra-Asia trades).

In 2005, approximately 65% of the world container traffic, in terms of TEU, was attributed to Asian ports, whereby the top eight Chinese ports alone represented 26.5% of the total container traffic. Europe had a share of 18.5% of the world container port traffic, and USA 15.2%. According to Drewry Consultants and Cygnus Research, Far East is expected to drive the global container traffic. Its contribution is likely to touch 40% by 2009, from 36% in 2004.

Buoyancy in Other Ports As Well

All major container ports in the US showed substantial traffic gains. This is especially true for the West Coast ports of Long Beach, (16.1%), Seattle (17.4%), Tacoma (14.8%), and Oakland (11.1%). In 2005, Rotterdam, the top European container port, increased its traffic by 12.3%. Rotterdam and Hamburg, with an increase of 15.5% far above the average of the North Range ports, won market shares from Antwerp, Bremen/Bremerhaven and Le Havre. Le Havre's container traffic decreased, again, in the period 2004-2005 by 1.2%. Container traffic of the top five Mediterranean ports, namely, Gioia Tauro, Algeciras, Valencia, Barcelona and Genoa increased by 4.7%.

Table 3.7: Asia's Contribution to World Container Growth

	2002	2015
South Asia	4%	5%
South East Asia	10%	10%
Africa	3%	3%
East Asia	24%	32%
North Asia	10%	8%
ANZ/Pacific	3%	2%
Middle East	3%	2%
North America	17%	13%
Europe	22%	17%
Latin America	5%	6%

Source: UNESCAP

Rotterdam lost market shares of the intra-European traffic to Hamburg, Bremen/Bremerhaven, and Antwerp. The biggest transshipment hub within the North Range is Hamburg due to its proximity to markets in the Baltic Sea Area. The ports of New York/New Jersey's top trading partners are located in Asia. About 50% of the ports container traffic in 2005 was because of trade with Asia.

The striking changes in regional domination of the container ports across the world are observed in Table 3.8. Over the past few years, the world's six largest container ports are from Asia.

Table 3.8: Top 20 Container Ports

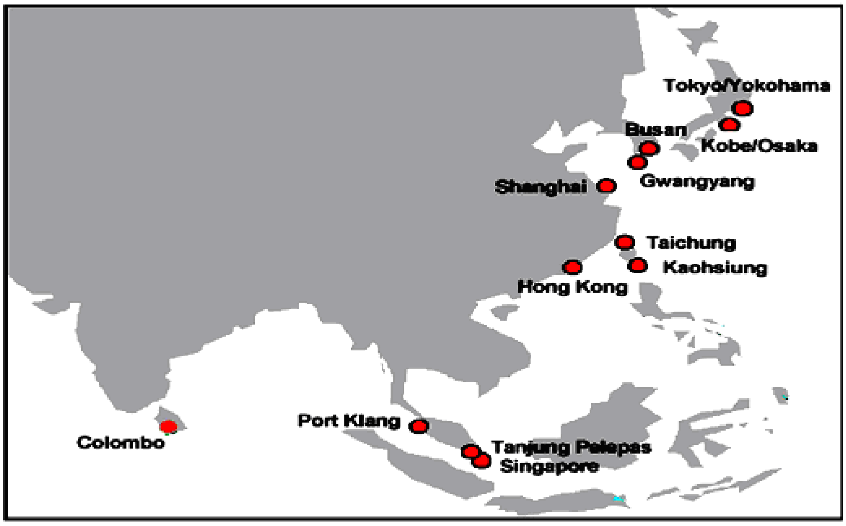
	Port	Region	Total TEU		Port	Region	Total TEU
1970				**1980**			
1.	New York/ New Jersey	ECNA	930,000	1.	New York/ New Jersey	ECNA	1,947,000
2.	Oakland	WCNA	336,364	2.	Rotterdam	N Europe	1,900,707
3.	Rotterdam	N Europe	242,328	3.	Hong Kong	East Asia	1,464,961
4.	Seattle	WCNA	223,740	4.	Kaohsiung	East Asia	979,015
5.	Antwerp	N Europe	215,256	5.	Singapore (PSA)	South-east Asia	916,989
6.	Belfast	N Europe	210,000	6.	Hamburg	N Europe	783,323
7.	Bremen/ Bremerhaven	N Europe	194,812	7.	Oakland	WCNA	782,175
8.	Los Angeles	WCNA	165,000	8.	Seattle	WCNA	781,563
9.	Melbourne	Australia	158,127	9.	Kobe	North-east Asia	727,313
10.	Tilbury	N Europe	155,082	10.	Antwerp	N Europe	724,247
11.	Larne	N Europe	147,309	11.	Yokohama	North-east Asia	722,025
12.	Virginia	ECNA	143,231	12.	Bremen/ Bremerhaven	N Europe	702,764
13.	Liverpool	N Europe	140,419	13.	Baltimore	ECNA	663,000
14.	Harwich	N Europe	139,627	14.	Keelung	East Asia	659,645
15.	Gothenburg	Scandanavia /Baltic	128,270	15.	Busan	North-east Asia	632,866
16.	Philadelphia	ECNA	120,000	16.	Tokyo	North-east Asia	631,505
17.	Sydney	Australia	117,985	17.	Los Angeles	WCNA	620,988
18.	Le Havre	N Europe	107,995	18.	Jeddah	Red Sea	562,792
19.	Anchorage	WCNA	100,731	19.	Long Beach	WCNA	553,709
20.	Felixstowe	N Europe	93,099	20.	Melbourne	Australia	512,864
Total			4,069,375	Total			17,269,451
Share of global throughput			75.9%	Share of global throughput			49.6%
Global Total			**5363235**	**Global Total**			**34,805,944**

	Port	Region	Total TEU		Port	Region	Total TEU
1990				**2006**			
1.	Singapore	South-east Asia	5,223,500	1.	Singapore	South-east Asia	24,792,400
2.	Hong Kong	East Asia	5,100,637	2.	Hong Kong	East Asia	23,230,000
3.	Rotterdam	N Europe	3,666,666	3.	Shanghai	East Asia	21,710,000
4.	Kaohsiung	East Asia	3,494,631	4.	Shenzhen	East Asia	18,468,900
5.	Kobe	North-east Asia	2,595,940	5.	Busan	North-east Asia	12,030,000
6.	Los Angeles	WCNA	2,587,435	6.	Kaohsiung	East Asia	9,774,670
7.	Busan	North-east Asia	2,348,475	7.	Rotterdam	N Europe	9,690,052
8.	Hamburg	N Europe	1,968,986	8.	Dubai	Middle East	8,923,465
9.	New York/ New Jersey	ECNA	1,871,859	9.	Hamburg	N Europe	8,861,545
10.	Keelung	East Asia	1,828,143	10.	Los Angeles	WCNA	8,469,853
11.	Yokohama	North-east Asia	1,647,891	11.	Qingdao	East Asia	7,702,000
12.	Long Beach	WCNA	1,598,078	12.	Long Beach	WCNA	7,290,365
13.	Tokyo	North-east Asia	1,555,138	13.	Ningbo	East Asia	7,068,000
14.	Antwerp	N Europe	1,549,113	14.	Antwerp	N Europe	7,018,799
15.	Felixstowe	N Europe	1,417,693	15.	Guangzhou	East Asia	6,600,000
16.	San Juan	Caribbean	1,381,404	16.	Port Klang	South-east Asia	6,320,000
17.	Bremen/ Bremerhaven	N Europe	1,197,775	17.	Tianjin	East Asia	5,900,000
18.	Seattle	WCNA	1,171,090	18.	New York/ New Jersey	ECNA	5,092,806
19.	Oakland	WCNA	1,124,123	19.	Port Tanjung Pelepas	South-east Asia	4,770,000
20.	Manila	East Asia	1,038,905	20.	Bremen/ Bremerhaven	N Europe	4,450,000
Total			44,367,482	Total			208162855
Share of global throughput			52.4%	Share of global throughput			56.3%
Global Total			**84,642,133**	**Global Total**			***369719521**

Source: Liner Intelligence * provisional figure

Asian ports continue to dominate the global container port league.

Figure 3.3: Expanding Asian Ports



The steadily rising intra-Asia trade, with growing container throughputs, has been reshaping the world shipping. Asia has become increasingly interdependent. One important sectoral shift in Asia's economic activity is from primary products to manufacturing. Asia's share of world merchandise goods exports has doubled over the last two decades – from 10% to 20% – for emerging economies. Intra-Asian exports have registered an annual average growth rate of 14%, almost double of the world exports growth rate of 7.5%.

More than 50% of the containers on both the Asia-Pacific route and the Asia-Europe route return empty to Asia.

By 2011, it is expected that East Asia will have replaced Western Europe as the most important driver of the global container trade, although Europe will remain almost as important, with 22% of the total. North America's share is expected to decline to 14%. Container exports from the Far East to different parts of the world tripled – including intra-Asia trades – and against a 40% share in 1995, it reached 55% in 2004. Asia's container trade with Africa and Latin America and Australia is expected to grow at rates well in excess of the world average of over 9% per annum. Higher growth over the period will also allow the volumes generated by South-East Asia to surpass those from North Asia, and Latin America. The

South Asian countries are also expected to increase their share of the global total.

Diverse and complex economies of Asia pose their own challenges of logistics. Some of the Asian ports – those of Singapore and Hong Kong in particular – have been great success stories, in fact, setting enviable efficiency indices and benchmarks. Dubai commands a strategic location midway between the East and the West. China has meanwhile recorded unprecedented performance levels. China's role as a global factory is reshaping transportation logistics. Today, 80% of China's U.S.-bound exports in containers are unloaded on the US West Coast, then hauled by train or trucks to their destination – a route that can cut a week off shipping time through Panama Canal.

New Container Berths: As volumes have risen, existing infrastructure in ports and the capacity of the onward inter-modal transportation option have been seriously strained. In order to handle the anticipated port container traffic in 2011, a requirement of over 430 new container berths has been estimated in the region, involving an investment of around $27 billion only for developing the terminals. China, Hong Kong and Taiwan will require over 160 new berths by 2011, South East Asia around 120 berths, North Asia (excluding China) and South Asia about 90 and 40 berths, respectively. Substantial additional investment will also be required to secure adequate access to the terminals by road, rail and inland waterways.

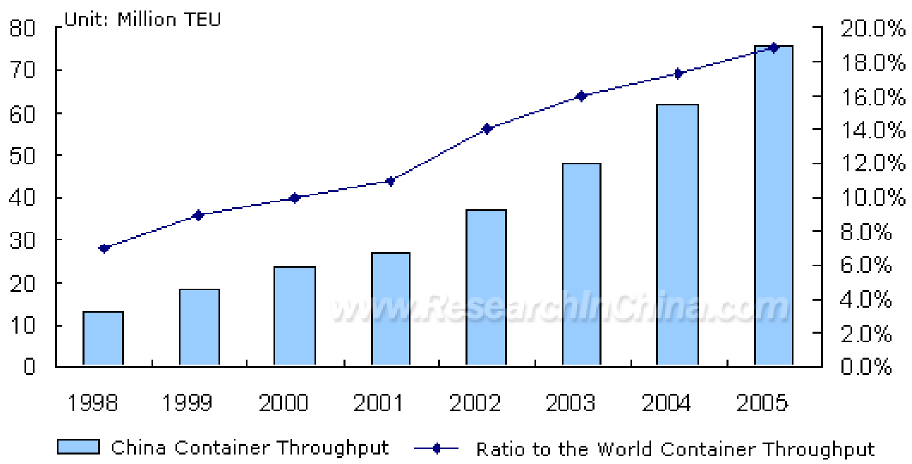
Room for All: There is enough room for ports to co-exist and function even in close proximity. The mega transshipment port of Tanjung Pelepas, the 19th largest in the world, handled 4.18 million TEU. This port is located just 150 km from the 14th largest port, Port Klang in Malaysia which handled 5.54 million TEU. The Chinese port of Ningbo, the 15th largest, is but 200 km away from Shanghai. The new South Korean transshipment port of Gwangyang is a mere 170 km from the 5th largest port of Busan. Tanjung Pelepas Sdn Bhd, a wholly owned subsidiary of Seaport Terminal (Johore) Sdn Bhd, situated at the mouth of the River Pulai in south west Johor is projected to transform itself into the largest container port in Malaysia. According to the London-based Drewry Shipping Consultants, the Asian region container ports will witness demand outstripping supply by 2010.

China Clearly in the Lead: China has emerged as a major container market. In 1989, Chinese mainland ports handled less than 1 million TEU; by 1995, it increased to 4 million TEU; by 2002, it was 12 million TEU, and kept increasing annually by over 25%. On the east land Asia-North America route, the share of Chinese exports is reported to exceed 60%, implying that about 7 million TEU move eastbound from China to the US.

China now handles more boxes than any other nation in the world, with over 100 million TEU estimated to have passed through its ports in 2006. China has 10 ports handling more than one million TEU, five ports handling over five million TEU, and two complexes processing in excess of 15 million TEU per annum. It is estimated that the container throughput in the Chinese ports will increase at an annual rate of 12% through the year 2011 and exceed 140 million TEU. More than 27% of world's containerised cargo leaves or arrives at Chinese ports. Chinese ports accounted for 47% of the 2005 world container throughput, according to UNCTAD (*Review of Maritime Transport, 2006*). Shanghai is well on its way to be the world's largest container port by end-2007.

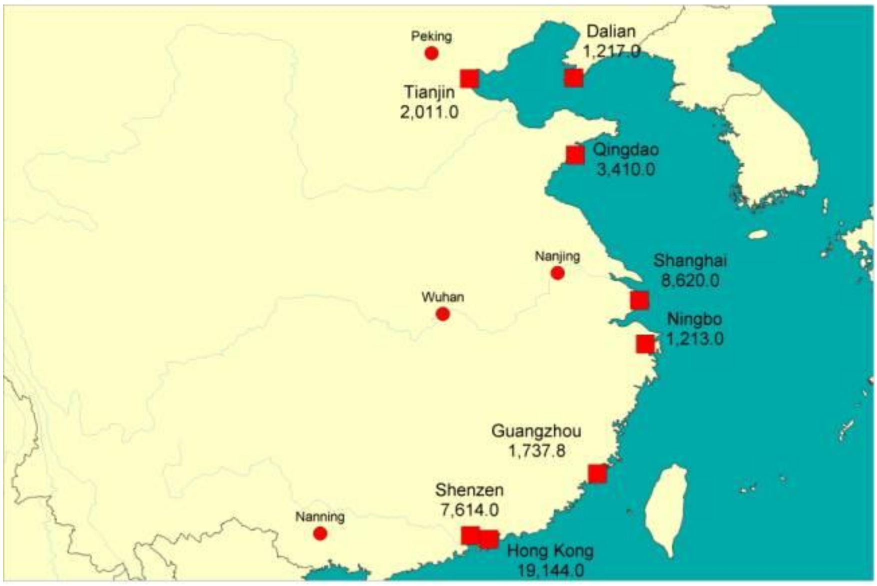
Figure 3.4 below shows the steady rise in China's port container throughput during the period 1998-2005 and its share in world container volumes:

Figure 3.4: China Port Container Throughput and its Ratio to that of the World, 1998-2005



Source: China Container Port Industry Report, 2006

Figure 3.5: Major Chinese Container Ports in 2005: TEU: '000



China's buoyant economy and its international commerce is speeding up the investment in, and construction of, container ports. All regions in China are eager to construct large container ports to serve as hub ports. In north China, Qingdao, Tianjin and Dalian compete with each other; in Yangtze Delta Region, Shanghai and Ningbo have a fierce competition; in South China, Shenzen and Guangzhou are strong rivals.

Table 3.9: China's Top Ten Container Ports: 2006

		Throughput: Million TEU	
		2006	**2005**
1.	Shanghai	21.7	18.08
2.	Shenzen	18.46	16.20
3.	Qingdao	7.7	6.31
4.	Ningbo	7.06*	5.21
5.	Guangzhou	6.6	4.68
6.	Tianjin	5.96	4.80
7.	Xiamen	4.01	3.34
8.	Dalian	3.21	3.66
9.	Lianyungang	1.3	1.01
10.	Zhongzhan**	1.17	1.08

* *After merger with Zhoushan* ** *The only river port in the table*

Source: Liner Intelligence

Logistics Week reports Shanghai port throughput in 2006 increased by 20.1% year-on-year, to a volume of 21.7 million TEU. The ports of Ningbo and Zhoushan merged. Guangzhou recorded the fastest growth among the top ten, with an increase of 41% over the previous year, and overtook Tianjin for the first time.

Although the Chinese juggernaut rolls ahead with its global exports, its export share in the intra-Asian trade declined from 56% in 1985 to 46% in 2002. On the other hand, exports of Asian countries to China rose during the period, from 1% to 10%, thereby signifying China's emergence as a global production base, verily the world's factory, importing intermediate products from other Asian economies for processing and exporting to the industrialized economies of US and Europe.

Growth impulses are today primarily concentrated on China, resulting in massive changes in regional shares in total world seaborne trade. According to the *World Trade Service*, published quarterly by GlobalInsight, seaborne exports will experience a fundamental regional shift up to 2022. China, which currently ranks fifth in the list by volume, will rank second with 1.2 billion tonne. In respect of throughput of containers, China dominates the country league. In 2004, the top 20 countries in the container league included the following.

Table 3.10: Top-20 Countries in the League for Containers: 2004

S.N.	Country	Throughput: TEU	S.N.	Country	Throughput: TEU
1.	China	52,556,000	11.	Spain	7,809,503
2.	USA	35,612,651	12.	UK	7,450,891
3.	Singapore	21,311,000	13.	Belgium	7,282,942
4.	Japan	15,937,464	14.	Indonesia	5,566,586
5.	Korea	14,288,304	15.	Australia	5,128,848
6.	Taiwan	13,025,377	16.	Brazil	5,068,622
7.	Germany	12,467,705	17.	Thailand	4,855,827
8.	Malaysia	11,264,389	18.	India	4,266,910
9.	UAE	8,681,636	19.	France	3,947,010
10.	Netherlands	8,482,404	20	Canada	3,926,147

Source: Containerisation International Yearbook 2006

The Pearl River Delta, in the Province of Guangdong, forms a triangle with the cities of Hong Kong, Macau and Guangzhou, and at the centre of three SEZs – Shenzhen, Zhuhai, and Shantou. It has been critical to the economic development of China. The ports of Pearl River Delta are important southern gateways to the country's heartland.

In addition to Shanghai, Ningbo and Shenzhen ports, some of the other ports in China have been expanding. For example, Qingdao Port, China's third busiest container port strategically located near the southern entry to Bohai Bay, is a natural deepwater port located in the Yellow River basin on the western Pacific Rim. In 2003, additional four container berths of 1,660 metre were commissioned, offering 16-17.5 metre depth alongside with the capability to handle vessels up to 10,000 TEU. Total designed capacity of QQCT was expected to reach 4 million TEU in 2006, when three additional berths of 1,000 metre would be completed, and further increase to 7.4 million TEU in 2010. About 500 metres from Qianwan Terminal, Qingdao Qianwan International Logistics Park started operations in 2004.

Tianjin Port: Situated in the North-East of China, 137 km from Beijing on the coast of Bohai Sea, Tianjin port is a key gateway to northern China. Transshipment volumes with Mongolia, Kazakhstan and other inland countries continue rising at the port. Tianjin port is divided into four areas, namely, (i) Inner River Port Area; (ii) North Harbour Area; (iii) South Harbour Area; and (iv) Bulk Cargo Logistics Centre. North Harbour Area is mainly developed for containers and general cargoes, while South Harbour Area is a modern port area for coal, coke, oil and petrochemicals.

Dalian Port is located at the southern tip of the Liaodong Peninsula, and serves as the gateway to North-Eastern provinces of China. The port is linked to an inland container transport network. The port is stepping up its development in a bid to become an international shipping centre for North-East Asia. By 2010, its total throughput will increase to 200 million tonne and container throughput to 6 million TEU.

Malaysian ports are also expected to experience significant increase mainly due to expansion of the transshipment business. Its port international container throughput will increase at an annual average rate of 12%, from 3.8 million TEU in 1999 to 14.6 million TEU in 2011, of which transshipment will account for as much as 7.9 million TEU, or 55%.

Ports in Malaysia registered a 12% volume increase in 2006, compared with 12 m TEU in 2005. Tanjung Pelepas now accounts for one-third of Malaysia's total box traffic, while 50% of all containers in the country are transshipped.

Taiwan: Its two main container ports – Kaohsiung and Keelung – are now overshadowed by Taichung on its west coast. The port gets its main business of direct import and export flows from its hinterland, about 20% of Taiwan's exports and imports being generated from within the greater Taichung area. Taiwan today is not the manufacturing centres it used to be. Some seven years ago, Kaohsiung was the world's third largest container port. It is now relegated to 6th slot, and volumes are nearly flat lines, with premier customer Maersk ramping up investment and calls at Xiamen, directly opposite the Taiwan Strait on the mainland. Evergreen has been attracted to set up its Taichung Container Terminal to avail itself of direct cross-straits sailings opportunities. In fact, Taichung complements Evergreen's hub in the Kaohsuing port which acts as a transit and transshipment centre for long-haul routes, whereas Jaichung functions essentially as an intra-Asian hub.

Korea: In 2006, Busan port throughput rose at its lowest level for 16 years, just up 1.6% to 12m TEU. Transhipment made up 43% of the total. Busan Port Authority has embarked on a new strategy, looking to invest in its first overseas concessions in Viet Nam and Russia's Far East. By investing in Vostochny, and possibly Vung Tau in Viet Nam, Busan expects to control the inbound and outbound destination of containers. The port's location renders it a gateway for container traffic moving across the straits, and also for use as a base for transshipping Chinese cargo on to other markets in Asia. A 180 ha free trade zone, close to the container terminal, adds to its potential.

Vietnam: In the wake of major economic growth, Viet Nam has been bunching a major port development plan. Hanoi-based Vinamarine, a body charged with coordinating a national port policy earmarked an amount of US$600 million for a number of container port projects in the north, central and southern regions of the country. Eight port groups were identified for development, including Haiphong and Cailan in the north, and Vung Tau, Thi Vai and Cai Mep in Ho Chi Minh. Although three-fourths of Viet Nam's containerised cargo is generated in the south, Haiphong in the north is important for many apparel, footwear and electronics manufacturers.

There have also been some intra-regional shifts as traditional maritime gateways, such as Singapore, Hong Kong, Kaohsiung, Tokyo, Yokohama and more recently, Busan, have lost out to emerging ports in Malaysia (Port Tanjung Pelepas), China (Shenzhen, Shanghai, Ningbo and Qingdao, in particular), Thailand (Laem Chabang) and India (Jawaharlal Nehru Port).

India Looking East: In the context of India's 'Look East' policy catalysing trade between India and South East Asia and East Asia, a steady substantial growth is envisaged. The India-China trade is expected to record a CAGR of 20%, and intra-Asia trade by as much as 35% by the year 2015. Steadily increasing traffic volumes from Asia to US West Coast have emphasised the need for substantial augmentation of ocean cargo capacity on the Asia-Pacific trade lanes. India's ports thus have a great opportunity to develop requisite infrastructure to handle large volumes.

Indian Ports

The Asian trade share (in terms of value) of India's exports and imports in 2004 was 31% and 21%, respectively. India's container trade in 2004 was about 8.5% of Asian container trade – 51 million tonne compared to about 600 m.t. of all Asia's container trade. All Chinese ports are likely to deal with a 130 million TEU traffic through 2011, according to the Korea Maritime Institute (KMI). The forecast for Indian ports by the Japan International Consulting Agency suggests a traffic level of 10 million TEU by that year.

The Indian peninsula and the lower echelons of the Gangetic plain across Orissa and Bengal on the east and Gujarat on the west are skirted by Bay of Bengal and Arabian Sea, thereby opening the subcontinent on the pathway of international trade and commerce. Indian coastline extending over 7,500 km has 13 ‘major’ ports (under the Central Government jurisdiction) and about 187 intermediate/minor (non-major) ports under the control of respective state governments.

Figure 3.6: Indian Ports

The share of “non-major”/ “intermediate ports” (other than central government controlled major ports) has been steadily rising.

Table 3.11: Traffic at Ports: Million Tonne

	1991-92	1999-00	2003-04	2004-05	2005-06
Major ports	157.6	271.9	334.5	383.76	423.62
Minor/Intermediate ports	13.2	62.3	117.4	137.87	151.14
Total	**170.8**	**334.2**	**461.8**	**521.63**	**574.76**
Share of ‘intermediate’ ports:%	8	18.5	25.4	26.4	26.3

Source: Indian Ports Association

India's major ports are under the administrative jurisdiction of Central Government, governed by Major Port Trusts Act, 1963. Minor/intermediate ports are under the administrative control of respective state governments. Most of the minor/intermediate ports are being developed through private sector participation.

Cochin and Mumbai ports were the first to handle containers. Over the years, many of the major ports have built dedicated terminals equipped with specialized handling equipment. The principal ports handling container traffic include:

- *West coast ports:* Kandla, Mundra, Pipavav, Jawaharlal Nehru Port (JNP), Mumbai, Cochin;
- *East coast ports:* Tuticorin, Chennai, Visakhapatnam, Kolkata/Haldia.

Mormugao, New Mangalore and Paradip ports handle only a limited number of containers on their general cargo berths.

Relatively a late starter in respect of intermodal/multimodal development, India improvised rudimentary infrastructure at some of the ports like Cochin, Chennai, Kolkata and Mumbai supported by a couple of make-shift rail-fed inland container depots (ICDs) at Delhi, Bangalore and Coimbatore in the mid-1980s. It was only in 1990 onwards that intermodal development came to make a significant beginning, when CONCOR (Container Corporation of India Ltd.) provided an impetus to the scheme. A string of ICDs and container freight stations (CFSs) were set up in different parts of the country. The new gateway at Nhava Sheva (JNP) near Mumbai steadily emerged as the main container terminal on the country's west coast, linking the sprawling hinterland in the western and central parts of the country as well as the northern and northwestern region. These regions have emerged as the largest beneficiaries of intermodal infrastructure.

Following a steady competition emerging from road transport eroding their market share, Indian Railways had taken a rare initiative in developing a multimodal containerised intra-country transportation of high revenue yielding consumer goods. IR introduced its own 5 tonne container for the service in mid-1960s. Again, IR set up in 1980s a few improvised inland container depots (ICDs) with linkages to gateway ports for export-import cargoes to move in ISO containers. APL and Pakistan railways were moving containers between Karachi and Lahore as early as 1989.

In Asia, intermodalism is still in its infancy, although the potential, particularly in China and India, is enormous. Interest in the China landbridge, linking Japan and Asia with the Central Asian Republics of the former Soviet Union is gathering momentum.

India's Container Trade at Foreign Hubs: Presently, large container ships break their bulk in Singapore, Colombo, Dubai and some other ports in smaller ships for handling of inward and outward oceanic traffic from and to the Indian seaports. Container terminals at Indian ports serve a closed hinterland and operate essentially as collection and distribution centres for their trading areas. Cargo handling is, in fact, fragmented; it is handled by several entities with different objectives, management structures, and work practices. In 2005-06, India's international container trade originating from, or terminating at, Indian gateways was transshipped at various hub ports as indicated in table below. For want of adequate port infrastructure, a substantial part of container traffic at Indian ports traverses other regional ports with resultant additional cost and transit for India's trade.

Table 3.12: Transshipment of Indian Exim Containers 2005-06: TEU: '000,000

Port	Transshipment						Indian Coastal	Direct Destination	Total	Direct Destination %
	Singapore	Klang	Dubai	Colombo	Salalah	Others				
Kolkata	1.23	0.21		0.50		0.07	0.02		2.03	
Haldia	0.70	0.13		0.23		0.04			1.10	
Paradip	0.03								0.03	
Visakhapatnam	0.28	0.03		0.07		0.02	0.03	0.04	0.47	8.5
Chennai	1.71	0.60		1.33	0.26	0.05	0.19	3.21	7.35	43.7
Tuticorin	0.02	0.01		0.84	0.15	0.07	0.05	2.07	3.21	64.5
Cochin	0.12	0.03	0.01	0.93	0.31	0.27	0.17	0.16	2.00	8.0
New Mangalore				0.07				0.03	0.10	30.0
Mormugao				0.09					0.09	
Mumbai	0.47		0.25	0.11	0.02		0.38	0.33	1.56	21.2
JNPCT	0.06	0.02	0.01	0.02	0.01	0.83	0.46	11.98	13.39	89.5
NSICT#			0.42			0.46	0.12	12.66	13.24	95.6
GTTIPL								0.04	0.04	100.0
Kandla	0.01			0.37		0.51	0.17		1.48	0
Total	**4.63**	**1.03**	**0.69**	**4.56**	**0.75**	**2.32**	**1.59**	**30.52**	**46.09**	**66.20**

*Source: All major ports. * Containers transshipped at Singapore & Klang separately not available*
 # All transshipment containers handled at NSICT figure in 'others'

Changes in Port Sector: Of late, there has been a great deal of reconfiguring of maritime activities along the country's coast, which is reflected in a large number of terminals in the private sector, both on the east and west coasts, and increasing private sector participation in developing port terminals.

Container terminals are being privatized under BOT format. There are currently private sector container terminals operating at JNP, Tuticorin, Chennai and Visakhapatnam, among the Government sector major ports. Contracts for additional terminals for containers at Cochin and JNP have been awarded. Mumbai port too, has opted for a similar arrangement. Container terminals have come up, one each at Mundra and Pipavav state-sector "non-major" ports on the Gujarat coast, to be operated by foreign shipping lines/terminal operators.

Indian ports recorded a high compound annual growth rate for all cargoes but still higher growth rate for the container traffic since the year 1990 as reflected in the tables below.

Table 3.13: Share of Containers in Total Traffic at India's Major Ports

(million tonne)

	Total Cargo Traffic at Major Ports	Total Container Traffic at Major Ports	Share of Container Cargo: %
1990-91	152.86	8.04	5.26
1991-92	157.60	7.63	4.84
1992-93	166.58	9.01	5.41
1993-94	179.26	12.25	6.83
1994-95	197.26	15.36	7.79
1995-96	215.34	17.62	8.18
1996-97	227.26	20.59	9.06
1997-98	251.66	23.30	9.26
1998-99	251.72	23.78	9.45
1999-00	271.92	27.69	10.18
2000-01	281.11	32.22	11.46
2001-02	287.58	37.23	12.95
2002-03	313.53	43.67	13.93
2003-04	344.80	51.00	14.79
2004-05	383.62	54.76	14.27
2005-06	423.57	61.98	14.63
2006-07	463.84	73.48	15.84

Source: Indian Ports Association

Table: 3.14: Growth of Container Traffic at India's Major Ports: CAGR: 1992-2005

Port	Container Traffic	Overall Cargo	Port	Container Traffic	Overall Cargo
Kolkata	6%	5%	Cochin	10%	4%
Haldia	25%	8%	New Mangalore	12%	13%
Paradip	Negligible	11%	Momugao	19%	5%
Visakhapatnam	13%	6%	Mumbai	-3%	1%
Ennore	-	-	JNP	24%	20%
Chennai	13%	4%	Kandla	15%	5%
Tuticorin	18%	7%	**Overall**	**14%**	**7%**

The retrospect and prospect of handling containers at India's major ports is reviewed in the following table:

Table 3.15: Cargo at Major Ports: Retrospect and Prospect

	Total Cargo Handled/ Projected (m.t.)	General Cargo including Containers(m.t.)	Containers (m.t.)	Containers% of Total	Containers:% of General Cargo
2000-01	281.10	75.05 (26.7%)	32.22	11.5	42.9
2001-02	287.58	83.13 (28.9%)	37.24	12.9	44.8
2002-03	313.53	96.43 (30.8%)	43.67	13.9	45.3
2003-04	344.80	105.82 (30.7%)	51.06	14.8	48.2
2004-05	383.77	113.75 (29.6%)	54.87	14.3	48.2
2005-06	405.00	120.69 (29.8%)	58.18	14.4	48.2
2006-07(*)	415.00	123,45 (29.7%)	61.10	14.7	49.5
2007-08($)	457.00	137.00 (30.0%)	69.19	15.1	50.5
2008-09($)	502.00	155.60 (31.0%)	80.91	16.1	52.0
2009-10($)	552.00	176.60 (32.0%)	94.48	17.1	53.5
2013-14@	961.55	404.15 (42.0%)	251.4	26.1	62.2
2013-14(**)	705.84	307.24 (43.5%)	181.2	25.7	58.9

Figures in parenthesis show growth over the previous year.
(*) *Forecast for Tenth Five Year Plan*
($) *Forecast by CONCOR for 2007-10*
@ *Forecast by Ministry of Shipping (NMDP) for all ports*
(**) *Forecast by Ministry of Shipping (NMDP) for all major ports.*

These projections point to the urgent need for developing additional container handling facilities. In 2008 itself, in order to sustain the traffic level of about 8 million TEU, the port infrastructure would require to be augmented by at least eleven additional berths capable of handling 300,000 TEU throughput per berth per annum.

A profile of containers handled at major ports in India is shown in Table 3.16:

Table 3.16: Containers Handled at Indian Ports: TEU'000 (1996-97 to 2006-07)

	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Kolkata	133	141	132	147	138	98	106	123	159	203	240
Haldia	9	28	28	28	51	93	117	137	128	110	110
Paradip	..	..	..	..	..	..	2	4	2	3	2
Visakhapatnam	13	13	14	20	20	22	22	20	45	47	50
Ennore	..	..	..	..	..	..	..	..	..	..	
Chennai	256	293	284	322	352	344	425	539	617	734	798
Tuticorin	89	102	100	137	157	214	213	254	307	321	377
Cochin	112	122	129	130	143	152	166	170	185	203	227
New Mangalore	..	..	..	..	2	4	6	7	9	10	17
Mormugao	3	3	3	4	4	6	9	10	10	10	12
Mumbai	583	601	509	429	321	254	213	197	219	156	138
JNPT	423	504	669	889	1189	1573	1930	2269	2371	2668	3,298
Kandla	77	84	64	79	91	126	157	170	181	148	177
Mundra								49	211	299	529
Pipavav								25	69	86	153
Total	**1,698**	**1,891**	**1,932**	**2,185**	**2,468**	**2,886**	**3,373**	**3,900**	**4,517**	**4,998**	**6,128**

Source: Indian Ports Association/other ports

India seriously tried to adopt containerisation only in the 1980s/1990s. India's container traffic aggregates just about 1% of global container volumes. However, lately, it has been growing fast, and is expected to further grow substantially.

Table 3.17: India's Share in World Container Traffic (1990-91 – 2003-04)

	World Container Traffic Million TEU	Indian Container Traffic Million TEU	India's share: %
1990-91	85.6	0.68	0.79
1991-92	93.6	0.68	0.73
1992-93	102.9	0.80	0.78
1993-94	112.4	1.05	0.93
1994-95	124.8	1.26	1.01
1995-96	137.2	1.45	1.06
1996-97	150.8	1.70	1.13
1997-98	160.7	189	1.18
1998-99	171.5	1.93	1.13
1999-00	203.2	2.19	1.08
2000-01	231.7	2.47	1.07
2001-02	243.8	2.89	1.19
2002-03	266.3	3.37	1.27
2003-04	297.2	3.98*	1.34

* *Includes 76,689 TEU (49,305 TEU) at Mundra and (27,384 TEU) at Pipavav*

Containerisation share of about 11% of the total cargo at major ports in 2000-01 increased to around 15% in 2005-06; this share is projected to rise to over 22% by 2010-2011.

Table 3.18: Share of Import and Export Containers Handled at India's Major Ports

	Container Traffic: million tonne			Container Traffic: million TEU		
	Import	**Export**	**Total**	**Import**	**Export**	**Total**
1990-91	3.85	4.19	8.04	0.33	0.35	0.68
1991-92	3.15	4.48	7.63	0.34	0.34	0.68
1992-93	3.90	5.11	9.01	0.40	0.40	0.80
1993-94	5.40	6.85	12.25	0.53	0.52	1.05
1994-95	7.20	8.16	15.36	0.63	0.63	1.26
1995-96	8.11	9.51	17.62	0.73	0.72	1.45
1996-97	9.11	11.48	20.59	0.85	0.85	1.70
1997-98	10.49	12.63	23.12	0.94	0.95	1.89
1998-99	11.70	12.08	23.78	0.94	0.95	1.89
1999-00	13.61	14.08	27.69	0.97	0.96	1.93
2000-01	15.63	16.59	32.22	1.24	1.23	2.47
2001-02	17.94	19.29	37.23	1.46	1.43	2.89
2002-03	19.95	23.72	43.67	1.69	1.68	3.37
2003-04	23.87	27.13	51.00	1.97	1.93	3.90
2004-05	26.65	28.11	54.76	2.15	2.08	4.23
2005-06	31.06	30.92	61.98	2.35	2.26	4.61
CAGR(%)	**14.70**	**15.53**	**15.14**	**14.64**	**14.09**	**14.37**

CAGR: Compound Annual Growth Rate between 1990-91 and 2005-06.

Table 3.19: Total Cargo and 'Others' at India's Major Ports: 2005-06

Ports	Total Cargo (million tonne)	General Cargo			Share of general cargo vis-à-vis Total Cargo: %	Share of containerised cargo in general cargo: %
		Others	Contain-erised	Total		
		(million tonne)				
All major ports	**423.41**	**68.98**	**61.83**	**130.81**	**30.9**	**47.3**
Kolkata	10.81	2.49	3.23	5.72	52.9	56.5
Haldia	42.22	5.20	1.71	6.91	16.4	24.7
Visakhapatnam	55.80	8.84	2.63	9.47	17.0	27.8
Ennore	9.17	-	-	-	-	-
Chennai	47.25	8.58	11.76	20.34	43.0	57.8
Tuticorin	17.14	5.35	3.43	8.78	51.2	39.1
Cochin	13.94	0.88	2.54	3.42	24.5	74.3
New Mangalore	34.45	1.43	0.15	1.58	4.6	9.5
Mormugao	31.69	1.94	0.11	2.05	6.5	5.4
Mumbai	44.19	11.84	2.15	13.95	31.6	15.4
JNPT	37.75	1.48	33.78	35.26	93.4	95.8
Kandla	45.91	16.94	2.31	19.25	41.9	12.0
Paradip	33.11	4.03	0.05	4.08	12.3	1.2

Source: *Indian Ports Association*

Two-thirds of the country's container traffic is handled at the west coast ports. The National Maritime Development Programme envisages all Indian ports to handle 17.98 million TEU by 2013-14. The following table shows the port-wise projections:

Table 3.20: Container Traffic Projections for Ports in India

Actual: 2005-06 TEU: '000		Projection: 2013-14 TEU: Million
203	Kolkata	0.75
110	Haldia	0.47
3	Paradip	0.05
47	Visakhapatnam	1.0
---	Ennore	0.9
734	Chennai	1.2
321	Tuticorin	1.0
203	Cochin	2.5
10	New Mangalore	---
10	Mormugao	---
156	Mumbai	1.0
2,668	JNPT *	5.5
148	Kandla	0.7
4,613	All Ports	15.10
	Pipavav + Mundra-Vizhingam + Coastal Transshipment	2.88
	Total	**17.98**

** JNP + NSICT + GTPL*
Source: National Maritime Development Programme: Ministry of Shipping

Jawaharlal Nehru Port (JNP): Of all the container traffic handled at major and intermediate ports in 2005-06, JNP and Mumbai ports on the west coast accounted for over 61%.

Other than JNP, containerised trade is expected to grow faster at ports like Kandla, Tuticorin and Chennai, among the 'major' ports. JNP has three container terminals, namely, (i) Jawaharlal Nehru Port Container Terminal (JNPCT) operated by the port trust itself, (ii) Nhava Sheva International Container Terminal (NSICT) operated by DPW on BOT basis, and (iii) Gateway Terminal Pvt. Ltd. (GTPL), operated by Maersk-CONCOR combine. JNPCT combined with the private sector Nhava Sheva International Container Terminal (NSICT) handled 58% of the country's total container traffic in 2005-06 – 2.668 million TEU of a total of 4.613 million TEU handled at all ports. JNP handled 3.30m TEU in 2006-07, up by 23.6% over the 2.67m TEU output in 2005-06. JNPCT handled 1.31m TEU, NSICT handled 1.36m TEU, and Gateway Terminals 0.63m TEU.

The fourth container terminal at JNP with 2.2m TEU capacity is likely to be commissioned by 2011. Average dwell time at JNP for import containers in 2006-07 was 0.93 day against 1.56 days in 2005-06, although for boxes consigned to inland CONCOR ICDs, it was 4.17 days. Congestion at the port continues to persist primarily due to inadequate logistics support by way of rail and road capacity. Some measures already under implementation will help, e.g., double-tracking of the rail line between Panvel and JNP, and widening of road to and from the port.

Capacity Enhancement: Realizing that container traffic in the country has the potential to increase exponentially, a major thrust is being given to the building of container handling capacity at different terminals and gateways. It is likely that major growth will materialise in the existing container terminals having low base and proximity to the main load centres. This is particularly due to the hitherto principal players like JNP and Chennai ports facing connectivity constraints and saturation of back-up infrastructure.

A formidable challenge to JNP on the west coast is brewing not only from greenfield 'non-major' ports like Mundra and Pipavav, but also Kandla, among the major ports. Kandla has planned for the development of a 3.36 million tonne container terminal. New terminals at Mundra, Pipavav should expect container traffic to eventually move away from JNP and Mumbai. The Mundra port handled over 8 million tonne of bulk cargo and 0.5 million tonne of containerised cargo in 2005-06.

Mundra Port is a naturally protected harbour for year-round operations; it has a draught of 18 metre, the deepest among Indian ports, where super post-Panamax ships can be berthed; it has the shortest distance from the ports in the Middle East and those further west; and the distances from Mundra port to ICDs in the north are shorter compared to other west coast ports. Rail and road distances from JNP, Mundra and Pipavav ports to some of the important ICDs are shown in Table 3.21.

Table 3.21: Rail and Road Distance (km)

From	To	Dhandari Kalan (Ludhiana)	Morada-bad	Agra Cantt	Dadri	Tughla-kabad	Sabarmati	Gwalior (Malanpur)	Vadodara
Pipavav	Road	1537	1369	1029	1266	1190	337	1205	341
	Rail	1593	1469	1230	1332	1319	431	1373	531
Mundra	Road	1461	1397	1130	1241	1312	425	1280	538
	Rail	1528	1388	1165	1267	1239	356	1283	456
JNP	Road	1713	1566	1516	1442	1387	561	1251	442
	Rail	1741	1588	1293	1464	1413	580	1436	437

Rail distances are based on Railway Time Tables, road distances on Indian Distance Guide (TTK Publication)

The distance by rail from Mundra to Gurgaon is 1,144 km, and from Pipavav 1,233 km – all via Viramgam-Mehsana-Palanpur-Marwar-Ajmer-Phulera-Jaipur-Rewari. If, instead of Jaipur, the route covers Phulera-Ringus-Rewari section, it will be shorter by 65 km. There will be a further saving of a distance of 63 km, when the Kutch Railway, on completion, will provide a through route (Gandhidham-Samkhiali-Bhildi-Palanpur). For the Ludhiana stream of traffic, the routes would follow Merta Road-Bikaner-Bhatinda-Dhuri-Ludhiana or Rewari-Hissar-Dhuri-Ludhiana.

The proposed dedicated freight corridor (DFC) along the west coast will admit of high-speed operation with wagon fleet of up to 30 tonne axle load and higher moving dimensions. This would enable the required flexibility to run not only high capacity wagons but double-stack container trains as well. The proposed DFC in the western sector will preferably be built along the Delhi-Jaipur-Ahmedabad-Mumbai route, with connections to Tughlakabad, Dadri and Gurgaon at one end, and JNP and Mumbai port complexes at the other end. The section between Mumbai and Vadodara will be a part of this route.

Double-stack container operation has already been introduced between Kanakpura (Jaipur) and Pipavav port. This will considerably improve average load per train, release line capacity, and reduce handling and freight costs.

Rewas: The hitherto little known port at Rewas has drawn countrywide attention, following the intent expressed by Reliance Industries to acquire the port and develop it into a future hub – to serve not only the mega SEZ (special economic zone) in Navi Mumbai, which is due to come up as a genuinely ambitious project in this genre, but also extensive hinterland. The port with a reported draught of over 16 metres will enable an important linkage to the north and northwest through double-stack container trains running along the proposed dedicated rail freight corridor.

The concession agreement for 50 years for the development of Rewas port was signed between the Maharashtra Maritime Board and the Amma Lines Ltd. in March 2002. A special purpose vehicle – Rewas Ports Ltd. – will execute the project in two phases on a build-own-operate-share-transfer (BOOST) basis. The port is projected to have a channel depth of 19 metres and berth depth of 21 metres.

Maersk India and P&O Ports (now DPW) India have acquired considerable strategic stake in the operation of container terminals at Mundra and Pipavav, anticipating future shift of cargo, while other global terminal operators like Singapore Port Authority (PSA), Dubai Ports (DPW) have staked investments in ports like Tuticorin, Visakhapatanam, Gangavaram and the proposed transshipment port at Vallarpadam (Cochin).

Vallarpadam/Vizhinjam: The proposed new transshipment terminal at Vallarpadam in the vicinity of Kochi will be able to handle container ships of about 6,000 TEU drawing a draught of 14.5 metres by the year 2010, when it is expected to go on stream. DP World has had Royal Haskoning prepare a blue-print for the phase I, $200m, 1m TEU capacity terminal at Vallarpadam. The project envisages the construction of 600 metre of quay and 30 hectare of back-up yard, the quayside lift to consist of six super post-Panamax quayside gantry cranes.

While laying the foundation stone for Rs.2,118-crore Vallarpadam terminal near Kochi on 16 February 2006, Prime Minister Dr. Manmohan Singh described it as the first global hub terminal, with immense potential of spin-off effects. International Container Transshipment Terminal (ICTT) at Vallarpadam strategically located on the main global shipping lanes has been envisaged to become a premier gateway for southern India, while offering an alternative to transshipment hubs like Colombo and Singapore for container transshipment. This transshipment terminal, when fully operational, is expected to attract 25% of the 12 million TEU projected to be handled along the west coast. A sizeable portion of the east coast traffic is also expected to find its way to it, depending on the availability of land bridging facility, attractive rates to be offered by the mainline vessels, minimum of transshipment cost, savings in time, etc. DP World, the terminal operator, proposes to invest $200 million in phase I. A 17.2 km 4-lane road from Vallarpadam Island to Kalamassery, besides rail connectivity is to be provided.

The need, in fact, is to create port infrastructure to be able to accommodate mega container vessels of up to 15,000 TEU. The site at Vizhinjam near Thiruvananthapuram is reported to offer a depth of about 20 metres, besides being located close to east-west sea route maritime corridor, about 200 nautical miles or about 10 hours of sailing from Colombo. The state government of Kerala has been pushing the project to be considered for investment and development.

Tuticorin/Colachel: With the dredging of the Sethusamudram Ship Canal Project (SSCP), the shipping and business community in Tuticorin has stepped up its demand for the simultaneous creation of the Tuticorin hub port, also referred to as the Tuticorin Outer Harbour Project. The Sethusamudram Project will allow ships sailing between the east and west coasts of India to have straight passage through Indian territorial waters instead of having to go around Sri Lanka and thereby saving about 780 km and up to 30 hours in sailing time. Currently, ships have to cover this additional distance owing to the shallow water across the Adam’s Bridge near Rameshwaram and in the Palk Strait. SSCP will facilitate movement of vessels of draught upto 12.80 metre. The canal will reduce the distance between Kanyakumari and Kolkata from 1,357 to 1,098 nautical miles. First conceived by an Indian marines commander, A.D. Taylor in 1860 to avoid circumnavigating Sri Lanka, the expected length of the canal is 45 nautical miles, off Pamban, 300 km south of Chennai near Rameshwaram, connecting Gulf of Munnar and Palk Strait.

Pricewaterhouse Coopers, consultants for the Tuticorin project, have prepared a report on “Development of Container Transshipment Hub at Tuticorin". The domestic transshipment forms up to 40% of Tuticorin port throughput which has been estimated to increase by about 17% due to additional containers reaching it due to the SSCP. The Inner Harbour project entails deepening the draught from the existing 10.7 metres to 12.8 metres. The hub port, which entails the construction of a big breakwater, can have a draught of 16 metre. The long-term plan is to build the hub port in four stages, by 2011. The cost of its development is estimated at Rs.3,617 crore.

Additionally, the Sethusamudram Corporation Ltd. has proposed a container transshipment hub to be constructed at Colachel, a port in southern Tamil Nadu, involving an estimated expense of over Rs.2,000 crore. Although the project at Colachel had been mooted by RITES in its *Port Vision* 2020, and a feasibility study was prepared in 1998 by the State government, and updated in 2000 by a Malaysian enterprise for a greenfield port, a detailed project report is contemplated afresh by the government of Tamil Nadu.

On the eastcoast itself, in addition to Tuticorin, Chennai has always yearned to be a hub port, although its location amidst the busy metropolitan city, with concomitant congestion and difficulties of access, militates, as in other similar cases of Kolkata and Mumbai ports, against the prospect of large-scale expansion of landside facilities, rail and road network.

Dhamra: The Tata-L&T port project to come up at Dhamra in Bhadrak district of Orissa, between Paradip and Haldia/Kolkata, has the potential to develop, expand and diversify beyond its current plans to deal mostly with bulk commodities. Endowed with natural advantages of deep draught and promising hinterland, not to talk of the immense possibilities of a linkage to the proposed east-north dedicated rail freight corridor, Dhamra port may well make a serious bid to transform itself into a hub port on India's eastern seabord.

Section II:
Land Transport Logistics

Chapter 4

Land Transport Networks
Regional and Subregional

Developing Corridors

For an integrated intermodal network in the region, especially in the context of developing growth impulses and nodal clusters in inland locations, dry ports constitute an important factor. For the benefits of globalisation and economic growth to percolate also to a large number of disadvantaged people in the interior, and to enable such people to share the fruits of economic progress with those living in coastal areas, infrastructural facilities of intermodal transport will be a crucial element. UNESCAP has been focusing on the development of international transport corridors. This is the approach followed by the Trans-Asian Railway (TAR) network, the Asian Highway (AH), the Euro-Asian Linkage Project, and other initiatives. The AH and TAR agreements constitute the two important building blocks for realizing the vision of an international integrated intermodal transport system in Asia.

Catalysts of Economic Growth

Integration requires a number of inland intermodal interfaces which are strategically located at cross-over points, where networks of different modes converge. Efficient interfaces optimize fleet utilization, thereby reducing the idle time of vessels in ports and rail wagons in yards, as well as bringing down the inventory costs. Intermodal interfaces are an integral part of an international integrated intermodal transport system, as they are not only the nodes that connect inland areas to the coastal production networks efficiently, but also become part of the production network that stimulates economic development in the inland areas. Intermodal interfaces could act as inland growth centres, which would also provide the local people with increased job opportunities.

Inland Waterways

The total navigational length of rivers lakes and canals in the ESCAP region exceeds 290,000 km. These waterways annually carry over one billion tonne of cargo and 560 million passengers. The regional inland waterway transport fleet consists of more than 450,000 vessels with an aggregate carrying capacity of 40 million tonne.

Inland waterways are of great relevance to the economic development of remote rural areas, where the inhabitants are usually among the poorest in the region. There are fifteen countries in the ESCAP region where inland waterway transport (IWT) plays a significant role in transportation.

Asia is generously endowed with navigable inland waterways. Some of them, such as the Ayeyarwady, Ganga, Jamuna, Brahmaputra, Lancang-Mekong, Volga and Yangtze rivers are world famous. Others, including the Pearl River in China, the Thanlwin River in Myanmar, the Fly River in Papua New Guinea, the Chao Phraya River in Thailand and the Red River in Viet Nam, although not so well known, are important for their contribution to national economies and people's daily lives.

In China and Russian Federation, the annual volume of freight carried by IWT is about 690 and 155 million tonne, respectively. Use of the Yangtze alone is increasing at 40% per year. The volume of containers moved on the inland waterway system in China has grown significantly fast.

Inland waterways remain an underutilized linkage in the chain between Asian ports and their hinterland markets because of inadequate draught and other natural impediments to navigation, poor navigation system, and poor cargo handling facilities. For example, over 70% of the navigable length of the inland waterway system in Bangladesh provides for vessel draught of 0.91 metre or less during the dry season.

Apart from the effects of monsoon on channel depths, the natural characteristics of some inland waterways can impede their navigability. Until recently, nine rapids and ten scattered reefs, in a section of the Mekong river that borders the Lao People's Democratic Republic and Myanmar, severely endangered navigation safety. Through a China-funded project in 2002, these impediments were removed so that 150 tonne vessels can now safely pass through the affected parts of the river.

Inadequate navigation systems impede all-day use of channels in some countries. About two-thirds of the 31,000 km length of Indonesia's inland waterways are navigable, with the predominant lifeline uses in Sumatra and Kalimantan. IWT freight activity is anticipated to treble to 20 million tonne during the current five-year plan period. Nevertheless, Indonesia suffers from a severe lack of navigation marks and appropriate charting of the rivers to permit greater time use of the system.

There are a number of projects underway in countries such as Bangladesh, Thailand, Indonesia and China to improve the navigability and commercial attractiveness of inland waterways for freight transport. Chinese are putting a great deal of emphasis on the provision of inland waterway services, especially in the Pearl River Delta and the Yangtze, where a number of inland container depots have been established at river ports such as Nanjing.

The Greater Mekong River System, one of the world's major navigable waterways, has long been under-utilized for lack of adequate infrastructure, navigational aids, and lack of consistency in rules and regulations. An agreement signed in 2000 on commercial navigation on the Lancang-Mekong River among the four Greater Mekong Subregion countries – China, Lao, Myanmar and Thailand – is expected to promote substantial investment and river traffic growth.

As with the development of railways and their related systems, the governments in the ESCAP region can also foster improved use of inland waterways and ports by:

- enhancement of channel depths and provision of navigation systems;
- introduction of coordinated shipping, rail and road transport schedules, development of intermodal hubs at inland ports;
- promoting the role of inland waterways as an efficient and environmentally sustainable alternative to roads through the support and sponsorship of pilot projects;
- extending incentives for building intermodal facilities, such as warehouses and distribution centres near inland ports; and
- liberalizing cabotage laws for increased flexibility in operating domestic waterways.

Linking Asia with Europe

There is a growing recognition that rail has an important role to play in the national and international movement of freight and passengers. The US railroads have signed contracts with trans-Pacific shipping lines to provide fixed-day services. This arrangement allows containers from Asia unloaded from vessels on the US west coast to be delivered on the east coast within 72 hours, which is reportedly 4-6 days faster, and less costly than the all-water route. Rail services now move 60% of containers arriving by sea for destinations inland. These services have also created economies of scale, which, in turn, have resulted in rail freight rates that were 30% lower in 2004 than in 1981, and, in fact, 60% lower in inflation-adjusted terms.

Rail Corridors: Organisations such as the International Union of Railways (UIC) have been promoting a trans-European rail link in competition with maritime transport. The project focusses on two land transport corridors: (i) the East Asia link, from Vostochny in Russia, and (ii) the Central Asia link, from Urumqi in China. A link between Kazakhstan and western China provides for a shorter distance between Europe and western and central parts of China.

Figure 4.1: Trans-Siberian Rail Network

Vostochny port is not only a gateway for Siberian land-bridge container transport, but also exports timber, coal and fertilizers, which are brought from central Siberia. The port has regular container route links with Japanese ports, Busan and Shanghai, while Vladivostok port has container links with Busan and Viet Nam. The annual container handling capacity of Vostochny port is 200,000 TEU and Vladivostok has almost the same volume, but little transit cargo.

The Trans-Siberian Railway network and the network between China and Kazakhstan are both connected to Western Europe. TSR offers an alternative to maritime transport between Western Europe and the Far East. Road links may also provide viable alternative routes to sea links. Road routes between origin and destination points in Europe and Asia could be up to 8,000 km shorter than sea routes. The Trans-Siberian spans Russia from the Baltic to Vladivostok. This line extends westward from Moscow and connects St. Petersburg to extensions towards Finnish ports. For traffic between Kazakhstan and China, rail network connects at the Druzhba/Alashankou interchange; it involves break-of-gauge, and the goods have also to be reloaded.

The Trans Siberian Railway (TSR) network and the network between China and Kazakhstan both connect to Western Europe. The TSR network has had container volumes rising. The main users of the eastward rail connections through Siberia are Korean shippers.

A container from Busan port to Moscow via Vostochny port, a distance of 10,280 km, covers the journey in 20-25 days. It would normally take some 35 days if sent by sea from Busan to St. Petersburg port and thence overland to Moscow, a distance of about 23,000 km. The costs by rail are stated to be USD 2,700 per container vs USD 3,800 if routed by sea.

Source: Korean International Trade Association

Of late, rail-borne transit of containers has been attracting several operators. The Maersk railway subsidiary European Rail Shuttle (ERS) has commenced regular liner blocktrain services from China to the Czech Republic via Mongolia, Russia and Poland. The inaugural train from Shenzen delivered 52 FEU (forty foot equivalent unit) loaded with computer components to a customer in Paradubice, near Prague. The transit over this 12,229 km route took 17 days, more than twice as fast as by sea. Differential track gauges along the transit corridor necessitated transloading of containers to different trains twice, and customs clearance done at six boder crossings. The train length limitations in Europe required the train to be split into two parts for its final leg into Pardubice.

Linking Asia with Europe, through rail transport, in particular, the Trans-Siberian Railway, accounts for just about 3-4% of the current volumes, mainly from northern China and the Korean Peninsula. Road transport accounts for less than 1% of the containerised Sino-European trade, in volume terms.

But, of late, interest in rail services to carry goods from Western Europe to Moscow and the Urals has significantly increased. RZD (Russian Rail) is making massive investments and also involving private sector operators. There is growing cooperation among RZD, Deutsche Bahn and the Chinese Railways. Also, a closer cooperation is emerging between China's and Kazakhstan's railways for promoting development of China's north western region. Inter Rail, a constituent of the association of European trains – Siberian operators (GETO) awaits the launch of through container trains between Western Europe and China.

China's port of Ningbo and the port of Tallinna Sadam (Tallinn, Estonia) recently agreed to organise container transportation services between the two ports. Ningbo plans to establish a distribution centre in the port of Tallinna to forward containerised goods to Europe, with a special focus on Scandinavia and Russia.

Intermodal Option: Intermodal transport is claimed as one of the viable alternatives for managing the expected growth in traffic between Europe and Asia. The growth in maritime transport, which has been carrying the bulk of Europe-Asia trade flows, is increasingly getting concentrated in both Europe and Asia on just a few major maritime hubs, partly because of the increase in vessel sizes.

Central Asian Republics (CARs) – An Important Bloc: After Japan's economic breakthrough in the 1950s and that of the Asian 'dragons' and 'tigers' in the 1970s and 1980s, China has drawn world attention since the

1990s, followed now by India. A breakthrough in international trade by Russia and the CIS countries had also been expected since the mid-1990s. These partners are creating a new dynamics along an axis that spans the continent of Eurasia. Since 2001, growth in the CIS countries has hovered between 5 and 6%, outpacing that of the Central European countries (between 4 and 5%) and well above that of Western Europe (around 2%).

Figure 4.2: Central Asia

ECO Region: Economic Cooperation Organisation (ECO) founded by Iran, Pakistan and Turkey was expanded in 1992, to include Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. In recognition of the important role of transport in the economic and social development of ECO member states, an Outline Plan of October 1993 stipulated: (a) completion of a rail link between Iran and Turkmenistan in 1996 with a view to completing a new 'silk' railway across China-Central Asia-Iran-Turkey-Europe; (b) construction of a railway line, Kerman-Zahedan, in Iran, for an uninterrupted rail connection from Europe to South Asia via Turkey, Iran, Pakistan; (c) improvement and development of highway network of ECO region; and (d) creation of common customs procedures in the ECO region.

Land Routes of High Promise: The land route between the Baltic and North-East Asia has the distance differential in its favour, about 1:2, with approximately 12,000 km by land (with Kazakhstan being roughly in the centre), over 20,000 km by sea. Potentially, rail services could be provided that would take no more than 20 days, from China to Europe via Central Asia rather than the six weeks and more that transport by ship would take. It is estimated that the road transport sector, for its part, could do Europe-Asia hauls in two weeks. Port approach costs could wipe out the advantage of maritime transport.

Table 4.1: Land and Sea Distances between Asia and Europe: km

From/To	London		Rostock	
	By sea	By rail	By sea	By rail
China, ports - Tianjin	20,900	11,100-11,600	22,500	9,900-10,400
- Lianyungang	20,200	11,900-11,400	21,800	10,700-10,200
- Shanghai	19,600	12,300-11,800	21,200	11,100-10,600
Japan	21,200	14,500-13,900	22,800	13,300-12,700
Hong Kong	18,100	12,400	19,700	11,200

Railways have an Edge: Railways have retained a dominant role in the CIS countries. No doubt, the break-of-gauge is an impediment, but it is hoped that technology will help find a viable solution.

Table 4.2: Break-of Gauge Connections

Connections	Gauges (mm)	
China-Russia	1,435	1,520
China-Mongolia	1,435	1,520
China-Kazakhstan	1,435	1,520
Iran-Turkmenistan	1,435	1,520
Iran-Azerbaijan	1,435	1,520
Korean Peninsula-Russia	1,435	1,520
Iran-Pakistan	1,435	1,676
Western part-Eastern part of Bangladesh	1,676	1,000
China-Viet Nam	1,435	1,000

Major projects have been developed for the trans-Asian rail corridor by Kazakhstan; in particular, a European gauge alignment has been envisaged from the Caspian Sea to China over nearly 3,000 km. The line runs along the Caspian Sea, with a north-south branch over 700 km across Turkmenistan to link up with the Iranian network, with 70 km of new track.

A north-south line through Iran will improve maritime access for Central Asia. This north-south rail connection leads to the Iranian port of Bandar Abbas at the entrance to the Persian Gulf; this port is already served by a branch rail line. On the route between Iran and Turkey, investment has also been planned for a rail bypass of Lake Van and a rail crossing of the Bosphorus (by tunnel) for a standard gauge line from end to end –the same gauge being shared by China.

Capacity Enhancement: While shipping companies and ports may be able to cope with the expected increase in maritime traffic, particularly container traffic, inland transport modes for hauls between ports and their hinterlands remain inadequate. The risks of saturation on road networks to these ports are high, while rail and inland waterways often have insufficient capacity.

Towards Facilitation: Some essential policy reforms are considered crucial for the development of inland transport services on Europe-Asia links as a complement to sea transport, e.g., adapting capacity and making adequate infrastructure available; opening and operating networks that are interoperable, which requires, among other things, the regulation of transport markets and an appropriate regulatory framework; reforming the railways in order to increase productivity; facilitating border crossings; safety and crime prevention.

North-East Asia: The five countries in North-East Asia account for 20% of the world's gross national income. The North-East Asian trade has shown a growing interdependence among the countries in the subregion. Maritime transport has played a key role in facilitating the movement of goods and people between these countries.

China and Japan finalized the shipping agreement in 1974, two years after the diplomatic relationship between the two countries was normalized in 1972. Container shipping services on the China-Japan route started in 1976.

Democratic People's Republic of Korea opened maritime transport routes with Japan in 1962 and with the Republic of Korea in 1999. Liner shipping services between Japan and the Republic of Korea commenced in 1965.

Korea-China Link: The Korean Peninsula West Corridor links Busan port in the Republic of Korea with Shenyang in China, via Seoul, Pyongyang, Sinuiju on the Democratic People's Republic of Korea side of the border and Dandong on the Chinese side. At present, the lines linking the Republic of Korea and the Democratic People's Republic of Korea are disconnected. Rail connection between North Korea and South Korea is important. The trans-Korea Railway (TKR), piercing through Korea peninsula, will connect Busan and Kwangyang ports with Manchuria, North China, Northeast Russia. TKR can thus be connected with TSR (trans-Siberian Railway) and TCR (Trans-China Railway), enabling cargoes to go from Busan to Europe and Middle East by rail.

The two Koreas agreed in April 2004 to begin the final phase of the construction of the TKR, also called the Iron Silk Road. A series of demonstration runs of container block-trains along the full length of the Eurasian Land-bridge began to show the commercial feasibility of six new Trans-Asian Railway Corridors by shipping large blocks of freight containers from pacific ports in Korea, China and Russia to Moscow, Berlin, Helsinki, and other Western cities. The "test trains" were run, the first container train running from Tianjin, China via Ulaanbaatar, in Mongolia, and Russia to Poland on 8 November 2004.

The corridor would provide direct overland linkage between the Republic of Korea and China, as well as connect international sea routes to Busan port with inland North-East Asia.

Busan port is the largest port in the Republic of Korea in terms of the quantity of cargo handled. It has many trunk maritime routes serviced by Europe-bound and North America-bound container vessels.

North-East Asia-Central Asia: The trade corridor China Landbridge (CLB) railway line would compete with the Siberian Landbridge in transport between East Asia and Central Asia. Until now, the former corridor has been the sole trunk road between North-East Asia and Central Asia. International TIR truck traffic from Europe is now possible up to Kazakhstan. It is anticipated that TIR trucks will begin to travel to North-East Asia in the near future, using this road.

Connection of the trans-Korean Railway (TKR) to the trans-continental railways (TCR) can bring about appreciable changes in the transportation network between North-East Asia and Europe. Starting from China, and passing mid-Asia and Europe, TCR (called ‘China Landbridge’ in China), has about 80% of the line double-tracked and almost 90% electrified.

By utilizing transportation centres, such as Pusan and Kwangyang ports, Incheon International Airport, and the TKR, Korea will be able to attain a high level of international trade competitiveness, serving as a hub in Northeast Asia. Connection of railway lines between North Korea and South Korea would be essential for establishing a link with both TCR and TSR. TKR, piercing through Korea peninsular, will connect Pusan and Kwangyang ports with Manchuria, North China, Northeast Russia by rail, enabling cargoes to go from Pusan to Europe and Middle East. In order for the Korean railways to play a key role, capacity on the South Korean railway would need to be increased. Korean railways intend investing for their extension by 5,000 km by 2010. They also propose to use variable gauge systems for fast and safe transportation, instead of transshipment of cargo/containers or bogie-changing.

Russian Railways and those of South Korea and North Korea have decided on the rehabilitation of the trans-Korean main railway, with a pilot project of reconstruction along the section between the Russian station Hasan to the North Korean port Radjin. They have already coordinated de facto the route of the future Trans-Korean main railway passing through South Korea, connecting in the demilitarised zone within the Torasan-Keson section. The main railway will be connected to Russia through the border-crossing point Khasan-Tumangam.

International North-South Transport Corridor (INSTC) is a multimodal transportation corridor, established on 12 September 2000 in St. Petersburg, by Iran, Russia and India for the purpose of promoting transportation cooperation among the member states. The corridor connects Indian Ocean and Persian Gulf to the Caspian Sea via Iran, then is connected to St. Petersburg and north European countries via Russian Federation. The North-South Corridor in reality links the goods trade transit among Southeast Asian region, Indian Ocean and Persian Gulf through Iran to Cenral Asia, Caucasus, Russia and north of Europe. This corridor is considered cheaper and shorter than the other competitor corridors.

The 3,651 km railway line between Lianyungang and Urumqi is double-track, while the 477 km line from Urumqi to Alashankou is single-track. Deluxe double-decker passenger trains run on the Urumqi-Alashankou line. Lianyungang port has a container berth with a depth of 11 metre. Container cargo is loaded onto trains at this terminal. The port has regular Europe-bound and North America-bound container freight services in addition to a maritime network connecting Busan, Hong Kong, Singapore and Japan.

Container Traffic – New Inroads: Rail transit of maritime container traffic in different parts of the region has been recording a high growth rate. Between 2001 and 2005, the Trans-Siberian Railway’s container throughput increased by over 200%. There has been a 250% growth in the number of TEUs on the Malaysia-Thailand landbridge since the launch of the service in June 1999. In March 2002, the railways of Belarus, the Russian Federation and Mongolia launched an international container block train service between Brest and Ulaanbaatar, followed two months later by a similar initiative by the railways of China and Mongolia with the launch of a regular service between Tianjin and Ulaanbaatar. These services became the precursor of the extended service launched in March 2005 between Honhot in China’s Inner Mongolia Autonomous Region and Duisburg in Germany.

Asian Highway and Trans-Asian Railway

The Asian Highway project was initiated in 1959 by the then United Nations Economic and Social Commission for Asia and the Far

East (ECAFE), which was later renamed as ESCAP. This initiative was followed by the Trans-Asian Railway Project, which was commenced in the 1960s by ESCAP with the objective of providing a continuous 14,000 km rail link between Singapore and Istanbul (Turkey), via the most direct route, a southernly alignment, taking in Bangladesh, India, Pakistan, Iran, besides Malaysia, Myanmar, and Thailand, with possible onward connections to Europe and Africa. Subsequently, Indonesia was added to the proposal, since the islands of Java and Sumatra were to be connected to the Malaysian Railway at Singapore and Penang by means of short sea shipping services.

ALTID: As population densities in East, South-East and South-Asia are considerably higher than those in North America, and more in line with those in Japan and Europe, railways are likely to have an increasing role to play in Asia. The revived interest in railways since the late 1980s led to the creation of the Asian Land Transport Infrastructure Development Project (ALTID) in 1992. Endorsed by the ESCAP Commission in 1992 at its 48th session in Beijing, it is essentially an umbrella project, comprising the Asian Highway (AH) and the Trans-Asian Railway (TAR) projects, as well as components related to the facilitation of cross-border land transport. The project signified an important concept of intermodal connectivity to be promoted in the region.

New Delhi Action Plan: The first ESCAP Ministerial Conference on Infrastructure, held in New Delhi in 1996, recognized the importance of developing transport infrastructure in a systematic and focused way, and launched the New Delhi Action Plan on Infrastructure Development in Asia and the Pacific. This commitment was later reinforced by the Seoul Declaration in November 2001. In 2001, the second Ministerial Conference on Infrastructure held in Seoul brought into focus the ever-increasing demand for reliable and efficient transport services in the region that required an integrated intermodal transport network to be developed.

The initial proposals were frustrated to a large extent by the lack of a uniform railway gauge in the selected corridor, which has three different track gauge standards: 1,000 mm; 1,676 mm; and 1,435 mm, and by the gaps or ‘missing links’ in the route, to the extent of about 2,000 km.

The Intergovernmental Agreement on the Asian Highway Network in 2005, and the Intergovernmental Agreement on the Trans-Asian Railway Network adopted by the ESCAP Commission on 12 April 2006 signify high-quality connectivities, considerable growth in rail-borne freight improvement in the capacity and efficiency of the region's ports, besides the growing investment in intermodal connections. These projects which have immense new possibilities will help extend the benefits of globalization to inland locations.

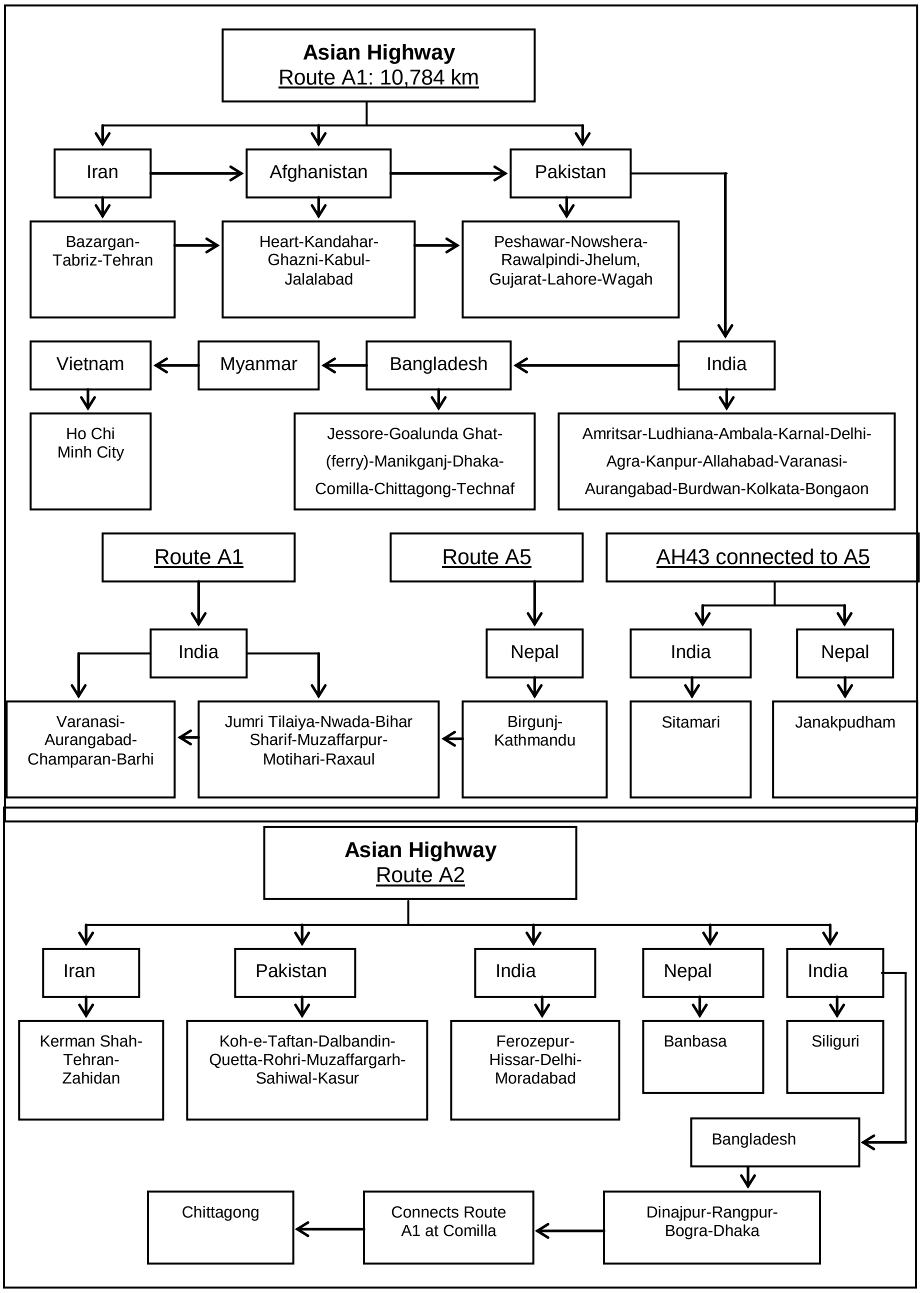
Dry Ports: The TAR Agreement identified stations with container terminals (list attached as Annexure 'A'). These indicative terminals may be suitable locations to develop a network of dry ports. Not only do these facilities improve transport efficiency, but act as platforms for attaining broader regional benefits, especially when the region is undergoing rapid changes in economic outlook and integration.

Asian Highway

The AH Intergovernmental Agreement adopted on 18 November 2003 identified 55 routes in 32 ESCAP countries, aggregating about 140,000 km. The Agreement entered into force on 4 July 2005. By end July 2007, 28 countries had signed the Agreement. Route AH I is proposed to extend from Tokyo to the border with Bulgaria west of Istanbul, passing through South Korea and North Korea, China and other countries in Southeast, Central and South Asia. To complete the route, existing roads would be upgraded and some new roads constructed as links with the network.

AH network initially stretched over 90,000 km covering 25 countries – with 40,000 km of international routes and 50,000 km of sub-regional routes. The network originally covered the whole of Asia except Bhutan, Russian Federation, Turkey and Korea. These countries have now been added and the network will have connectivity to the European road network. The basic principle of AH project is to minimise the number of links to be included in the networks and maximise the use of existing infrastructure.

Figure 4.3: Asian Highway Networks



In the case of Bhutan, Lao PDR, Nepal, as well as remote parts of north-east of India and north-western parts of Myanmar, the AH routes, when properly developed, would provide efficient overland connections. Other examples of AH potential are its links with the five landlocked Central Asian republics, namely, Kazakhstan, Kyrgystan, Tajikistan, Turkmenistan, and Uzbekistan. Some new AH routes may drastically reduce the distance between major international origin and destination points, thus contributing to overall economic development of the region, e.g., the routes being considered by India and Bangladesh to link with Myanmar, and the potential AH route to link the sea port of Tavoy in Myanmar to the existing AH route A-1 in Thailand, which could continue eastward to the sea ports on the east coast of Vietnam.

The 1,360 km trilateral highway, stretching from Moreh (Manipur in India to Mac Sot in Thailand through Bagan in Myanmar has great potential: it will strengthen trade links with all of Southeast Asia. A road link from India to Myanmar and Thailand will provide direct access to China's Yunnan province. Northern and North-Eastern India will also be linked to the southwest China.

In the current dynamic environment, among various proposals for rail/road connectivity between the countries in the region, there has, of late, been an avid follow up for the revival of the 1,650 km long Stillwell Road of World War II vintage, connecting India's Northeast to China's Yunan province through Myanmar. The transnational Stillwell Road was once termed the lifeline of the Chinese army in its war against Japan. Started at Ledo in Upper Assam, it crosses Upper Chindwin to reach Bhamo in Myanmar before linking to Kunming in China. The Kunming-Bangkok road has already become operational and is being further upgraded.

The bridge over the Mekong River on AH route A-12 connecting Thailand and Laos, constructed in 1994 with Australian assistance, facilitates trade and tourism between the two countries. Construction of the Thai-Myanmar Friendship Bridge on AH route A-1, completed by Thailand, has eliminated a missing link. In the South Asia subregion, the Jamuna (Bangabandhu) bridge in Bangladesh, which was opened to traffic in March 1998, has provided a long-awaited land transport link of international importance.

AH classification and design standards developed in 1974 were revised in 1993 to meet the following requirements:

– Trends in increased gross vehicle weight, size and axle load
– Increased traffic volumes;
– Compatibility of network parameters within the region as well as neighbouring regions; and
– Environmental considerations.

Table 4.3: Asian Highway Routes

No.	From	To	Length (km)
A-1	Haiphong (Viet Nam)	Bazargan	12,185
A-2	Denpasar (Indonesia)	Khosravy	10,918
A-3	Altanbulag (Mongolia)	Chiang Rai (Thailand)	6,347
A-4	Shanghai (China)	Karachi (Pakistan)	7,727
A-11	Vieniane (Lao PDR)	Sihanouk Ville (Cambodia)	1,604
A-12	Louang Namtha (Lao PDR)	Nong Khae (Thailand)	1,230
A-13	Hanoi (Viet Nam)	Oudomxay (Lao PDR)	696
A-15	Vinh (Viet Nam)	Udon Thani (Thailand)	458
A-17	Ho Chi Minh	Hoi An (Viet Nam)	900
A-18	Hat Yai (Thailand)	Segamat (Malaysia)	689
A-25	Banda Aceh (Indonesia)	Jakarta (Indonesia)	2,850
A-26	Laoag (Philippines)	Zamboanga (Philippines)	3,051
A-41	Cox's Bazar (Bangladesh)	Mongla (Bangladesh)	706
A-42	Kathmandu (Nepal)	Bahri (India)	636
A-43	Agra (India)	Matara (Sri Lanka)	2995
A-44	Dambulla (Sri Lanka)	Trincomalee (Sri Lanka)	108
A-45	Kolkata (India)	Bangalore (India)	2,057
A-46	Tharpokharia (India)	Dhuria (India)	1,438
A-47	Gwalior (India)	Bangalore (India)	2,096
A-71	Peshawar (Pakistan)	Quetta (Pakistan)	882
A-74	Kandahar (Afghanistan)	Kaachi (Pakistan)	919
A-75	Girishk (Afghanistan)	Zahedan (Iran)	665
A-76	Kabul (Afghanistan)	Heart (Afghanistan)	1,212
A-77	Kabul (Afghanistan)	Heart (Afghanistan)	806
A-78	Turkmenistan border	Bandar Abbas (Iran)	1,388
A-79	Hamadan (Iran)	Khorramshahr (Iran)	762
A-81	Beijing (China)	Tanggu (China)	209
A-82	Shanghai (China)	Shenzhen (China)	2,010
A-83	Ulaanbaatar (Mongolia)	Borshoo (Mongolia)	1,347
Total			**68,891**

The upgrading and development of the Asian Highway has been receiving attention from the member States: Iran's Fourth Five-year Development Plan (2005-2009) envisages AH development; Association of Southeast Asian Nations (ASEAN) plans to upgrade routes in Indonesia, Malaysia, Singapore and Thailand to conform to AH standards or higher standards. All routes under construction in Cambodia and Laos are of AH standard. AH connecting four metropolitan cities in India and the North-South corridor are being upgraded to four lanes under the National Highway Development Project. International community is assisting Afghanistan in rehabilitating and restoring most of the AH routes to re-establish regional connectivity. Mongolia is implementing the Millennium Road Project, including all AH routes; China is developing 35,000 km of national trunk highway system which includes the majority of AH routes within China.

Trans-Asian Railway

The TAR project endorsed by the ESCAP Commission, part of the ALTID Action Plan for 1994-95, included a feasibility study on connecting the railway networks effectively for a northern TAR corridor, particularly involving China, Kazakhstan, Mongolia, Russian Federation and the Korean Peninsula, besides a TAR study in the Indo-China and ASEAN subregion.

Figure: 4.4: Trans-Asian Railway

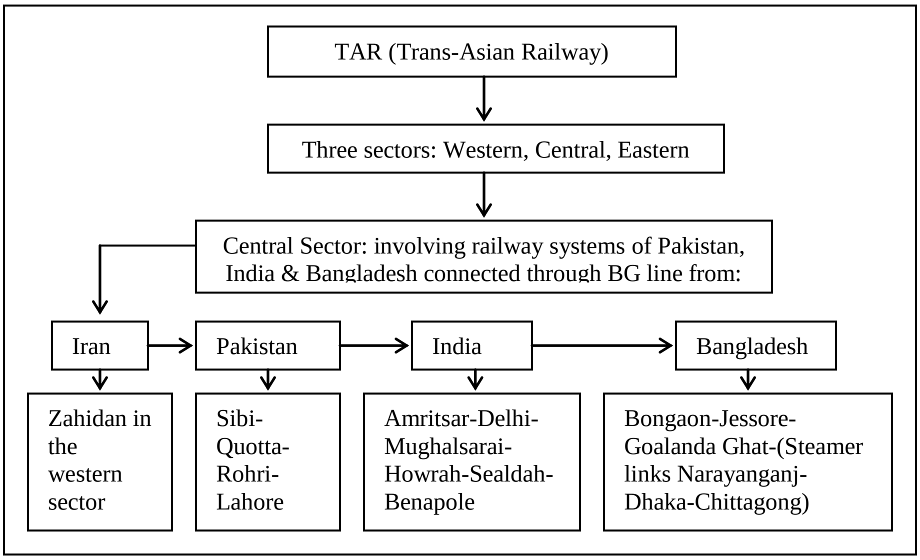


Figure: 4.5: TAR Network

During 1995, ESCAP undertook a preliminary study of route requirements for a TAR southern corridor, with the participation of the railway organizations of Bangladesh, India, Iran, Pakistan and Sri Lanka. A fundamental operating requirement was that the corridor must be capable of transporting all types of ISO and other containers commonly used for international transport. The Inter-governmental Agreement on the Trans-Asian Railway network, covering about 81,000 km in 28 countries has been signed by 19 member countries (by end-August 2007).

Three routes of international significance were identified, designated TAR-S1, TAR-S2, and TAR-S3.

Route TAR-S1: This is the main route of international significance within the corridor. It would commence in Kunming (China), running southwest from the existing Chinese railhead at Xiaguan (near Dali) to the border with Myanmar at Ruili, thence to the existing railhead of Lashio in Myanmar and along, what is currently a branch line, to Mandalay. From Mandalay, it would follow a broadly east-west axis, crossing the territory of Myanmar, India (twice), Bangladesh, Pakistan, Iran, as far as the border between Turkey and Bulgaria, at Kapikule. From its western extremity it would allow access to Western Europe via Bulgaria, Romania, Hungary and Austria. From Kunming to Kapikule, it would have a total length of 11,700 km of which 9,790 km (or 84%) is in place, 95 km (1%) comprises ferry links, and 1,820 km (15%) would need to be constructed, most of it through difficult mountainous terrain.

From the border between Turkey and Bulgaria, Frankfurt (Germany) is another 1,785 km by rail, giving a total distance between Kunming and Frankfurt of approximately 13,500 km. Between its eastern and western extremities, route TAR-S1 would cross as many as 7 national borders (with another 5 to be crossed west of Turkey) and would contain three different track gauges - metre (1,000 mm), standard (1,435 mm) and broad (1,676 mm). If it is to provide a continuous rail link, Route TAR-S1 could have up to five inter-gauge transfer points; if it were currently to be used for intercontinental traffic, freight shippers could face up to 12 locations at which modal transfer (transshipment) would be necessary.

Route TAR-S2: This route would start from the westernmost railhead on the Thai system at Nam Tok, 210 km by rail from Bangkok, proceeding west or northwest to the border with Myanmar and joining the existing railway network of the Myanmar Railway before running north to Mandalay where it would connect with Route TAR-S1. A connection to Yangon would be provided at the junction station of Bago, which is 75 km north of Yangon on the Yangon-Mandalay trunk line. Northwesterly direction from Nam Tok to the border with Myanmar at Three Pagoda Pass, a distance of 153 km, and from there a further 110 km to Thanbyuzayat, a major station on the isolated Mawlamyaing (Moulmein) - Ye line of the Myanmar Railway.

From Thanbyuzayat, Route TAR-S2 would run north to the railhead of Mawlamyaing on the southern bank of the Thanlwin (Salween) River, a distance of 70 km, and from there a 4 km ferry crossing would be necessary in order to reach the railhead on the northern bank at Moktama (Martaban). From Moktama, Route TAR-S2 would follow the existing line to Bago, a distance of 196 km, and from there to the junction with TAR-S1 at Mandalay, a further 545 km.

The total length of TAR-S2 via Three Pagoda Pass would be 1,078 km, of which 810 km (or 75%) is in place, 4 km is a ferry link and 263 km (25%) would have to be constructed.

The second alignment alternative has not so far been subjected to detailed survey, but has been supported by the State Railway of Thailand. From Nam Tok, it would proceed in a westerly direction to the border with Myanmar at Ban Bong Tee, a distance of about 40 km, thence a further 110 km across the coastal range of southern Myanmar to the port of Dawei (Tavoy). From Dawei, Route TAR-S3 would run north along the 161 km Ye-Tavoy line, and from Ye (which is currently the southernmost railhead on the Myanmar Railways system) would run for another 74 km to reach Thanbuyuzat.

The total length of Route TAR-S2 via Ban Bong Tee and Dawei would be about 1,200 km, of which 1,046 km (or 87%) is in place, four km is a ferry link, and 150 km (13%) would have to be constructed. Depending upon the alignment alternative adopted, intercontinental rail traffic using Route TAR-S2 would travel a total distance of 11,460 km between Bangkok and Kapikule (via Three Pagoda Pass) or 11,580 (via Ban Bong Tee and Dawei), and between Bangkok and Frankfurt of 13,240 km (via Three Pagoda Pass) or 13,360 km (via Dawei). This route would cross seven national borders, with inter-gauge transfers being required at four locations. Current use of the route would involve modal transfers at 14 locations.

Route TAR S-3: This route has been designated as one of international significance owing to its importance in connecting the landlocked countries of Central Asia with Europe and South/Southeast Asia. It would start from Sarakhs on the border between Iran and Turkmenistan, running 164 km southwest to Fariman on the existing trunk line linking Sarakhs with the border between Iran and Turkey at Razi.

TAR (Southern Corridor) in Bangladesh: The first such link, Bn.1 forms part of the principal transcontinental route TAR-S1, described earlier. It starts from the northeastern Bangladeshi border station of Shahbazpur, opposite Mahishasan in the southern part of Assam in India. From Shahbazpur, Link Bn.1 follows the existing Bangladeshi MG branch line in a southwesterly direction to the junction with the mainline to Sylhet at

Kulaura, thence the MG mainline via Akhaura and Bhairab Bazar to Tongi, to which Dhaka is connected by a 22 km double-tracked metre gauge line. From Tongi, this link runs north to Joydebpur, from where a new dual gauge (1000/1676 mm) line is being constructed via Tangail to connect with the new Jamuna Bridge (opened 23 June 1998), providing a continuous rail link with Jamtoil, 15 km southwest of Serajganj Ghat, the existing BG railhead on the western bank of the river. From Jamtoil, the route follows the existing broad gauge line to the border with the West Bengal at Darsana (opposite the Indian border station of Gede).

Of the existing BG route between Jamtoil and Darsana, a 66 km section between Jamtoil and Ishurdi to be converted to dual gauge as part of the Jamuna Bridge Railway Link Project. Link Bn.1 would have a length of 522.5 km, comprising 277.4 km of MG, 165.1 km of dual gauge and 80 km of BG line. For its entire length, this link would be single-tracked, non-electrified.

The second link, Bn.2, connects Dhaka, northern Bangladesh and northeastern India with the port of Chittagong. It has a length of 321 km, but between Tongi and Akhaura (98 km), it shares the alignment of Link Bn.1. With the exception of the 22 km section between Dhaka and Tongi, a 33 km section between Bhairab and Akhaura and a 69 km section between Akhaura and Chittagong which are double-tracked, Link Bn.2 is of single track configuration throughout. A third link, designated Bn.2a, is an extension of Bn.2 which terminates in Chittagong.

Link Bn.2a has been proposed by the Bangladesh Railways as a means of connecting with the central part of Myanmar via a border crossing inland from Teknaf. This link would have a length of 192 km, of which 47 km is in place and 145 km would have to be constructed. Initially, this link runs southeast from Chittagong to Dohazari before turning south to the Bangladesh-Myanmar border.

Link Bn.3 (Ishurdi-Birol) is an MG line connected to the border with India through the stations of Birol (Bangladesh) and Radhikapur (India). It forms part of a rail and road transit route allowing the flow of Nepal’s third country trade on the India-Nepal border at Jogbani (India)/Biratnagar (Nepal) and the Bangladeshi ports of Chittagong and Mongla. Since at present Link Bn.3 between Ishurdi and Parbatipur is BG only, it is practical to move trade consignments by road between Parbatipur and Chittagong or Mongla, necessitating intermodal transfer at Parbatipur. The dual gauging of the BG line between Ishurdi and Parbatipur, as part of the Jamuna River Rail Link project, would allow BG trains to move through to Ishurdi where rail to road transfer can be effected for onward movement to Mongla (which is not yet rail-connected) or directly through to Chittagong.

An alternative rail transit route between Nepal and Bangladesh is available through the Indian border station of Singhabad, opposite Rohanpur in Bangladesh. This route, connecting with the India-Nepal border at Raxaul (India)/Birgunj (Nepal), has the advantage of being entirely BG between Raxaul and Khulna in Bangladesh, where rail to road or rail to barge transfer would occur, for onward movement to Mongla.

TAR (Southern Corridor) in China: In China, the southern corridor of the Trans-Asian Railway potentially comprises two links. The first, designated *Ch.1* starts in Kunming, proceeding in a westerly direction for 365 km to the city of Xiaguan, located some 15 km southeast of the Yunnanese cultural and tourist centre of Dali. The new section of the link (between Guanton and Dali) contains 52 tunnels and 100 bridges, the latter with a total length of 50.4 km (or 23% of the whole line). From Xiaguan, there is a proposal to construct a new line connecting the existing railhead with the China-Myanmar border. This new line, designated Link *Ch.1A*, would run southwest for about 630 km to the border town of Ruili, opposite Mu-se in Myanmar.

TAR (Southern Corridor) in India: This link, forming part of the main intercontinental route TAR-S1, starts at Gede on the Indian side of Bangladesh’s western border and follows the Indian BG east-west trunkline up to the border with Pakistan at Attari. This BG link (1,676 mm) has a total length of 1,975 km, of which 138 km consists of quadrupled track, 127 km of triple track, 1,682 km of double track and 28 km of single track line. Link In.5a would provide a connection between the northeastern states and the rest of India. It would also have the potential to provide an international connection with Yunnan Province of China via northern Myanmar should it be decided in the future to construct the missing link along a more northerly alignment.

TAR (Southern Corridor) in India envisages six TAR links, basic characteristics of which are shown below:

Table 4.4: TAR in India

Sl. No.	Link	Gauge	Route length: km
1.	In.1: Gede-Attari	BG	1,975
2.	In.2: Delhi-Tuticorin	BG	2,866
3.	In.3: Mathura-Mumbai	BG	1,380
4.	In.4: Raxaul-Sitarampur	BG	471
5.	In.5a: Myanmar border-Lekhapani (missing link)	BG	45
	Lekhapani-Mughalsarai	BG	1,830
6.	In.5b: Lumding-Badarpur	MG	110
	Tamu-Jiribam (missing link)	BG	180
	Jiribam-Mahisasan	MG	160
	Total		9,017

Link In.5a would start at the border between India and Myanmar, about 45 km east of the existing Indian railhead at Lekhapani in the northeastern part of Assam. From Lekhapani, the existing alignment of Link In.5a runs for 1,830 km east across Assam, West Bengal and Bihar states, passing through the narrow (30 km) passage, known as the chicken’s neck between the borders of Nepal and Bangladesh before joining Link In.1 (and international route TAR-S1) at Mughalsarai.

The final TAR link in India, designated In.5b, has two components. The first is an MG line of about 110 km connecting Lumding (located on Link In.5a) with Badarpur which lies on international Route TAR-S1. The second is part missing link and part existing MG link joining the border towns of Tamu in Myanmar and Mahishasan on the border with Bangladesh (opposite the Bangladeshi border town of Shahbazpur), via Silchar and Badarpur and having an estimated length of 340 km, of which the existing section from Jiribam (just inside Manipur State) to Mahisasan is about 160 km long.

This link, also broad-gauged for its entire length, constitutes a route of regional Significance. It connects Delhi with the ports of Chennai and Tuticorin. It also provides a transit route for traffic to and from Sri Lanka, which arrives at and departs from the port of Tuticorin.

Link In.3 constitutes another route of regional significance, since its primary purpose is to connect Delhi with the two gateway ports in the Mumbai area, i.e. Mumbai and Jawaharlal Nehru ports.

Link In.4 provides a regional route for the movement of transit cargoes between Nepal and its principal port outlets in Kolkata and Haldia. This link starts at Raxaul/Birgunj India-Nepal border and runs southeast, for 471 km to Sitarampur located on Link In.1, from where the link shares the alignment of In.1 for a further 200 km to Kolkata.

TAR in Iran: The link, forming part of international route TAR-S1, from the border with Pakistan to the border with Turkey, a distance of 2,573 km, from Koh-i-Taftan (Pakistan) it crosses the border on the single track BG (1,676 mm) line, which runs for 92 km in a northwesterly direction as far as the provincial city of Zahedan. This is the only BG line in Iran. It is separated from the major portion of the Iranian railway system, which has a track gauge of 1,435 mm. Between the border and Zahedan, the only station of a significant size is located at Mirjaveh, 8 km from Koh-i-Taftan.

Link Ir.2 of only 117 km provides a regional rail connection between Iran and Azerbaijan.

Link Ir.3 of 164 km link which has been in operation since May 1996 has the important function of connecting Central Asia with the Iranian Railway system. It starts at Sarakhs on the border with Turkmenistan (opposite a border town of the same name within Turkmenistan) and runs west to Fariman, the junction of the main east-west trunk line to Tehran and a branchline running 38 km north to the provincial city and commercial centre of Masshad,

Link Ir.4 provides part of international route TAR-S2 which connects Central Asia with the port complex at Bandar Abbas, via Tehran.

TAR in Myanmar: Myanmar has a significant role in the development of the Trans-Asia Railway southern corridor, since it would provide the necessary linkages between the railway networks of China and Southeast Asia on the one hand and South Asia on the other. Nine links have been identified within Myanmar, of which only three are existing.

Links My.1a and My.1b would connect with the southern line of the Myanmar Railways which is in current operation between Mawlamyaing (Moulmein) and Ye and is extended to Dawei (Tavoy). Link My.1a running from the border with Thailand at Three Pagoda Pass to Thanbyazayat would have a length of 153 km, all of which would represent new construction and Link My.1b running from the border at Ban Bong Tee to Dawei and then on to Thanbyazayat would have a length of 345 km, of which 110 km would represent new construction. Link My.1 starts at Thanbyuzayat on this southern line and runs for 811 km north to Mandalay where it connects with Links My.2 and My.3, both forming part of international route TAR-S1. At Mawlamyaing, 70 km north of Thanbyuzayat, all rail traffic is required to cross the Thanlwin (Salween) River by ferry to Moktama (Mataban).

From Moktama, Link My.1 runs for 196 km in a northwesterly direction to Bago, which is a junction station located on the Yangon-Mandalay trunk line. From Bago, Yangon is 75 km to the south and Mandalay 545 km to the north.

Link My.2a is a missing link. It would begin at border with China at Mu-se (opposite Ruili in China) and run on a south-westerly bearing to the important commercial centre and railhead of Lashio, in northeastern Myanmar. It would have a total length of 232 km, all of it passing through adverse mountainous terrain.

Link My.2, connecting Lashio with Mandalay, is an existing branchline which suffers from poor alignment and receives limited maintenance, Link My.3 would begin at Mandalay, running for about 670 km in a westerly direction to the border with India (Manipur State) at Tamu.

TAR (Southern Corridor) in Pakistan: Link Pk.1: This link which has a total length of 1,730 km makes up the entire international route TAR-S1 within Pakistan, running from the border with India to the border with the Islamic Republic of Iran, essentially following an east-west alignment.

Spezand is a major junction station, from which a link designated as Pk.2 proceeds north through Quetta to near the border with Afghanistan at Chaman and Link Pk.1 heads west towards the border with Iran. Between Spezand and Nokundi, the link passes through sandy plains, before climbing through mountainous terrain to reach the border with Iran at Koh-i-Taftan.

Link Pk.2: This link with a length of 167 km has the important regional transport function of providing a connection, in combination with Pk.1 and Pk.3, between southern Afghanistan and the ports of Karachi and Qasim. The link starts from the junction station of Spezand, running north to Quetta. From Quetta, it proceeds through rising terrain to Gulistan from which point mountainous terrain starts and continues almost up to the station at Chaman, 2 km from the border with Afghanistan. Gradients in the final 60 km section between Gulistan and Chaman are as steep as 2.5 per cent and the section contains the longest tunnel on the Pakistan Railway system.

Link Pk.3: This link connects Karachi and Qasim ports with the hinterland of Pakistan and with Afghanistan. It starts at the junction with Link Pk.1 at Rohri, from there running south to city of Hyderabad and then southwest to Karachi. The primary purpose of this regional link is to provide a connection from the Pakistani capital city of Islamabad and its twin city, Rawalpindi, to the port city of Karachi, as well as to the main international route TAR-S1. The link starts from Lahore, running for 462 km in a northwesterly direction via Rawalpindi to Peshawar.

Connecting Sri Lanka: Sri Lanka could be connected to the southern corridor of the Trans-Asian Railway network in two ways: first, there is a 280 km shipping link between Colombo and the port of Tuticorin in southern India, and second, there is a 35 km ferry link between Talaimannar in northwestern Sri Lanka and Rameswaram in southern India.

There are currently no connections between the railway systems of Thailand and Myanmar. The westernmost railhead in Thailand is located at Nam Tok, some 77 km west of Kanchanaburi and 210 km west of Bangkok. An alignment survey of a rail link between Nam Tok in

Thailand and Thanbyuzayat in Myanmar, via the border checkpoint at Three Pagoda Pass, has been carried out.

Turkey is significant as the western extremity of the southern corridor of the Trans-Asian Railway between Asia and Europe. It is also significant as the connection between the European and Asian continents. The Straits of Bosphorus (at the northern end of the Sea of Marmara) and of Dardenelles (at the southern end) provide the dividing line between the European and Asian portions of Turkey.

Currently, the Strait of Bosphorus is spanned by two highway suspension bridges – the Fatih Sultan Mehmet Bridge and the Bosphorus Bridge. The railway networks on either side of the Bosphorus are connected by ferry services with vessels fitted with rail decks. This is the main east-west trunk line which forms international route TAR-S1 within Turkey. It runs from the checkpoint on the border with Iran at Kapicöy to the border with Bulgaria at Kapikule (opposite Svilengrad in Bulgaria), an overall distance of 2,354 km. Exchange of traffic with the standard gauge railway system of Turkey occurs at the Turkish border station of Kapicöy, opposite Razi in Iran. From Kapiköy, Link Tk.1 proceeds due west through rising terrain to the ferry terminal at Van on the eastern shore of Lake Van. At Van, trains arriving from Kapicöy are dissembled into short rakes for loading onto ferries for the 91 km east-west crossing of Lake Van, which currently takes 4-5 hours.

From Kunming, rail freight shippers would in future have two main route alternatives for moving their consignments to/from Europe: one, Central Asia and the northern part of Iran; the second would involve utilizing TAR international route TAR-S1. Unlike the northerly routes through China, this route is not currently continuous, with physical gaps or missing links existing in several places.

For Kunming-Europe rail freight movement, the route via northwestern China, Kazakhstan, the Russian Federation and Belarus (effectively the TAR Northern Corridor) would result in overall journeys up to 2,100 km shorter than those via route TAR-S1. Use of the former route could save more than three days in transit time as compared with the TAR southern corridor route alternative, not including additional border crossing dwell time resulting from the need (between Kunming and

Europe) to cross seven national borders in the case of route TAR-S1, as compared with only three for the routes via Chengdu or Chongqing.

In addition, use of TAR-S1, once it is continuous, could involve passing through seven break-of-gauge points, as compared with only two in the case of the routes via Chengdu or Chongqing, Kazakhstan, the Russian Federation and Belarus. Use of the northwestern China/TAR northern corridor route might save more than seven days in transit time overall as compared with use of TAR-S1.

In the case of freight movement between Kunming and the three major destinations in the Central Asian Republics, route TAR-S1 suffers a substantial distance disadvantage as compared with the route through northwestern China. For freight movement between Kunming and the northern part of Iran, taking Tehran as a representative destination, the TAR southern corridor route has a slight distance advantage over the route through northwestern China and the Central Asian Republics. This advantage is likely to be eroded by the slower average speeds likely to be achieved, and by the additional dwell time at border and break-of-gauge stations. Between Kunming and Tehran, the number of border crossings would be six and the number of breaks-of-gauge four, if route TAR-S1 were used, as compared with only four border crossings and two breaks-of-gauge, if the route via northwestern China and Central Asia were used.

Kunming has several port options for the distribution of its seaborne trade. The first obvious option is rail movement via the Chinese Railways east-west trunk routes to ports on the eastern and southern coasts of China (including to Hong Kong). The distances involved are very long – approximately 2,800 km to Shanghai and 2,300 km to Hong Kong. The second option is movement on the existing MG line to the port of Haiphong in Viet Nam. At 855 km, this is by far the shortest port connection available to Kunming-based shippers, but it suffers from the main disadvantages that Haiphong is a limited draught river port.

A third option soon to be available would involve movement to the port of Fangcheng on the south coast of China, via the newly constructed 898 km Kunming-Nanning line. The total rail distance between Kunming and Fancheng port is about 1,130 km.

A fourth option would involve direction of Kunming-sourced trade through the port of Yangon or the new Thilawa Port (near Yangon) in Myanmar. Use of rail for the hinterland transport would require new line construction. Connection of Kunming to ports in the Yangon area could be achieved via Ruili and Lashio (i.e. via TAR links Ch.1, Ch.1a, My.2, My.2a, and My.1). This route would have a total length of about 2,160 km, approximately 860 km of which would be new line (or 1,180 km if the Lashio-Mandalay section has to be reconstructed). This is the only option which would make use of TAR southern corridor links.

The fifth port connection option for Kunming-sourced trade would be via the port of Laem Chabang in Thailand. Again, there are two route alternatives for such a connection - via Jinghong (China), Kentung (Myanmar) and Chiang Rai (Thailand), with a total length of 2,300 km, about 1,270 km of which would need to be constructed, and via Jinghong (China), Boten (Lao PDR) and Nong Khai (Thailand). The total length will be 2,310 km, of which about 1,260 km would require construction.

For movements from Bangkok as far as the northern part of Iran (with Tehran as a representative destination), the TAR southern corridor route is likely to have a distinct distance and commercial (i.e. transit time) advantage. The TAR southern corridor would serve trade within that part of the corridor bounded on the west by the eastern part of Turkey, and on the east, by Bangladesh and northeastern India, with the possibility that trade between Kunming, Bangkok and Yangon to most locations in South Asia and the Islamic Republic of Iran could also be efficiently served by the TAR southern corridor.

Construction by the Chinese Railways of a new standard gauge line between Kunming and Dali has been completed. There is new 858 km line between Dali in Yunnan province of China and the existing railhead at Lashio in Myanmar via the border checkpoint at Ruili (China) and Mu-se (Myanmar). From Mu-se, Link My.2a would run south approximately 230 km to the existing northeastern railhead in Myanmar at Lashio.

Links between Myanmar and India: The potential rail link of some 320 `km is between Kalay in Sagaing State of Myanmar and Jiribam in Manipur State of India, via the official border post of Tamu in Myanmar. Link My.3a would start from the station of Kalay to Gangaw and would follow a northerly alignment for about 135 km up to the border checkpoint at Tamu.

Link In.5a would start from Tamu, possibly following Highway 39 in a northwesterly direction through Imphal, the capital of Manipur State, and from there following Highway 53 in a westerly direction to Jiribam which is the existing railhead on the Indian northeastern MG network. From Jiribam, the existing MG line provides a direct connection with Bangladesh at the Indian border station of Mahishasan (opposite Shahbazpur in Bangladesh), passing through Silchar en route. The distance from Tamu to Mahishasan is about 340 km, of which the missing section comprises about 180 km, nearly all of it requiring construction through mountainous terrain, with several peaks of 2,000 metres or more.

- Between Thailand and Myanmar, there is a gap of some 260 km;
- Between China (Yunnan Province) and Myanmar, there is a gap estimated at 860 km;
- Between Myanmar and India, a gap of about 300 km exists;
- Between the new Jamuna River Bridge and Joydebpur in Bangladesh, there is a gap of 99 km;
- Between the railheads on the eastern and western shores of Lake Van in Turkey, there is a gap of 91 km which is currently bridged by specialized rail ferries; and
- Between Haydarpasa Station in Anatolian Turkey and Sirkeci Station in European Turkey, there is a gap of 4.4 km across Bosphorus Strait, which is also currently bridged by specialized rail ferries.

Varying Standards: The TAR in the ASEAN subregion is a special case, as its constituent railway systems mostly conform to narrower (1,000 mm or 1,067 mm) track gauge standards, predominantly light track structures, light axle loads, slow speeds, and small vehicle profiles. It contrasts with the TAR northern corridor, which has a predominance of 1,520 mm gauge route (1,435 mm in China), heavier track structures, heavy axle loads, generally higher speeds, and larger vehicle profiles.

The TAR network in the Indo-China and ASEAN subregion is connected to the TAR northern corridor via southern China, linked to the

Viet Namese railway system via a dual gauge (1,000 mm/1,435 mm) track extending into the territory of Viet Nam as far as Hanoi. When the remaining gaps in the network are bridged, traffic originating in Singapore or Indonesia would have the possibility of joining the main Chinese north-south trunk line (which runs from Shenzhen to Erenhot on the border with Mongolia), or the main Chinese east-west trunk line (which runs from the port of Lianyungang on the coast of China to Druzba on the border with Kazakhstan).

Northern vs Southern Corridor: While the southern corridor involves fewer breaks-of-gauge than in the case of the link with the northern corridor (four gauge transfer points between Indo-China and Western Europe via the northern corridor, as compared with only three via the southern corridor), completion of the connections with the southern corridor would involve the construction of missing links totalling 1,400 km as compared with only 288 km of missing links on the northern corridor.

Northern Corridor: The northern corridor runs through Russia, Kazakhstan, Mongolia, China and Korea. It has a high level of operational readiness. The northern corridor would facilitate the movement between Central Asia and Europe through the Russian Federation and then on through either Belarus or Ukraine. This was a corridor traditionally used for inter-republic trade in the erstwhile Soviet Union, and also the traditional route for moving cargo between western and central Europe and the former USSR. As such, the railway infrastructure in this corridor is extensive and highly developed.

From the points in the north, rail links extend to Ekaterinburg where they connect with the Trans-Siberian railway line, linking the Russian Far East to Moscow. From Orenburg, a link extends to Moscow and then continues to Minsk and Brest (Belarus) and beyond to Western Europe through Poland (Warsaw) and Germany.

From Uzbekistan, cargo by rail can proceed either through Tashkent and on into Kazakhstan, crossing the border with Russian Federation south of Orenburg, or through Bukhara (in the south of Uzbekistan) and Chardjev (Turkimenistan), then in a north-westerly direction, using the railway link straddling the border between Uzbekistan and Turkmenistan.

The Southern Corridor: The southern corridor running through Thailand, China, Myanmar, Bangladesh, India, Pakistan, Iran and Turkey has a number of missing links. Use of the southern corridor involves routing cargo through Turkmenistan to one of its three main border points with Iran, i.e., Sarsakhs, Gandan, or Godriolum, and from there across the north of Iran to Turkey, and from Turkey either to Kapikule at the border with Bulgaria and then on to Western Europe. Alternatively, the route will be to the Black Sea ports of Samsun or Trabzon and across the Black Sea to ports in Ukraine or Bulgaria – and then on to Europe on the central corridor.

'Missing links' exist at the following seven main points in the southern corridor network.

- Between Thailand and Myanmar, a gap of some 263 km;
- Between Dali (Yunnan Province of China) and Lashio in Myanmar, a gap estimated at 858 km;
- Between Myanmar and India, a gap of about 315 km;
- Between the new Jamuna River Bridge and Joydebpur in Bangladesh, a gap of 99 km;
- Between Kerman and Zahedan in the southeast of Iran, a gap of 545 km;
- Between the railheads on the eastern and western shores of Lake Van in Turkey, a gap of 91 km (currently bridged by specialised rail ferries); and
- Between Haydarpasa Station and Sirkeci Station in Turkey, a gap of 4.4 km across Bosphorus Strait (currently bridged by specialized rail ferries).

Central Corridor: Use of the central corridor involves cargo movement by rail to the Caspian Sea port of Turkmenbashy – formerly Krasnovodsk – in Turkmenistan, and ferry movement across the Caspian Sea to the port of Baku (Azerbaijan).

Different Gauge Networks: The TAR network for the entire subregion, with the inclusion of missing and new links, would have an overall route length of 14,320 km, of which 10,050 km would be in the Greater Mekong Area. All but 30 km of the nominated TAR links in the ASEAN area (accounting for 4,270 route km) are in operation. Metre gauge (1,000 mm) lines would account for 9,436 km out of the subregional route total of 14,320 km (66%), while lines of 1,067 mm, 1,435 mm and mixed 1,000/1,435 mm gauge would account for 2,295, 2,277, and 312 km, respectively.

Railways can contribute significantly to sustaining mobility and playing a pivotal role in grappling with the challenges of globalisation. New economic growth impulses in the region encourage unprecedented increase in international trade leading, in turn, to regional integration and interdependence. A clear impact has been on the demand for multimodal transport infrastructure with growing interconnectivity between railway systems as much as with other modes.

Bridging the Network: Missing links account for about 740 route km, while new links (such as those planned for construction through the territory of Lao) account for 2,887 route km, which means a total of 3,627 km. Except for 30 km in Malaysia, all of the missing and new links are in the Greater Mekong Area, which would require the construction of approximately 1,140 km of new lines of 1,000 mm gauge and another 2,430 km of lines of 1,435 mm and dual 1,000/1,435 mm gauge.

Currently, the only break-of-gauge points in the nominated TAR network are located within Viet Nam (Hanoi) and Yunnan Province of China (Wangjiaying, near Kunming). While there are, currently, no break-of-gauge points at borders, it is likely that the proposed construction of a new link from Dali (Yunnan) to Kachang or Houqiao (Myanmar) will result in a break-of-gauge at the China-Myanmar border.

Missing Links in South Asia and Central Asia

Some of the important links in the TAR alignment west of India include the following:

India-Pakistan: Pakistan has completed the conversion of Mirpurkhaspur – Khokrapar metre gauge section to broad gauge.

Pakistan-Afghanistan: A feasibility study to connect Quetta (Pakistan) with Kushka (Turkmenistan border)- 800 km – through Afghanistan has been completed. The section from Chaman to Spinboldak (20 km) is expected to be operational in 2007. The next section for consideration would be from Spinboldak to Kandahar.

Pakistan-Central Asia: Pakistan is currently working on a project to link the new sea port of Gwadar with its existing rail network. The length of the connection would be around 800 km, and cost estimated at US$ 1.6 billion. The construction of the section could ultimately link the Gwadar port to Central Asia.

Pakistan-Iran: The missing link Kerman-Bam-Zahedan in Iran (535 km) is under construction and is scheduled to become operational in 2007. In support of the development of traffic along the Trans-Asian Railway network between Pakistan and Iran, Pakistan is upgrading the line between Spezand and Koh-i-Taftan.

Iran has launched the construction of the Iranian segment of the Khorramshahr (Iran) – Basra (Iraq) rail route. Of the total 51 km length of this connection, 16 km is on the Iranian side of the border and 35 km runs through Iraq.

Turkey: The principal missing link in Turkey is Lake Van. Turkey is undertaking studies designed to increase the capacity of ferries on this lake. A bypass skirting the lake is under consideration.

A major project under implementation is the Istanbul Strait Tube Tunnel Crossing ‘MARMARAY’ project. The completion of the project in 2009 will allow uninterrupted and continuous transfer of trains, which currently cross the Strait by ferries.

Turkey-Georgia: Turkey and Georgia have agreed to complete project studies in their respective countries on the missing link between Kars and Tbilisi.

It is essential for countries to develop the infrastructure necessary for containerised transport systems, which include highway and railway networks, port facilities and intermodal interfaces. In addition, the expansion of containerisation inland will require corresponding intermodal facilities at inland locations, particularly at most major border crossings, to ensure seamless land transport. The border crossing infrastructure would provide facilities for customs, warehousing and, if applicable, cargo transshipment.

Large Investments Required

For container ports alone in Asia and the Pacific, it is estimated that 735 new container berths will be required to meet the future container port traffic demands in 2015, involving an estimated investment of $46 billion. In addition to the $26 billion currently being invested or committed, the balance amount is required to upgrade and improve 26,000 km of the AH network. For the TAR network, it is estimated that building single-track lines on the 13 major missing links over a total of 6,237 km will entail an investment of about $14.6 billion. Moreover, a large number of TAR lines would need to be upgraded to double-track lines, requiring large outlays.

In particular, additional investment will be required to develop intermodal interfaces, such as inland container depots (dry ports) as well as border-crossing facilities. Some 312 dry ports have been estimated to be put in place, in addition to about 100 existing ones.

Air Traffic

A significant share of global airport and air navigation services investment of more than US$ 300 billion between 2000 and 2010 is being committed to develop airport infrastructure in the Asia-Pacific region. Major new airports in the region, at Chubu Centranir International Airport (Nagasaki), Baiyun International Airport (Guangzhou), Kuala Lumpur (Kuala Lumpur International), Hong Kong (Chek Lap Kok), Imam Komeini International Airport (Tehran), Osaka (Kansai), Incheon International Airport (Seoul) and Pudong International Airport (Shanghai) required an estimated investment of over US$ 50 billion. Bangkok’s new Suvarnabhumi Airport opened recently and new airports under construction at Bangalore and Hyderabad in India, among others, involve large outlays. Current plans are to continue the development of these new facilities, to upgrade existing hub airports, and construct completely new airports, requiring at least another US $20 billion funding by 2010.

Rural Roads

The overall aggregate expenditure for connecting all the currently unconnected villages, about 50% of the total, with all weather black topped roads, has been estimated at US$ 26 billion, excluding the cost of major bridges. This compares with currently committed investments in the Indian sections of the Asian Highway, i.e., the road backbone network, of roughly US$ 3.6 billion. China plans to construct 400,000 km of new rural roads to connect 80% of all villages by 2020. The efficiency of the road system depends on the state of all its links and nodes, and will, therefore, require development of all these links.

Essential Software

For deriving optimal gains across the region, there is a clear need for transition towards infrastructure maintenance and upgrading, technology transfer, and best practices to be shared. As the non-physical impediments are streamlined, there is need for a relentless effort at simplifying and harmonizing documentation, formalities and procedures for crossing borders, establishment and strengthening of facilitation and coordination mechanisms at the national level, streamlining of legal frameworks, application of new technologies and facilitation tools, and implementation of relevant international transport conventions.

Economies are increasingly integrating themselves into supply chains that span national borders, necessitating the development of logistics and freight forwarding, ensuring ongoing improvements in port efficiency, interchange capacity, warehousing and storage that can provide tangible cost advantages to the supply chain by means of intermodal transport.

Sub-regional Transport Networks

Subregional transport networks include the Association of South East Asian Nations (ASEAN) Highway; the priority road network in North-East Asia; the Economic Cooperation Organization (ECO) transport network; and the international road network of the Commonwealth of Independent States (CIS). Countries in South Asia and those in BIMSTEC and Mekong-Ganga Cooperation have deep interest in the regional transport networks. In 1998, the Economic Cooperation Organization (ECO) adopted the Almaty Outline Plan (1993) and the Programme of

Action for the ECO Decade of Transport and Communication (1998-2007) for the development of the transport sector in the ECO subregion.

ASEAN

Common Rail Gauge: Singapore, Malaysia and Thailand are linked by metre gauge rail network, which also was linked in the past to an MG system in Cambodia.

The MG rail network of Viet Nam runs parallel to the coast, linking HO Chi Minh City with the cities of Danag, Hanoi, and Haiphong. North of Hanoi, there are two links to the border with China, one of them dual-gauge, enabling Chinese standard gauge rolling stock to move more than about a hundred km into Viet Nam.

The new Friendship Bridge across the Mekong River has been designed to allow for the addition of rail along the centre line of the bridge in the future, providing an MG link from Thailand to Thanaleng or Vientiane in Laos.

In the ASEAN area, the TAR could potentially offer a distance and transit time advantage for the movement of container traffic between Bangkok and the Malaysian ports of Klang and Penang, and, in the longer term, between these ports and origins or destinations in Indo-China. Such traffic would also include container trade between the Indonesian port of Belawan (North Sumatra) and the ports of Bangkok and Laem Chabang in Thailand. There is potential for feeder movement of containers by rail between the Port of Laem Chabang and Vientiane (Laos) – following the extension of TAR Link I.2 from its current terminus at Nong Khai, across the Mekong River, via the Mittapharb (Friendship) Bridge, to Vientiane. Relevant to the TAR in the Greater Mekong Area, the rail transportation of containers is in its infancy. Container transportation by rail is, however, steadily gaining ground in Cambodia and Viet Nam.

A project with the potential of significant multimodal transport development in the region is the ASEAN Rail Express (ARX). A landbridge service, connecting Malaysia and Thailand, initiated by the rail systems of the two neighbouring countries in 1999, commenced as a joint venture business between Freight Management Stn Bhd (Malaysia) and Profreight International Company Ltd. (Thailand).

The maiden train journey began on 9th August 1999 from KTMB station with 10 export TEU to Bangkok, while the return journey brought 20 import TEU from Bangkok. Following is the export-import ARX throughput during the years 1999-2004:

Table 4.5: Export-Import ARX Throughput

TEU

	1999	2000	2001	2002	2003	2004
Export	869	5,085	5,835	6,637	7,332	7,855
Import	942	6,047	6,658	7,538	7,538	8,684
Total	1,811	11,132	12,493	14,175	14,870	16,539

Source: ESCAP Secretariat

The land-bridge project has recorded steady growth of 7% to 13% per year during this period. Currently operating four times per week, with a transit time of 3-4 days, it envisages train frequency to increase to a daily service. Transit time will also be shorter on the completion of double-tracking of the corridor. The service is proposed to be extended to Laos, Cambodia and Kunming (southern China).

As an integral component of TAR, the Singapore-Kunming Rail Link (SKRL) project is currently under active consideration of ASEAN. It has six routes, besides the 1,910 km common route, linking Singapore to Bangkok.

Proposed at the Fifth ASEAN Summit in Bangkok in December 1995, with Malaysia as the project coordinator, the Singpore-Kunming Rail Link (SKRL) project is the core agenda for action of the ASEAN Mekong Basin Development Cooperation (AMBDC) Programme, one of ASEAN's flagship projects, and an integral component of TAR (Trans-Asian Railway).

All the six route alternatives shown below have a common sector – from Singapore to Bangkok via Kuala Lumpur.

Table 4.6: Route Alternatives for Singapore-Kunming Rail Link

Route	Distance (km)	Description	Missing Links (km)	Countries Involved
Route 1	5,382	Singapore-Kuala Lumpur-Bangkok-Aranyaprathet connecting via Bangkok, Phnom Penh, Ho Chi Minh City, Dong Ha, Hanoi, Lao Cai, Hekou, Kunming	431	Cambodia, Lao PDR, Viet Nam
Route 2A	4,559	Singapore-Kuala Lumpur-Bangkok-NamTok-Three Pagoda Pass-Tnanbyuzayat-Yangon-Mandalay-Lashio-Muse-Rueli-Dali-Kunming	1,127	Myanmar, Thailand, China
Route 3A	4,259	Singapore-Kuala Lumpur-Bangkok-Nong Khai-Vientiane-Thakhek-Tan Ap (Vung Anh) Hanoi-Lao Cai-Hekou-Kunming	531	Lao PDR, Viet Nam
Route 3B	4,164	Singapore-Kuala Lumpur-Bangkok-Nong Khai-Vientiane-Luang Prabang-Boten-Kunming	1,300	Lao PDR, China
Route 3C	4,481	Singapore-Kuala Lumpur-Bangkok-Ubon Ratchathani-Chong Mek-Pakse-Savannakhet-Dong Ha-Hanoi-Lao Cai-Hekou-Kunming	616	Lao PDR, Viet Nam, Thailand
Route 3D	4,225	Singapore-Kuala Lumpur-Bangkok-Mukdahan-Savnnakhet-Dong Ha-Hanoi-Lao Cai-Hekou-Kunming	589	Lao PDR, Viet Nam, Thailand

Source: Feasibility Study for the Singapore-Kunming Rail Link: ASEAN

Table 4.7: The Missing Links and Spur Links

Missing & Spur Lines	Corridor	Distance (km)
Poipet-Sisophon	Cambodia	48
Phnom Penh-Loc Ninh	Cambodia	286
Loc Ninh-Ho Chi Minh City	Viet Nam	149
Ho Chi Minh-Vung Tau	Viet Nam	75
Three Pagodas Pass-Thanbyuzayat	Thailand-Myanmar	110
Nam Tok-Three Pagodas Pass	Thailand	153
Vientiane-Thakkek-Mu Da	Lao PDR	466
Mu Da-Tan Ap	Viet Nam	53

Source: Feasibility Study for the Singapore-Kunming Rail Link: ASEAN

China is keen to speed up construction work on its section of the 5,500 km railway link between Kunming, the capital of the southwestern province of Yunnan, and Singapore. China plans to invest US$ 6.42 b in constructing the rail line, which will connect Yunnan with Viet Nam and Laos, and an additional branch line to Myanmar.

China has conducted a pre-feasibility study on the 286 km Phnom Penh-Loc Ninh link on the Cambodia-Viet Nam corridor. It has provided for comprehensive renovation and construction of the Kunming-Hekou railway in support of an early connection of the Pan-Asian rail network. The network could also be linked to Indian railways via Myanmar, besides providing a link to Europe through the Trans-Siberian railway.

SKRL: Main Corridors: Route 1: the line starts from Singapore, passes through Kuala Lumpur and goes to Bangkok; from Bangkok, it extends to Phnom Penh, Ho Chi Minh City, Hanoi and Kunming (China). This forms the main route within the southern corridor, starting at Kunming, and joining at Lashio and Kalay (Myanmar), Jiribam (India), Bangladesh, Pakistan, Iran, and Kapikule (Turkey).

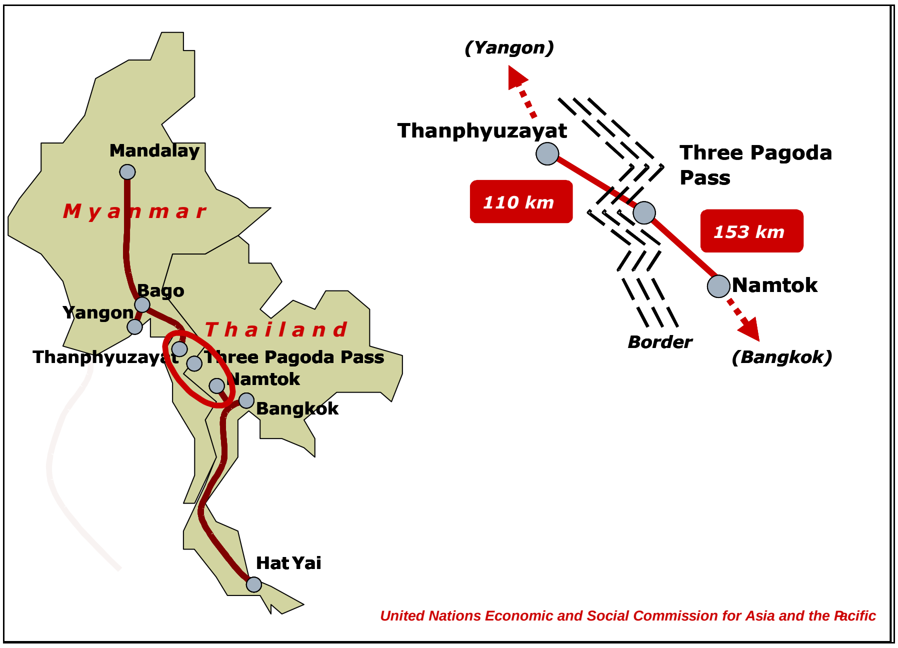
The total length from Kunming to Kapikule is about 11,700 km, involving seven national borders with three different rail track gauges. The existing Chinese railhead at Xiaguan and Myanmar railhead at Lashio Span has a distance of about 858 km, the Myanmar railhead at Kalay and the India railhead at Jiribam have a distance of about 315 km.

SKRL Missing Links: Main Corridors

Thailand-Myanmar: For the 110 km missing link between Thabhyuzayat and Three Pagoda Pass on the Thailand-Myanmar corridor, a feasibility study sponsored by the Korea International Cooperation Agency (KOICA) on the spur line connecting Nam Tok-Three Pagoda pass-Thanbhyuzayat (on the Myanmar-Thailand border) has been taken up. The report of the study will be examined by Thailand and Myanmar for further action.

The stretch along Yangon-Bango-Mawlamyine-Thanbhyuzayat has been taken up for upgradation, and the work is likely to be completed by 2008. A 164 km rail line from Ye to Dawei on the Thailand-Myanmar corridor has since been built.

Figure 4.6: Myanmar-Thailand Links



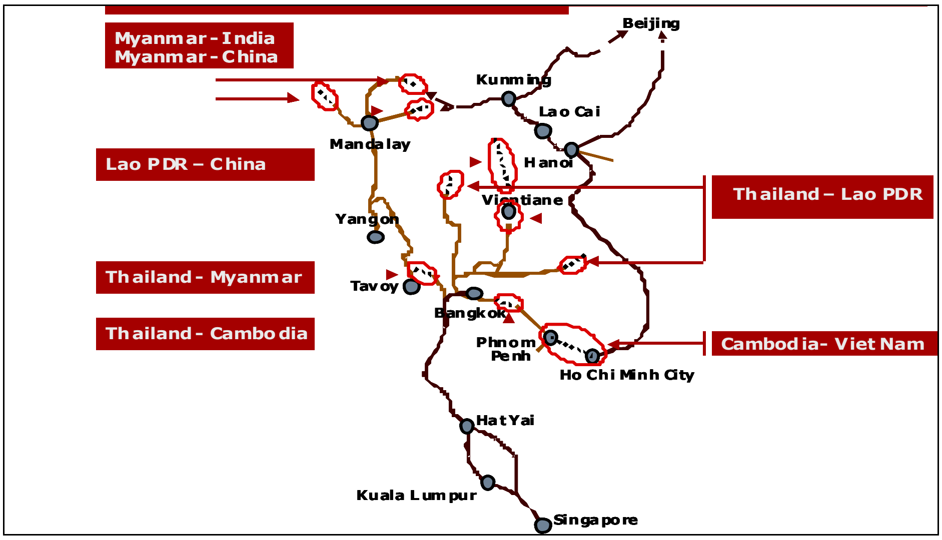
Myanmar-India: Of late, there have been several proposals initiated to provide increasing surface transport connectivity between Myanmar and India. A bus service has been proposed between Manipur and Myanmar. Following the bilateral agreement in 1995, border trade takes place only at Moreh in Manipur, the easternmost Indian border township. There is also a proposal for India to aid the development of Myanmar's Sittave port, situated in Rakhine state, a long narrow coastal region in western Myanmar. This will provide India's north-east access to the sea and international trade by developing the port in Myanmar and making the river Kaladan navigational.

Kaladan connects Mizoram with the Bay of Bengal. In fact, some of the north-eastern states like Assam and Arunachal Pradesh have urged Indian government to reopen the Stilwell Road, to link the region with China via Myanmar. The 1,726 km road, built by the Allied and Chinese troops under the command of US General Joseph Stilwell was used to transport supplies to the beleaguered Chinese army during World War II. The Stilwell Road originates in Assam and connects Kunming in China through the Pangsau pass in Myanmar. While a 632 km stretch of the road falls in China and only 61 km in India, 1,033 km lies in the rugged mountains and swampy valleys of northern Myanmar.

A 97 km rail line – Jiribam to Tupui (short of Imphal in Manipur) on Myanmar-India rail corridor – is under construction at an estimated cost of Rs. 100 crore (Rs. 1 billion). The work has been accorded the status of a national project. Next stage of construction would involve extension of the line to Morhe (122 km). The proposed TAR route on west of Imphal and Jiribam in Manipur will pass through Silchar and Mahisasan (Assam) before entering Bangladesh. It will again emerge in India at Gede in West Bengal.

A 350 km long missing link, if constructed, will connect Indian rail network with Myanmar's. Of this 350 km, about 150 km falls within India, for which a new rail line has now been proposed to be built between Jiribam – Imphal-Moreh at a cost of Rs. 2,941 crore (US$ 700 million). The rest – about 200 km rail line – is to be constructed between Tamu (Moreh) – Kalay – Segyi in Myanmar, at a cost of Rs. 1,339 crore (US$ 330 million). The rail link in Myanmar will involve rehabilitation of the existing line from Segyi to Chaungu Myohaung at an additional cost of Rs. 284 crore (US $ 65 million).

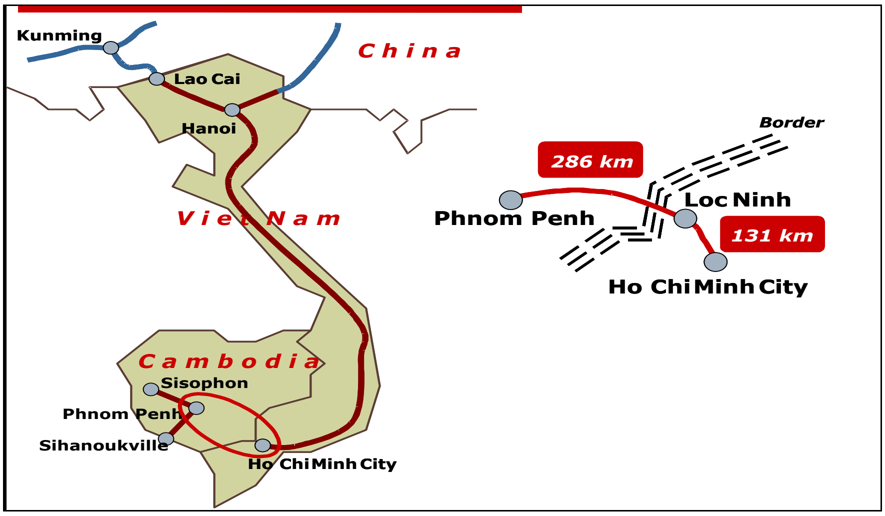
Figure 4.7: Important Missing Links



For a 135 km Kalay-Tamu missing rail link (within Myanmar) on Myanmar-India corridor, a feasibility report was submitted by RITES in March 2005. The report is being examined by Government of Myanmar. Site investigations of the Myanmar-China rail link, from Lashio to Muse Myse/Rueli, a distance of 232 km, have been made by a Chinese expert team. Another missing link in Myanmar is the 110 km stretch between Three Pagoda Pass and Thanbuzayat.

Viet Nam-Cambodia: There is a missing link of 130 km between Ho Chi_Minh City in Viet Nam and Loc Ninh on the Cambodian border. A feasibility study has been completed; the cost of its construction is estimated at $150 million.

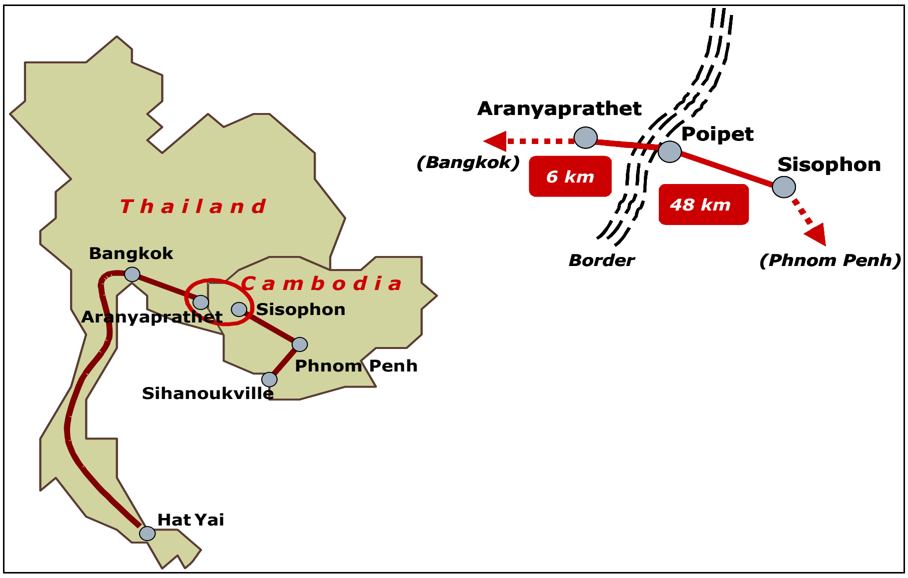
Figure 4.8: Linking Viet Nam-Combodia



Cambodia-Thailand: The Second Survey and Design Institute of China Railway carried out a preliminary technical study on the 286 km missing link from Phnom Penh in Cambodia to Loc Ninh in Viet Nam. Its report was submitted in June 2005. The estimated cost of construction is $480 million.

The Royal Railway of Cambodia is scheduled to take up the construction of the 48 km Sisophon-Poipet missing link in 2007. Malaysian government and KTMB have donated used rails of 106 km length for the stretch and its subsequent link to Phnom Penh project.

Figure 4.9: Cambodia-Thailand



The State Railway of Thailand is pursuing the construction of the 6-km missing link from Aranyaprathet to the border with Cambodia. A feasibility study for this link has been completed.

A fresh cross-border agreement between Cambodia and Thailand is being discussed based on an existing cross-border agreement between the two countries signed in 1955 and revised in 1972. KTMB has offered to facilitate the exercise, using its own border practices at Padang Besar and Rantau Panjang/Sungai Golok.

Viet Nam-China: There are two rail links: (i) the 297 km MG line between Hanoi and La Cai; and (ii) the 195 km dual gauge line (1435 mm and 1000 mm) line from Hanoi to Dougdoug.

Lao PDR-Thailand/Viet Nam: The missing links have been: (i) a 3.5 km stretch across the Friendship Bridge from Nong Khai in Thailand; and (ii) a 11 km link between Thanaleng and Vientiane. A feasibility study was conducted by the Korea Railroad Technical Cooperation in 2002 for a 13.6 km rail line from the centre of the Friendship Bridge to Vientiane city – as a part of the Nong Khai – Vientiane rail link.

A feasibility study has been conducted by the Korea Railroad Technical Corporation in 2002 for a 13.6 km rail line from the centre of the Friendship Bridge to Vientiane City – as a part of the Nong Khai-Vientiane rail link.

Thailand: Design works have been completed for 3.5 km line from Friendship Bridge to Ban Tha Na Long (Lao PDR).

Feasibility study has been completed for:

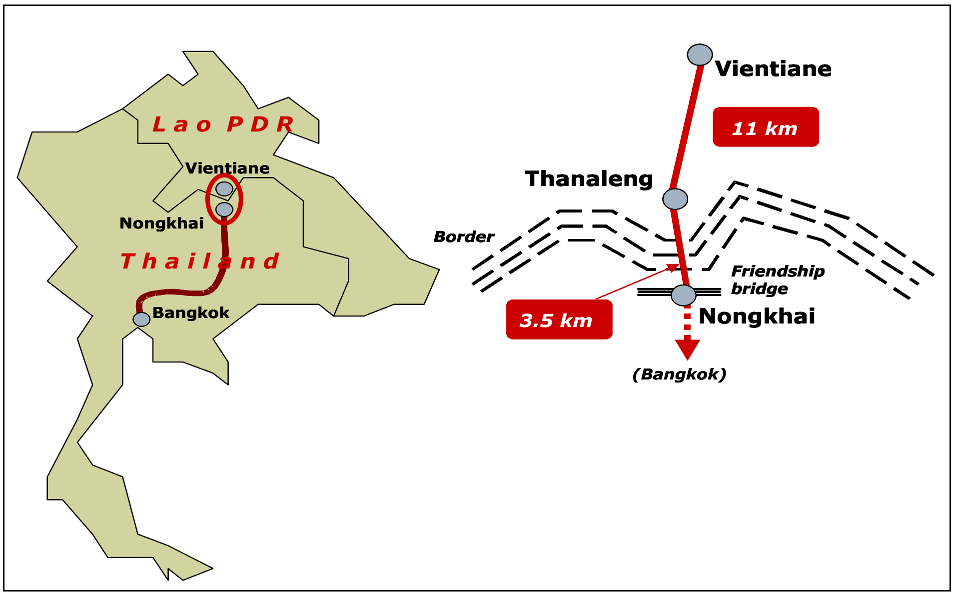
– 6 km Aranyaphathet-Poipet (to connect Cambodia)
– 80 km Chiang Rai-Chiang Khong (to connect Laos and Southern China)

Projects for which feasibility studies need to be done for connecting Myanmar

– 200 km line Phitsanulok-Mae Sod
– 260 km line Pichit-Mae Sod
– 280 km line Nakhonsawan-Mae Sod
– 153 km line Nam Tok-Three Pagoda Pass
– 40 km line Sai Yok-Bong Ti Pass

An important economic corridor, the link connecting Lao PDR's capital city, Vientiane with Bangkok and eastern seaboard in Northeast Thailand had the Thai-Lao Friendship Bridge over the Mekong Rivar constructed between Nong Khai and Vientiane and opened in April 1994. So far, this bridge has been used for road transport only. It carries an unused 2.5 km long metre gauge single track from the State Railway of Thailand terminus at Nong Khai station. Work to link Laos to Thailand's rail network began on 19 January 2007, with a 3.5 km line from the Bridge. The rail line from the Thai side at mid-point of the Friendship Bridge runs on the bridge about 600 metre, and terminates at Ban Thanalong station.

Figure 4.10: Lao PDR-Thailand



SAARC

"South Asia is the least integrated region in the world", observes the World Bank (*South Asia: Growth and Regional Integration*). While South Asia made significant progress in integrating with the global economy, integration within the region remained limited. South Asian countries have maintained a higher level of protection within the region than with the rest of the world… Restrictive policies within the region have neutralised the beneficial effects of common cultural affinity, common geography, and the 'gravitational' pull of proximity on movement of goods and people within the region.

The transport system of the mainland countries of South Asia has developed only in a national context, with little consideration given to cross-border issues of compatibility, uniformity of standards in infrastructure and equipment design. An ADB-sponsored Regional Multimodal Transport Study undertaken by SAARC (South Asian Association for Regional Cooperation) in June 2006 examined the transport scene in the region threadbare.

Roads: The SAARC countries had 3.82 million km of road network in 2002, which accounted for 10% of the world road network. In the context of regional road corridors, one crucial non-physical barrier has been the lack of a bilateral transport agreement to facilitate uninterrupted movement of goods and vehicles across the borders between India and Bangladesh, as well as between Pakistan and India. Goods are required to be transshipped at the border between the trucks of neighbouring countries. Divergences persist in regard to standardization of working hours and weekly holidays, besides use of complicated customs procedures and lack of transparency in inspection.

Rail Network: South Asia has one of the largest railway networks in the world, spreading over 77,000 route km. About 70% of this network is broad gauge, largely in India, Pakistan and Sri Lanka. Some of the major barriers in intra-regional movement by railways include the lack of standardization of technologies, operation and maintenance practices, including different types of gauges, braking systems, incompatibility of rolling stock, etc., in addition to inadequate loop lengths, some missing links in the borders areas, lack of physical infrastructure at interchange points, load restrictions on bridges, lack of coordination for gauge conversion programmes on different railway systems, and capacity constraints in certain sections of the identified corridors. One crucial barrier is the lack of a multilateral rail transport agreement. Other barriers include manual handling of documentation, duplication of customs checks, limited working hours, restrictions on movement of open wagons and oil tankers.

Inland Waterways: Regional inland waterways corridors serve the interest of only Bangladesh and India, where levels of traffic – both intra-country and transit – had been reducing over years. Inland waterways transport has great potential to provide a cost-effective transport service between India and Bangladesh. Some of the major physical barriers include high rates of siltation, bank erosion, inadequate navigational aids and draft restriction of 1.83 m, as well as poor condition of jetties, piers, lack of sufficient storage, cargo handling equipment and support craft. In addition, there is no container handling capability along inland water transport system. Cargo carrying vessels are also old, repair facilities inadequate and hinterland connectivity of the inland ports poor.

India has 15,544 km of navigable waterways including rivers, backwaters, canals, etc. About 5,200 km of rivers and 485 km of canals are suitable for mechanized transportation. The share of inland waterways has remained small.

It is estimated by the Inland Waterways Authority of India (IWAI) that about 20 million tonne, corresponding to 1.5 billion tonne km of cargo is moved using the IWT system which accounts for 0.15% the total cargo transported by all inland transportation systems.

Government aims at increasing the share of inland cargo movement by IWT mode from the present level of 0.15% to 2% by the year 2015 through schemes for fairway and infrastructure development, manpower training, institutional strengthening and through fiscal concessions.

There are currently three waterways classified as National Waterway. Government has planned to extend the national waterway system by declaring another five waterways i.e. (i) Barak River; (ii) Kakinada-Mercaunam Canal integrated with Godavari and Krishna Rivers; (iii) East Coast Canal integrated with Brahmani river system; (iv) extension of National Waterway 3; and (v) Damodar Valley Canal as national waterways

National Waterway 1: The traffic at Kolkata port is the key driver for NW 1. The significant issues in respect of this waterway are:

- Lack of sufficient draught to operate the most economically sized vessels.
- Need for modernisation of dockyards to ensure the repair facilities as required by the vessel operators.
- Need for attracting a base commodity so that it provides sufficient volumes to finance the development of supporting infrastructure and carry out improvements to the IWT system.

National Waterway 3: Kerala has the highest potential for using IW system for transporting cargo as it has long stretches of backwaters and about 40 rivers flowing into the Arabian Sea. The major waterways identified in the State are:

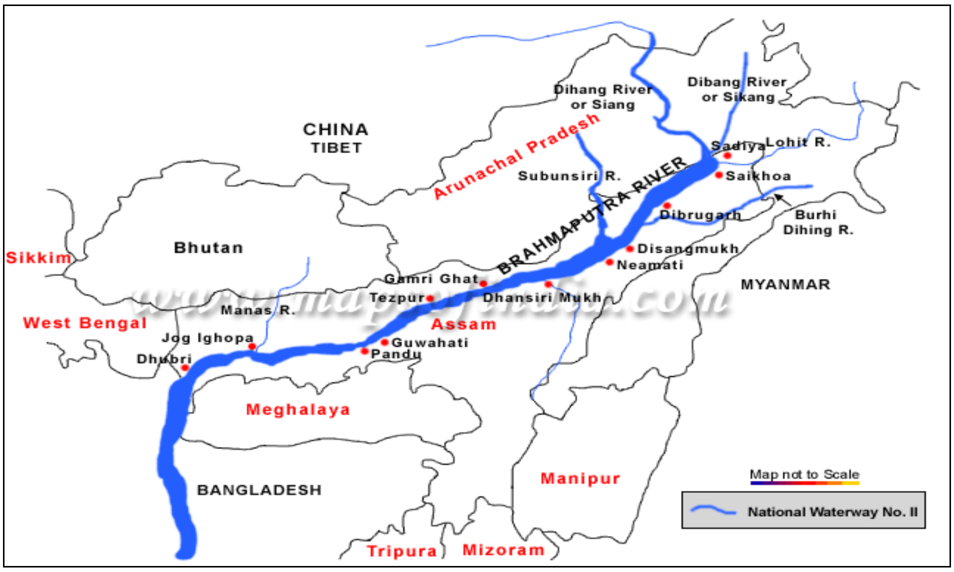
- Kottapuram to Vadakara;
- Sultan canal in Kannur district; and
- Vembanad lake.

These waterways, which could facilitate uninterrupted transport facility from Kozhikode to Thiruvananthapuram in the earlier days, have become defunct. Since the 1960s, the inland water transport in Kerala has lost its pre-eminence. Despite its latent potential, the IWT system in Kerala loses out to road and rail. It is effective only in the areas adjoining Kuttanad in Alappuzha district due to the lack of adequate road and rail infrastructure. Advantage of interlinking waterways is that wherever the network is not fully developed, the cargo can be transported by coastal shipping.

Figure 4.11: India's National Waterway1

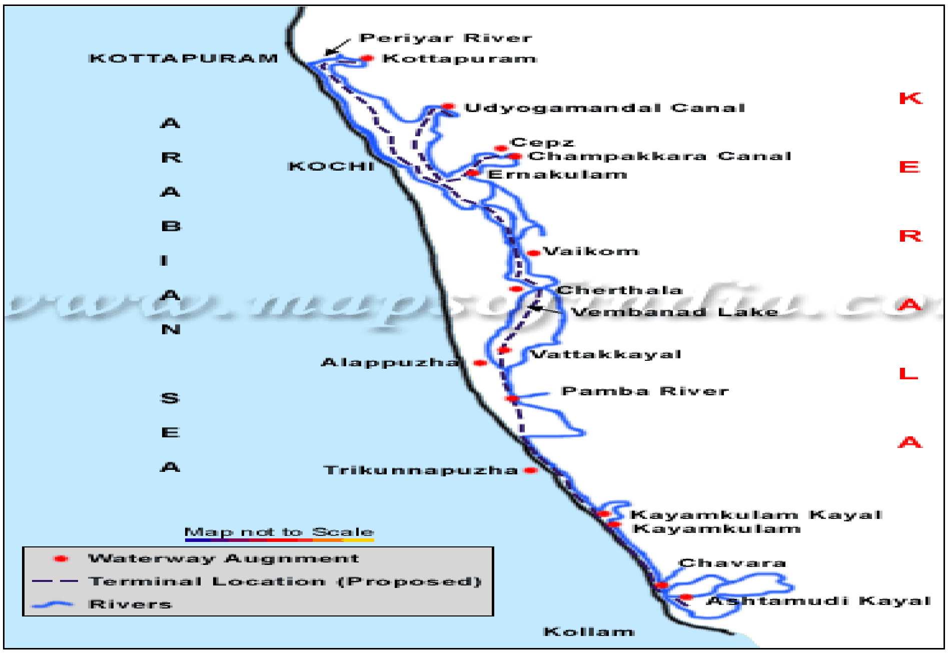
Source: IWAI

Figure 4.12: India's National Waterway2



Source: IWAI

Figure 4.13: India's National Waterway3



Source: IWAI

Ports: South Asia is endowed with about 25 major ports, of which 10 are gateways of regional significance. The major barriers identified in regional maritime gateways include capacity constraints at many of the ports, together with heavy siltation at channels where depths fluctuate with tide. Cargo and ship-handling equipment, as well as floating craft are old. Poor road and rail connectivity, lack of ICDs and CFSs are additional limitations. Other barriers which impact port performance include lack of professional management and computerisation, as well as EDI/IT to link up stakeholders. Customs procedures have remained generally complicated, and port documentation cumbersome. However, of late, measures have been initiated in some of the countries to simplify and modernize procedures.

Airports: Around 250 weekly flights operate between different SAARC destinations; in 2004, they carried around 2.23 million passengers and 36,602 tonne of freight. Some major physical barriers that could have adverse impact on the performance of the 16 gateways include capacity constraints at several airports in terms of runways, parking areas for aircrafts, passenger handling areas, cargo processing facilities, as well as security and baggage handling facilities.

Integrated Intermodal Facilities Desired

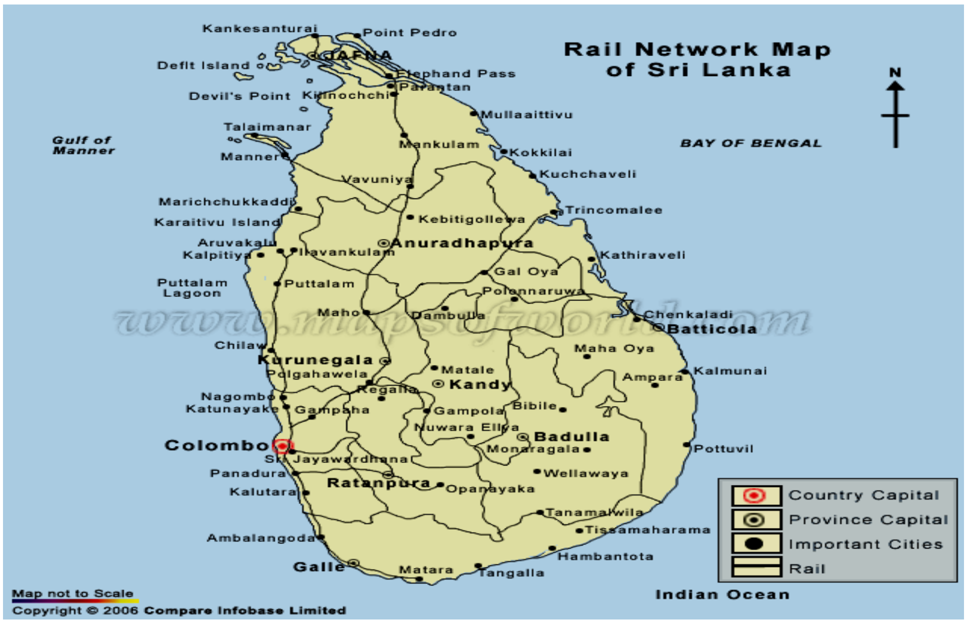
In a rapidly integrating, globalising world, countries in the SAARC region, for example, need to coalesce their strengths and synergies. Integrated multimodal logistics solutions may demand some bold and revolutionary initiatives like a mega hub port in the region supported by supplementary feeder services and land bridging of containers on selected rail corridors.

For South Asia’s intra-regional trade to grow rapidly, there is need, among others, for integration of its transport infrastructure. This calls for cooperation in the strengthening of transportation, transit and communication links across the region, including harmonization of standards and simplification of customs procedures and other similar trade facilitation measures.

Bilateral Interfaces: India has land-based trade with its four neighbouring SAARC countries – Bangladesh, Pakistan, Bhutan and Nepal.

India-Sri Lanka trade exchanges are by sea and air. Sri Lanka Railways (SLR) have a 1,200 km broad gauge (1676 mm) track in operation, that carries 4.6 billion passengers and 135 million tonne of freight in a year. SLR development strategies envisage several technological inputs for increasing their market share of passenger traffic from 6% at present to 15% of the county's total traffic and freight from 2% to 10% by 2016.

Figure 4.14: Rail Network of Sri Lanka



India-Bangladesh: India's most significant land-based trade in SAARC is with Bangladesh carried out through the Petrapole border post on the Indian side and Benapole in Bangladesh. Trucks carrying goods from various places in India reach Petrapole; trade documents are preprocessed by the Customs station. After physical examination of goods, trucks roll across the border, where they are again physically inspected and their documents verified by the Bangladesh Customs. Only then are they allowed to offload cargo at the customs warehouse and turn back. Bangladeshi vehicles then transport the goods to various customs inland destinations in that country. Inordinate delays occur at the border, as the customs stations are not well-equipped. There is a permanent queuing of vehicles.

There are four operative interchange points between India and Bangladesh railways, all located on the western side of Bangladesh.

Table 4.8: India-Bangladesh Interchange Points

Broad gauge	Metre gauge
Petrapole-Benapole Gede-Darsana Singhabad-Rohanpur	Radhikapur-Birol* (temporarily closed)

* *The rail route upto Radhikapur in India has since been converted into broad gauge.*

The northern side rail links (Haldibari-Chilahati; Gitalda-Moghulhat) were closed two decades ago. On the eastern side, Mahishasan-Shahbazpur metre gauge link was closed in 1997 due to extensive damage caused by floods.

Transit transport through Bangladesh is covered by the bilateral Trade and Payments Agreement and the Transit Agreement, signed in April 1976. Birol, a metre gauge rail point at Bangladesh border, has been used for the movement of Nepal's trade traffic to and through Bangladesh after the Government of India agreed for the rail connection from its border station at Radhikapur to Birol in 1978.

Bangladesh Railways (BR) has a network of 923 km of BG lines, mostly in the western region, and 1,822 km of MG lines, mostly in the central and eastern regions. The long-term plans of BR are based on a core network of broad gauge standards. It is in the process of either converting the metre gauge lines to broad gauge or providing dual gauge facilities on selected sections. A broad gauge link-up to Birol is expected to be provided shortly, thereby reviving Radhikapur-Birol interchange point. The BR components for TAR-Route I and Route II are:

– TAR Route-I: Darsana-Ishurdi-Jamtoil-Joyedevpur-Dhaka (BG/MG transshipment at Dhaka/Tongi) – Akhaura up to Chittagong port. Another link is from Akhaura via Kulaura-

Shabhazpur up to Mohishashan. This BG route has an alternate entry/exit at Rohanpur from where it joins the route at Ishurdi.

– TAR Route-II: This is all MG route at present: Birol-Parbatipur-Ishurdi-Jamtoil-Joydevpur-Dhaka-Akhaura up to Chittagong. Another link is from Akhaura via Kulaura-Shahbazpur up to Mohishashan.

With Indian Railways progressively converting its MG section to BG, BR will need to convert the Birol-Parbatipur MG subsection to dual gauge for movement from India on BG, using part of TAR Route-I.

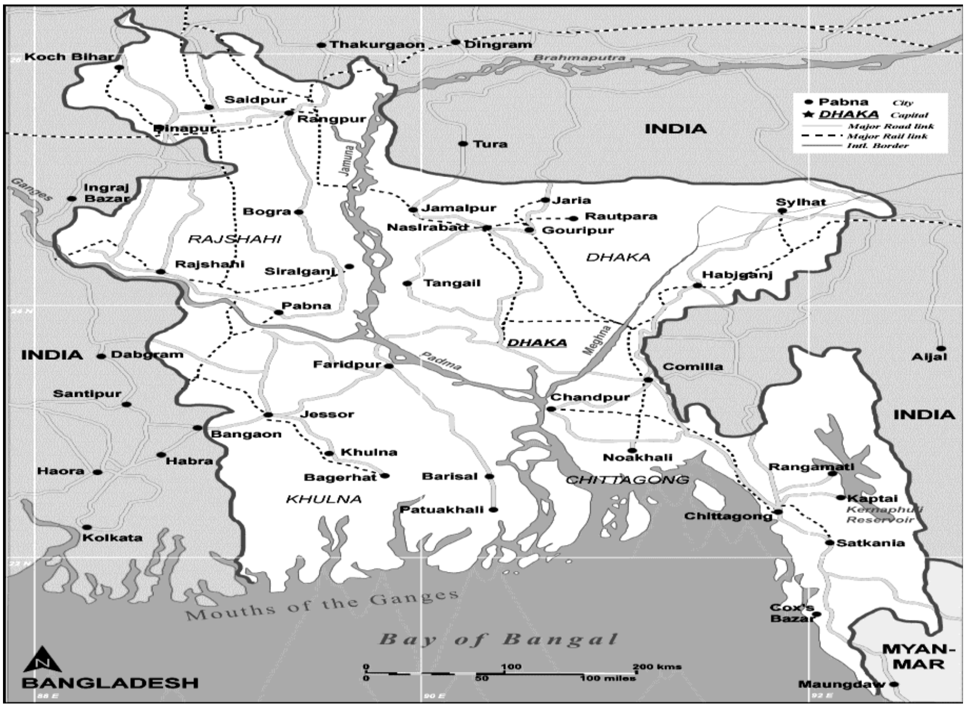
BR has planned for modernization and expansion of the network along with gauge rationalization. Besides, proposals include the construction of a second MG line on the single line portions between Dhaka and Chittagong on BG substructure for future uni-gauge programme.

BR has provided a 99 km broad gauge link from Jamtoil on the western side of the bridge to Joydevpur on the eastern side, located 35 km short of Dhaka. It proposes to extend the broad gauge line up to Dhaka in the near future. The rail tracks over the Jamuna bridge are suitable for both metre and broad gauge operations. The metre gauge rails have been laid within broad gauge tracks. There are load limitations over the bridge: axle load not exceeding 18 tonne and trailing load not exceeding 43.7 kilo Newton/metre. These limitations inhibit the movement of heavier rolling stock, but permit carriage of ISO containers.

The loading capacity on the bridge can be increased by suitable re-engineering like replacement of concrete parapets by lighter material and reducing surfacing thickness and load regulation of road traffic. BR has approached ADB for carrying out a study with a view to overcoming the existing limitations.

There is one inland container depot operational in Bangladesh, located at Dhaka. ICD, with an annual handling capacity of 90,000 TEU, is linked to Chittagong port, with BR as the carrier. Another ICD is proposed to be built at the outskirts of Dhaka, at Tongi.

Figure 4.15: Bangladesh Railways



An AITD study of Indo-Bangladesh trade transactions across the border revealed following salient points:

(i) Multimodal transit of goods over land route is cheaper by 35%, besides substantial saving accruing in transit time – at least by 70%.

(ii) India-Bangladesh trade suffers high transaction cost, involving time-consuming transportation, inventory, in-transit storage and transshipment.

(iii) Goods carried by road are transshipped across borders:

- Temporary storage of goods in warehouses/open yards/transit sheds – with dwell time of up to 7 days for cargo.
- Hundreds of trucks queue at Bongaon and Petrapole on Indian side
- An average of 6.2 days is taken for a truck to complete the 100 km journey from Kolkata to Benapole

- Typical cost of a single export shipment from Kolkata in India to Benapole in Bangladesh – with 9t of cargo – is as high as Rs. 8,940, or about Rs. 11/tkm.
- Land customs working hours are restricted to 0600 to 1800 h, with no work on Fridays
- Want of IT/EDI facility deprives stakeholders of timely, coordinated action.

(iv) There are no direct coastal sailings between ports of India and Bangladesh.

(v) Inland waterway operation likewise is not in use owing to ageing flotilla, shallow draught, restrictions on night navigation on large stretches of waterways.

(vi) Through rail transit across the Jamuna bridge is not feasible on account of axle load limitation for IR wagons.

(vii) Movement of ISO containers is permissible on the Jamuna bridge – for through transit of containerized cargo to reach the outskirts of Dhaka – on the other side of the bridge.

(viii) Container traffic originating in northern India for Bangladesh is currently routed via Mumbai-Singapore-Chittagong-Dhaka. If moved on all rail route over the Bangabandhu Setu, it will save at least on-third of the transit time, and more than half the haulage and handling costs.

(ix) There are proposals that the UN Road Transport Protocol TIR (*Transports Internationaux Routiers*) Convention, if adopted, will immensely help. The TIR system, managed by Geneva-based UN affiliated agency, the International Road Transport Union (IRU), admits of truck-based trade, for example, from Western Europe all the way to the periphery of the former Soviet Union. The system now covers over 80 countries worldwide. The system operates by issue of a document – TIR Carnet; it eliminates border checks and clearance of goods. A rapid screening of TIR Carnet and the TIR seal at border crossings does away with any need for detailed document and goods inspection. Due customs declarations and inspections are done at inland customs stations at the respective originating and destination locations.

India-Nepal: A similar AITD study of India-Nepal cross-border trade has highlighted similar deficiencies and suggested remedial measures.:

Figure 4.16: Nepal

Nepal has a 51 km long narrow gauge railway, Janakpur Railway, in operation since 1937 between Jaynagar (India) to Bijalpura (Mahottari, Nepal). This stretch was constructed for transporting logs and timber to India from Bijalpura forest. After the stock of logs and timber exhausted, the railway was converted for passenger and cargo services. At present, train services operate only on a 29 km stretch from Jaynagar to Janakpur, following the damage to one of the bridges by floods in 2005.

The ICD at Birgunj in Nepal is connected to the Indian Railways (IR) network extending from Raxaul by a 5.4 km broad gauge rail link completed in March 2001. The metre gauge rail network on the Indian side of the international border is being converted to broad gauge. Some sections have already been converted. With this conversion, the Nepalese dry ports at Bhairahawa, Biratnagar and Kakarbitta would be close to the broad gauge rail network.

Preliminary engineering-cum-traffic surveys for extending IR network into Nepal at five locations are at various stages of finalization. The links are (i) Jogbani to Biratnagar, (ii) Nautanwa to Bhairahawa, (iii)

Nepalgunj road to Nepalgunj, (iv) New Jalpaiguri to Kakarbitta, and (v) Jaynagar to Bardibas. Some of the links are short extensions, which would serve the Nepalese ICDs at Bhairahawa and Biratnagar.

A feasibility study for linking Birgunj with Kathmandu through a broad gauge rail line has been completed. The 160 km rail link would be much shorter than the existing road link of 284 km. The draft report is under consideration of the Government of Nepal.

The principal mode of transit transport between Nepal and India is road. The only border point in Nepal with China is by road through Kodari, 110 km northeast of Kathmandu. Nepal may well become an important transit country between India and China with the extension of the Asian Highway, route AH42, to Lhasa.

A 3.65-km road link has also been built connecting the Birgunj ICD to the main Kathmandu road. Since 1976, Chittagong and Mongla ports in Bangladesh have also been used for routing Nepal's third country trade.

Basic multimodal infrastructure by way of an ICD each at Birgunj, Bhairawah, Biratnagar, and Kakarbitta has been in place. India and Nepal have signed a separate agreement for the transit route between Nepal (Kakarbitta) and Bangladesh. India has also provided Nepal a rail route through Radhikapur for its trade with Bangladesh and for its overseas trade via Bangladesh. A bilateral Rail Services Agreement was signed in 2004 for transportation of containers between India and Nepal by rail from the ports of Kolkata/Haldia to ICD-Birgunj.

The flagship/ICD at Birgunj (dry port at Sirseya operational since July 2004) is yet to yield optimal gains. No doubt, rail transport of containers from Kolkata port to Birgunj has extended substantial savings in freight cost:

Table 4.9: Freight Charges: Kolkata-Birgunj: Rs/TEU

	By Rail	**By Road**	
Line haul cost	Up to 24t	Up to 18t	Up to 24t
	Rs. 17,000	Rs. 21,600	Rs. 28,800
Total cost	Rs. 27,000	Rs. 41,000	Rs. 48,000

Source: Asian Institute of Transport Development

Time taken for a box to reach ICD-Birgunj by rail after its arrival at Kolkata port averages 12.6 days vs 10.5 days by road. Actual rail transit from Kolkata to Birgunj is less than 3 days vs 4 days by road. Besides, there are attendant problems that transit on roads faces at checkpoints. Roads, especially in the Bihar belt, are of poor quality; inter-state checkpoints involve serious detention; vehicles are often overloaded. Security considerations are no less important.

Dwell time at port for rail containers is high: there is no through bill of lading; containers move as a fresh booking export; shipping lines continue to operate from Kolkata port, with no offices at ICD in Birgunj; customs observe restricted working hours and despatches await train load offering. There is no legislative provision for compensation claims in accordance with international practices and requirements, acceptable to carriers and banks.

IT/EDI connectivity will help timely, coordinated action, and help save time, cost, and hassles. Practices and procedures have ample scope for simplification and rationalization: At Raxaul-Birgunj interchange point, as many as 26 documents are used, with a total of 96 copies, authenticated by 338 signatures.

India-Pakistan

Table 4.10: Pakistan Railway

Network	**Unit**	**2004-2005**	**2005-2006**
Route	Km	7,791	7,791
Track	Km	11,515	11,515
Volume of Traffic			
Passengers carried	million	78.18	81.43
Passengers km	million	24,237.80	25,621.23
Freight carried: Tonne	million	6.41	6.03
Tonne km	million	5,013.54	5,906.85
Employment			
Persons employed	No	86.807	86,096
Finances			
Gross earnings: Rs.	million	17,827.47	18,043.64
Total ordinary working expenses: Rs.	million	14,158.74	15,868.28
Operating Ratio	Percent	79.42	87.93

Figure 4.17: Pakistan Railway

Indian Council for Research on International Economic Relations (ICRIER) has analysed India-Pakistan trade and underscored the need for rational multimodal linkages between India and Pakistan.

Table 4.11: India-Pakistan Trade Routes

Route	Mode	Distance km	Transport Cost US$/TEU
Delhi-Attari	Rail	478	325
Delhi-Attari	Rail-Road	479	338
Delhi-Mumbai-Karachi	Land-Sea	2,274	1010
Mumbai-Karachi	Sea	885	550
Mumbai-Dubai-Karachi	Sea	3,127	750-950
Mumbai-Karachi (switch B/L)	Sea	885	550

Source: ICRIER

Several important commercial centres in north-western India, like Amritsar, Jalandhar and Ambala are much nearer Karachi port than Mumbai or Kolkata ports. Containers for Punjab and Haryana received at Karachi port my economically and speedily be brought by rail instead of being handled at an Indian port and then carried by rail over much longer distances to these destinations. Likewise, cargo for Lahore, for example, received from the eastern seaboard at an Indian port can be land-bridged by rail through to Lahore.

Bhutan: A feasibility study for setting up a dry port (ICD) at Phuentsholing in Bhutan has been completed. The nearest IR station at Hashimara is about 15 km away from Phuentsholing. Feasibility studies for extending rail links from India to Bhutan at five locations are underway.

India: Indian Railway (IR) with 63,332 route kilometers of network, 1.41 million employees, 477 BTKMs 700 BPKMs. Railway operations account for 2.3E of the country's GDP directly.

Table 4.12: Indian Railways

	BG 81676 mm)		**MG (1000 mm)**		**NG 762/610 mm**		**Total**
Route km	77%	48,574	19%	11,834	45	2,924	63,332
Track km	83%	91,274	14%	15,236	3%	3,298	109,808
28% of the total route km electrified							
Number of bridges	***Important***		***Major***		***Minor***		Total
	637		10,453		116,678		12,768
Number of level crossings	***Manned (49%)***		***Unmanned (51%)***				***Total***
	16,600		18,297				34,132
Total land area (hectare)			431,000 (vacant 45,000)				
Number of zones, divisions, stations	***Zones***	***Divisions***	***Stations***	***PUs***	***Other Units***		***PSUs***
	16	67	6,974	7	5		12
Number of Locomotives	***Steam***		***Diesel***		***Electric***		***Total***
	44		4,793		3,188		8,025
Number of coaches and wagons	***Coaching vehicles***				***Wagons***		
	50,080				207,176		
Number of passenger trains run daily	***BG***		***MG***		***NG***		***Total***
	7,910		652		145		8,707

Table 4.13: Indian Railways: Performance: 2005-06

Route km	63,211 **
Track km	108,486 **
Freight traffic	
Originating loading	668 million tonne *
Freight output	441 billion net tonne km *
Passenger traffic	
No. of passengers	5,886 million *
Passenger km	620 billion *
Gross traffic receipts	Rs. 599,780 million *
Total working expenses employees	Rs. 503,970 million *

** Provisional* *** As on 31 March 2004*

India's Management of Interchange Points: A Land Port Authority of India is proposed to be set up for overseeing construction, management and maintenance of integrated check posts (ICPs) on borders. Government of India has identified 13 entry points on the border with Nepal, Bangladesh and Pakistan to be set up at an estimated cost of Rs. 734 crore (RITES).

Table 4.14: Integrated Checkposts (ICPs)

		Border
Phase I: 4 ICPs at estimated cost: Rs. 342 crore		
1	Petrapole (WB)	Indo-Bangladesh
2	Morch (Manipur)	India-Myanmar
3	Raxaul (Bihar)	Indo-Nepal
4	Wagah (Punjab)	Indo-Pak
Phase II: 9 ICPs at estimated cost: Rs. 392 crore		
1	Hili (WB)	India-Bangladesh
2	Chandrabangha (WB)	India-Bangladesh
3	Sutarkhandi (Assam)	India-Bangladesh
4	Dawki (Meghalaya)	India-Bangladesh
5	Akaura (Tripura)	India-Bangladesh
6	Kawarpuchiah (Mizoram)	India-Bangladesh
7	Jogbani (Bihar)	Indo-Nepal
8	Sunauli (UP)	Indo-Nepal
9	Rupaidiha/Nepalganj (UP)	Indo-Nepal

Critical Need

While essential wherewithal of adequate connectivity and capacity is developed and provided by different countries for smooth and efficient flow of goods and services, it is of paramount importance that the 'software' of facilities by way of simplified, rational procedures and documentation backed up with EDI is planned and created. The following disturbing details as an illustration provide a wake up call for a concerted facilitation strategy to be evolved.

Table 4.15: Transit Documentation and Procedures in Some Countries of the BIMSTEC Region

	India	Nepal	Bangladesh
Type of Documents	29	83	22
No. of Copies	118	102	116
No. of Signatures	256	113	55
Manpower required	22	11	7
Cost of Procedure	10% of the value of traded goods	NA	10% of the value of traded goods

Source: Asian Institute of Transport Development/The World Bank

There is unnecessary loading and unloading of vehicles at land border crossings.

Table 4.16: Transport and Transit: Performance Indicators

Routes	Time Delays (in days)			Costs (US $/ton)		
	Transit	Border Crossing	Transfer	Transit	Border Crossing	Transfer
Kolkata-Petrapole-Benapole-Dhaka (Road)	1.5 - 2	0.5 – 2	1 – 2	64	2 – 3	7 – 8
Kathmandu-Biratnagar-Kolkata (Road)	5 – 7	1.5 – 2	1 – 2	10 - 40	1.5 – 3	7 – 8
Kathmandu-Birganj-Kolkata-Haldia (Multimode)	5 – 7	3 – 7	NA	20 - 40	7.5 - 10	7 - 8
Patna-Hili-J.Bridge-Dhaka- Chittagong (Road)	10 - 15	1 – 3	0.5 – 2	8 - 10	5 – 10	7 - 8
Guwahati-Shillong-Dawki- Tamabil-Chittagong (Road)	6 – 10	0.5 – 2	0.5 - 2	NA	NA	NA

Source: Asian Institute of Transport Development

A special feature of this region is the long coastline skirting the Indian Ocean. A geopolitical extension of this feature visualizes BIMSTEC emerging as a natural bridge between South Asia and Southeast Asia. In most of the BIMSTEC member countries, the potential of infrastructural services has not been fully exploited. The density of the inland container depots (ICDs) is low, leading to stuffing and de-stuffing of containers at ports. To remedy the situation, there is need to adopt integrated approach, encompassing legislative measures, regulatory framework and human resource development. The member countries need to develop compatible technologies, harmonized documentary procedures, and customs regulations as also legislation for multimodal transport operator's liability.

BIMSTEC

All BIMSTEC countries, except Thailand were under colonial rule for long and, as such, had their focus on transport in a typically colonial pattern, to and from seaports, for trade linkages with the ruling nation. These economies thus had only underdeveloped infrastructure with large parts of the territory and people in the hinterland having been left out of the mainstream. The post-independence developments in several cases further exacerbated the situation. Emergence of independent states, for example, in South Asia, saw them increasingly isolated from one another: distance between Dhaka and Lahore, for example, increased from 2,300 km to about 7,200 km.

In the post-independence period, with the redrawing of political boundaries in the case of some of the countries, border-crossing issues emerged, historical land routes languished, or were closed. Traditional inter-country trade along land routes often gets diverted to ocean transport, involving circuitous routes and multiple handling.

Inadequate infrastructural wherewithal between the BIMSTEC countries hinders the development of reliable and efficient sea-cum-land transport to facilitate trade. In many cases, there are impediments by way of institutional, operational, and infrastructural bottlenecks which prevent smooth and unhindered movement of cargo. These problems result in delays, inefficiencies and sub-optimal utilisation of assets, leading to high transaction costs.

The Economic Ministerial Retreat held at Bangkok in August 1998 endorsed the ALTID (Asian Land Transport Infrastructure Development) project, and agreed to work for early operationalising of the BIMSTEC component of the TAR and AH southern corridors. The second BIMSTEC

Ministerial Meeting held at Dhaka in December 1998 recognised the importance of speedy implementation of these important AH and TAR components.

UNESCAP with the active participation of its member countries has evolved a blue-print for the Asian Highway (AH) network. The table below shows its identified routes relevant to BIMSTEC:

Figure 4.17: AH Routes for BIMSTEC Countries

Country	AH Route	Nomenclature	Length (km)
Bangladesh	Benapole – Dhaka – Sylhet – Tamabil	-A-1	553
India	Attari - Amritsar - Delhi - Kanpur - Calcutta - Petrapole Dawki - Shillong - Kohima - Imphal –Moreh	-A-1	2,799
Myanmar	Tamu - Yangoon – Myawadi	-A-1	1,622
Sri Lanka	Talai Mannar – Colombo – Matara	-A-43	559
Thailand	Mae Sot - Bangkok – Aranyaprathet	-A-1	698

Rail Linkages: AH network, with its feeder roads, would also provide access to rural and other economically disadvantaged areas, and would gradually open up opportunities of new markets, new industries and new jobs. Construction of the Thai-Myanmar Friendship Bridge on the AH route A1, completed by Thailand has provided for an important missing link. Similarly, the Jamuna (Bangabandhu) bridge in Bangladesh has provided an important link. Construction of a long stretch of road by India within Myanmar has restored the cross-border link between the two countries.

Another purpose is to connect the hinterland regions of the countries in the corridor with their nearest seaports. Based on these, two types of railway routes – international and subregional – have been identified:

Figure 4.18: Rail Routes of BIMSTEC Countries

Country	TAR Route	Nomenclature	Length (km)
Bangladesh	Shahbazpur - Tongi - Joydebpur - Jamtoil - Darsana	Bn – 1	522
India	Gede - Kolkota - Mughalsarai - Delhi - Amritsar - Attari	In – 1	1,380
Myanmar	Tamu - Kalay - Mandalay - Bogo - Thanbyuzayat Thanbyuzayat - Three Pagoda Pass Thanbyuzayat - Dawei – Bongty	My – 1 My - 1a My - 1b	811 110 345
Sri Lanka	Matara - Colombo Medawachchiya - Telaimannar Pier	Sl - 1 Sl – 2	159 337
Thailand	Three Pagoda Pass - Namtok Bongty - Nam Tok	Th - 1a Th - 1b	153 40

The commissioning of a multi-purpose bridge over the Jamuna, with a provision for a dual gauge rail track, has significantly improved through connectivity of rail network. Bangladesh Railways (BR) have recently undertaken a gauge rationalisation project, essentially providing dual gauge (BG&MG) on certain sections, in order to provide through links for the rail network on either side of the bridge. These are major initiatives that would enable through journey from Dhaka to Kolkata without transshipment or ferry-crossing enroute. Similarly, BR has plans to provide dual gauge track between Dhaka and Akhaura – a station on the eastern border with India.

BIMSTEC member countries could cooperate in the upgradation of the railway systems, which have become run down in some countries due to lack of investment and technological obsolescence. Presently, there are innumerable non-physical barriers to the movement of people and goods. A recent study has shown that the documentation and procedures are restrictive, complicated and time-consuming, and greatly add to the transaction costs.

Inland Waterways

The Ganga-Brahmaputra-Meghna basin is one of the world's largest water systems. An efficient inland water transport system would enhance the efficacy of inter-country movement and trade. But these traditional modes are in various stages of neglect and decay. Rivers are silted, country crafts overladen and unsafe, motorized bulk transport generally outmoded. Ganga, which was navigable up to its upper reaches, is no longer so. The potential for linking the inaccessible north-east of India through the riverine route is yet to be achieved. Irrawaddy was known to be navigable far into the upper reaches. There is considerable scope for exchange of information and expertise in this area among the countries of this sub-region for restoring and redeveloping this important mode.

For India, National Waterway I on the Ganga-Bhagirathi-Hooghly rivers, with a 1,620 km navigable stretch between Allahabad and Haldia, has been identified for navigation improvements. Addition of two new routes to the national waterways I and II on the Brahmaputra, with a 891 km navigable stretch between Sadiya and Dhubri, and of a 205 km stretch on the West Canal between Kottapuram and Kollam along with the Udyogmandal and Champakara canals for National Waterway III has been proposed. Upgradation of the Chertala – Rajahmundry river system (Andhra Pradesh) as well as the Zuari and mandavi rivers in Goa has been sought. Zuari and Mandavi are among the busiest routes in Goa, carrying as they do some 30,000t of iron ore through the 40 km Mandavi every day and about 35,000t of cargo through Zuari – by barges.

The restoration of old transport links by rail, road and waterways would involve minimal investment and yet result in maximum benefits in the shortest time-frame. This would also make the transit smooth and efficient and would be an effective instrument for alleviation of poverty in the region.

Mekong-Ganga Cooperation

The leading area of cooperation has been transport linkages, e.g., India-Myanmar-Thailand trilateral highway project.

Chapter 5

Dry Ports: Sharing Benefits

Inland Locations

It is generally observed that the coastal areas of the region have benefited most while development levels have often been declining in areas away from the coastline, often rendering inland locations less competitive. Historically, economic growth and trade in countries has centred around seaports. The coastal areas are not only richer than inland sites but have also seen much faster growth too, exacerbating spatial inequalities in national economies. An emphasis on the development of integrated transport, communication and energy networks, which provide improved access to inland areas, helps spread the benefits of economic growth.

Probably the most important factor contributing to massive productivity and cost savings in transport has been the advent of the marine container and the containership. To achieve the significant productivity gains from the container and changes in shipping technology, there has been need for complementary large-scale investments in seaports.

Spatial concentration of economic activities, particularly in mega cities, has been a key feature of rapid development in Asia. It has been mainly coastal regions of Asia and the Pacific that have benefited from the current phase of globalization by becoming important nodes in the regional production networks. In order to economically move the inland sites linked to the coastal networks, ICDs (inland container depots) and CFSs (container freight stations) have been promoted.

Transport infrastructure development has been a major driver of far-reaching qualitative changes in the internationalisation of production. In fact, the impressive growth of shipping in Asia is in a large part due to the formation of regional production networks (RPNs). In Asia, the process of internationalisation of production gathered momentum in the mid-1980s, when a number of countries of the region started lowering their barriers to trade and investment. The impact of these policies is often referred to as the ‘East Asian Miracle’. FDI (Foreign direct investment) inflows increased twelvefold and East Asian exports increased fivefold between 1985 and the year of ‘East Asian Crisis’, i.e., 1997.

The development of growth centres away from coastal areas implies promotion of dry ports as one of the several important instruments, designated inland locations for the consolidation and distribution of goods with functions analogous to those of a seaport. Completing necessary documentation and procedures at these facilities helps reduce congestion and delays at border crossings and ports, in turn, reducing transaction costs for exporters and importers. This is particularly important for landlocked countries.

The indicative norm suggested by ESCAP Secretariat for one dry port per million TEU handled at the country’s seaports may, in effect, vary in different situations. In Europe, one dry port is generally observed for each city with annual output exceeding $ 2.5 billion. Dry ports, as a rule, potentially nurture manufacturing and service clusters, for example, special economic zones, export processing zones, etc. A dry port is generally located close to an existing or potential production or consumption centre. The number of dry ports would depend on geography as well as diversity and extent of economic activity. The size of ICDs and CFSs would likewise vary according to the industrial production and commercial transactions in the area served by the facility. The average size of dry ports in European Union is seen to vary from a yearly throughput ranging from 40,000 to 1.9 million TEU, their land area similarly ranging between 30 and 200 hectares, the number of enterprises between 25 and 100, and the number of employees between 7,000 and 37,000.

The dry ports make tangible new contribution to growth, both directly, via reduced transaction costs and, indirectly, through productivity gains as producers organize their manufacturing and distribution more efficiently. Functioning as growth impulses, dry ports could potentially act as ‘growth poles’, similar to seaports. Additionally, a network of dry ports as load centres also has the potential to promote traffic on railways, with significant environmental benefits and energy gains.

An ICD or a CFS, located away from a seaport, provides facilities for cross-border trade to a shipper in hinterland, with linkages to gateway ports. It is a common user facility, for handling and temporary storage of import/export, laden/empty containers, for clearance by Customs for home consumption, warehousing, onward transit, or export. It is a transit facility, which offers services for containerisation of break-bulk cargo, and *vice-versa*. It could be served by rail and/or road transport.

A CFS is generally an off-dock facility close to the servicing port, helping decongest port by shifting cargo and customs-related activities. It is also set up inland for linkage to a regional rail-linked ICD and to gateway port(s) by road. Those near the ports serve dual purpose: as an extended arm of port, and for handling export-import cargo for port towns which themselves are important industrial and commercial hubs.

Dry port/ ICD/CFS/Distripark/Freight village may thus be viewed in generic terms, implying facilities in close vicinity of production/ consumption centres for:

- speedy evacuation of import/export containers from/to a gateway port
- unitisation, stuffing/destuffing of cargo, and mandatory clearances
- warehousing for safety and security of cargo during in-transit storage
- storage, cleaning, repairs and transport of empty containers
- integrated logistics and value-added services.

A dry port or an ICD is the well known facility which provides comprehensive services to foreign trade. Whereas an ICD is restricted to processing container traffic, a dry port has facilities which allows it to process all forms of cargo. A third type of modal interchange facility, the freight village, is gaining increasing acceptance in Europe. It provides comprehensive services related to customs clearance, modal transfer, container stuffing and de-stuffing, and container and cargo storage, but in addition provides added value logistics services, such as inventory management, high density warehousing, and packaging on behalf of manufacturing, retailing and wholesaling customers.

Republic of Korea has seven dry ports already built, or being planned. Yangsan ICD, built in 2000 close to Busan Port is operating at its annual capacity of 1.4 million TEU. Located on the Busan-Seoul road and rail corridor, the ICD handles around 45% of Seoul-bound container traffic. The Republic of Korea is planning to establish additional dry ports in the regions of Honam, Youngnam, and elsewhere in the central area, consistent with the objective to make the country an international logistics hub of North-East Asia.

In Thailand, the largest facility is the Lat Krabang ICD developed in conjunction with the deep seaport at Laem Chabang. The site, close to the Lat Krabang Industrial Estate, approximately 30 km east of Bangkok and 120 km from Laem Chabang Port, the dry port was completed by the State Railway of Thailand in 1995. Its container throughput now exceeds one million TEU per year. Lat Krabang ICD also provides international transport and connects to the neighbouring countries, including the Lao People's Democratic Republic and Malaysia.

Indian Experience

In India too, historically, industry grew largely around ports, old port cities emerging as mega metros. India's transport system is estimated to handle 870 btkm (freight), and 2,450 bpkm (passenger) annually. The road sector commands about 80% share of land transport demand. It has witnessed a 12% annual growth in freight demand, and 8% in passenger demand. While the overall transport sector contributes 6.4% of the country's GDP, the road sector's share is 4.5%.

Although endowed with about 14,500 km of rivers and canal networks navigable at least by country boats, inland water transport is rather meagre. Three major waterways – the Ganga, Brahmaputra and West Coast Canal, aggregating 2,716 km, have been declared National Waterways. Their development and maintenance is the responsibility of the National Waterways Authority of India. Other waterways are managed by the respective state governments. Only about 5,200 km of major rivers and 485 km of canals are suitable for mechanized crafts. The sub-sector has an annual traffic throughput of 1.5 billion tonne km.

Inland Waterways Authority of India (IWAI) has formed two joint venture companies with SKS Ship Ltd. for cargo transportation. The two companies, Royal Logistics and Sunderban Waterways, are planned to be formed for carrying on the business of construction and management of small ships to be operated on the 1,620 km National Waterway No.1, river chain between Haldia and Allahabad, and the 891 km Dhubri-Sadiya National Waterway No.2. The routes under this project include river chain between Kolkata and Pandu and between Kolkata and Mongla in Bangladesh. The capacity of the vessels will be up to 2,000 tonne. These vessels can carry 97 TEU besides oil products and other break-bulk items. The total cost for building vessels for the project is estimated at Rs. 1,000 million, equivalent to US$ 23 million).

Hinterland potential for export-import container traffic handled at ports in India is estimated to be at least 70%; actual movement of full containers from and to hinterland locations is currently less than 35%. Rail-borne container movement between ICDs and gateway ports currently is in the 28% range; an optimal ratio would be about 50%.

Container Corporation of India (CONCOR) Leads: The task of consolidation and transfer of cargo from the production centres to the gateway ports and *vice-versa* would necessitate an efficient, fast and reliable transportation system by rail, road and inland waterways. CONCOR has played a pioneering role in India for ushering in intermodal containerisation of export-import trade. CONCOR has taken initiative in developing a network of ICDs and CFSs, which, together with those, promoted and operated by other entrepreneurs and agencies, constitute the basic wherewithal, in fact, the most vital infrastructure that has provided a unique strength and thrust to intermodal transport in the country.

Figure 5.1: ICDs & CFSs Set Up by CONCOR

Figure 5.2: ICD, Tughlakabad: A View

The following table shows the number of dry ports set up by CONCOR and others in different regions:

Table 5.1: Details of Selected ICDs in India's North-West Region

ICD	Total area	Paved area: sq.m.	Type of paving	Un-paved area: sq.m.	Container traffic dealt with	No. of rail tracks	Line length: m.	Warehouse Capacity	
								No.	sq.m.
Dadri	245.73 acre or 110 hectare	16,000	CC/DBM	180,000	Exim	4	719 719 780 825	1	9,000
Dhandari Kalan (Ludhiana)	34.79 acre	115,104	CC	28,776	Exim	2	686 each	2	2,125 & 2,175
Agra	53,000 sq.mt	2,800	Bitumen	25,000	Combined	1	646	1	2,000
Babarpur (Panipat)	8 acre	5,300	Concrete WBM	19,000	Exim	-	-	1	1,200
Ballabhgarh	2.86 hectare	15,000	CC	370	Domestic	2	300 350	-	-
Juhi (Kanpur)	87,925 sq.mt	32,900	Bitumen	57,100	Combined	1	700	1	2,000
Malanpur (Gwalior)	15,600 sq.mt	10,000	Asphalt	5,600	Exim	1	645	1	2,000
Moradabad	70,000 sq.mt	41,600	Premixed concrete	-	Combined	1	765	3	1,400
Tughlakabad	50 hectare	29,500	CC Black Top paving	31,500	Exim	4	686 each	3	1,000 6,000 5,000
Sabarmati	128,428 sq.mt	63,597	CC	8,250	Exim	2	470 each	3	3,000
Vadodara	20,000 sq.mt	16,720	CC	-	Combined	1	620	1	200
Jodhpur (Bhagat ki Kothi)	40,000 sq.mt	1,000	Asphalt	-	Combined	1	640	1	1,000
Rewari	32 acre	26,640	Bitumen	12,440	Combined	2	686 each	-*	-*
Kanakpura (Jaipur)	58,145 sq mt	17,727	CC WBM Kutcha compact	7,625	Combined	1	646	1	600

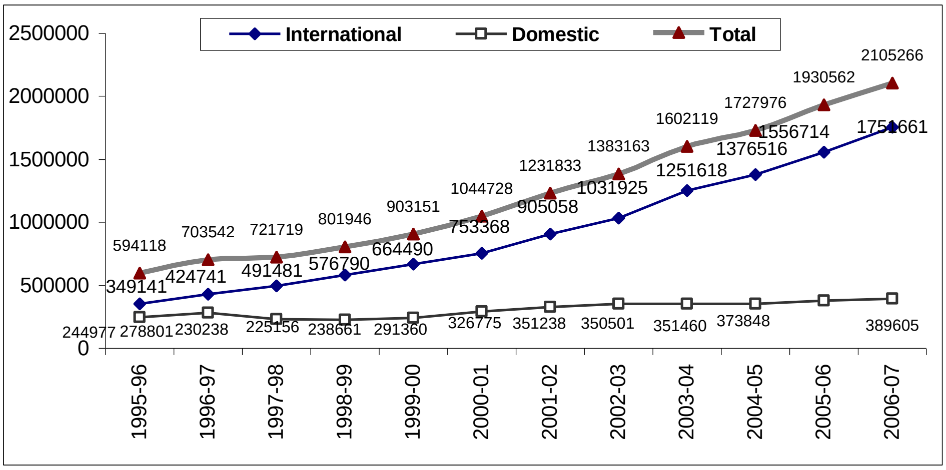
* Warehousing and 75 sqm. office space at Rewari provided by Haryana Warehousing Corporation (HSWC)

Abbreviations used :
Exim : Export-Import
Combined : Exim & Domestic
CC : Cement Concrete
DBM : Dense Bituminous Macadam
WBM : Water Bound Macadam

Figure 5.3: Warehouse at ICD, Dadri

The sprawling ICD at Dadri is equipped with large state-of-the-art warehousing complex

Figure 5.4: CONCOR Throughput: TEU



Source: CONCOR

Top ten ICDs accounted for 72% of CONCOR's overall intermodal traffic in 2005-06.

Table 5.2: CONCOR: 2005-06: TEU

	ICD Throughput: EXIM		
	Export	**Import**	**Total**
Tughlakabad	184,894	220,951	405,845
Dhandari Kalan	56,775	63,914	120,689
Dadri	40,827	55,536	96,363
Sabarmati	50,261	45,852	96,113
Dronagiri Node	36,396	58,737	95,133
Whitefield	30,388	37,330	67,718
New Mulund	33,882	33,797	67,679
Tondiarpet	26,394	40,089	66,483
Milavittan (Tuticorin)	31,083	25,540	56,623
Nagpur	25,389	27,895	53,284
Total	516,289	609,641	1125,930
Total, including others	**731,077**	**825,637**	**1,556,714**

Source: CONCOR

An accelerated growth of 15% in EXIM container volumes is projected to take place at CAGR during the period 2006 to 2015.

Table 5.3: Region-wise Growth Perspective

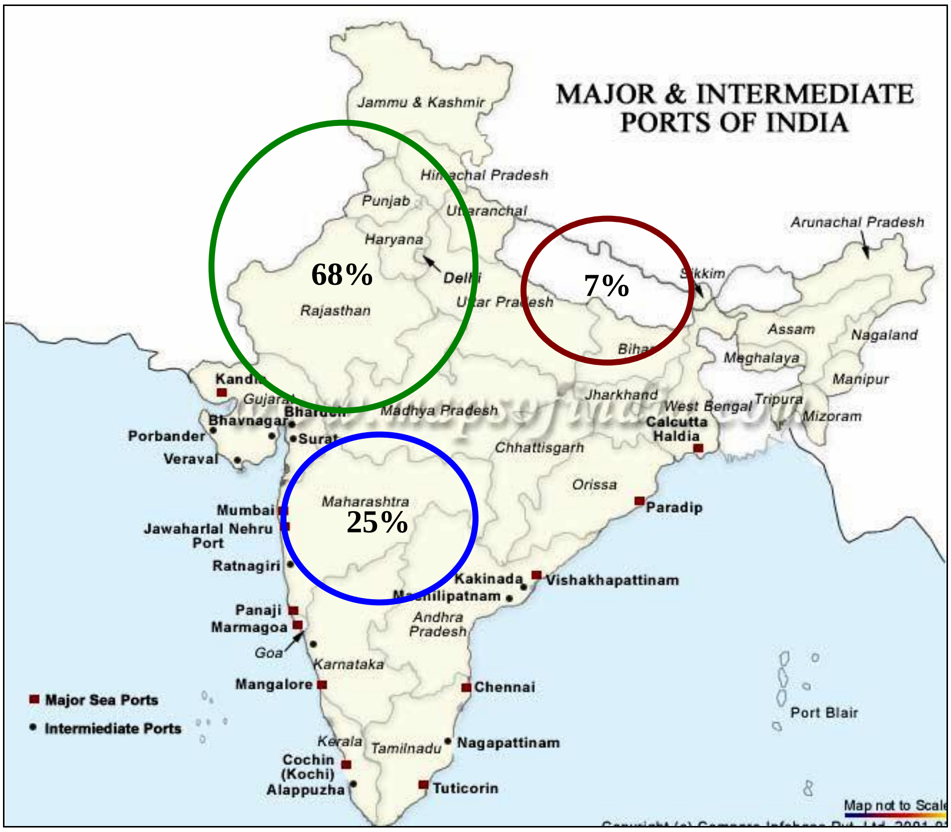
	1995-99	**2000-04**	**2004-10**	**2010-15**
Western Ports	12%	18%	11%	15%
Southern Ports	10%	14%	16%	17%
Eastern Ports	8%	11%	16%	17%
All India	11%	16%	14%	15%

Source: CONCOR

Northern and Western Regions Lead: During 2005, the western and northwestern hinterland together accounted for a predominant share of export-import container cargo, to the extent of 68% of the total container traffic handled in the country; the southern region has a share of 25%; the eastern region accounts for just about 7% of all such traffic handled at the country's 'major' and 'intermediate' ports.

The northern hinterland itself commands 35% share of the country's total export-import container streams. It is also the fastest growing region in this respect. In fact, the western and northwestern region has registered an annual average of 19% growth during the previous three years, while the southern region has shown a growth of 15%, and the eastern region 7%. The northern hinterland itself has grown in excess of 20% per annum during the previous three-year period.

Figure 5.5: Regional Container Trade in India



Source:

Potential for Rail Sector: India needs to substantially increase the use of containers as well as of rail transportation for inland movement of containers. Over 50% of trucking hauls on the country's national highways are reported to be in excess of 500 km and 30% in excess of 1,000 km. A large proportion of this traffic should move by rail in containers. It calls for a concerted strategy to provide for adequate capacity on busy rail corridors as also at terminals for efficient intermodal business catering to both international and domestic requirements.

Concerted Strategy Called For: Efficient operation of transport modes and availability of requisite interface facilities is thus the necessary precondition for effective improvement of international trade and transit operations. Due attention needs to be paid to infrastructural development, not the least to the 'software' part of the development (trade facilitation, systems, procedures, documentation, liabilities, service concepts, professional liabilities, etc.).

There is need for augmenting the CFS/ICD facilities in the country to ensure smooth handling of cargo. Terminal operators try to benefit from integration of logistics by promoting the development of distriparks and ICDs, shipping companies offering complete logistics solutions, existing logistics players partnering with road/rail transporters for door-to-door services, and moving towards a framework which encourages integration with ICD operators. Ports and harbours cannot accommodate increased traffic of containerisable cargo and require ancillary facilities for:

- Speedy evacuation of import containers from the port for activities like unitisation, stuffing, destuffing and regulatory clearances to be undertaken;
- Warehousing to ensure speedy clearance and security of cargo during in-transit storage;
- Storage and transport of empty containers.

In India, the container traffic for the inland container depots has been steadily increasing over the years. However, the penetration levels are still low as compared to the container traffic handled at the ports. The position is not very much different from that of China.

According to the *China Port Industry Report*, 2005-06, its sea-rail combined transportation volume is less than 1% of the total port container throughput in China. Again, Prof. Bing-Liang Song of Shanghai Maritime University, in an essay on *Shanghai: a Newly and Rapidly Developing Hub Port*, provides a snapshot of modal split in landside transportation:

Table 5.4: Modal Split for Containers in China

Percentage

Port	Road	Rail	Inland Waterway
Shanghai[1]	92.72	0.00	7.28
Hong Kong[2]	32.52	2.29	65.19
Rotterdam[3]	15.00	6.00	79.00
Hamburg[4]	52.00	33.00	15.00

1. *Exported container cargoes from the hinterland to Shanghai port, 1997*
2. *Exported cargoes from Chinese mainland to Hong Kong port, 1996*

3&4. *All cargoes in 1996, inbound and outbound*

Source: Klink (1998)

Growing Container Trade: Rising disposable incomes, rising standards of living, changes in traditional patterns of consumption, and higher levels of saving are fuelling consumer goods trade and resultant container trade growth, and have become one of the major drivers for future growth of the container sector. Among the important factors contributing to this robust growth is the country's manufacturing industry.

India's share of world exports has been growing steadily. Export growth is aided by the ongoing transformation of the country's export mix with higher-value manufactured products, including high-tech, pharmaceuticals, engineering goods, automotive components, textiles and garments. India's containerisation is of the order of 70% of the total export cargo and about 40% of import cargo.

There is immense scope and potential, for containerisation to grow. Textile contributes about 18% of India's total exports; this share is expected to increase to 25% and more in the next five years in the wake of post-multifibre agreement. Engineering industry contributes more than 11% of total exports; this share is expected to rise to 15-18% by 2010. India's auto component exports rose by more than 33% in 2005-06 and are likely to maintain the tempo in the future. A.T. Kearney has estimated that India's retail industry will grow to a level of over $ 200 billion, recording a 30% CAGR over the next five years. With steady increase in value-added exports from the country, level of containerisation will substantially improve.

Connectivity Snags: Besides the deficiency of port infrastructure and its low productivity being a concern in container business in the country, inadequate road infrastructure and rail connectivity have been militating against its full development. An important bottleneck for container terminals has been the delay encountered in the evacuation of containers. The JNP complex, with 25% annual growth over the last 10 years, has been reeling under the stress of serious congestion and inadequate road and rail connectivity.

The landside infrastructure requirements, vital to the effective and efficient management of the Indian container shipping/multimodal sector, have been, over the years, characterized by less efficient and inadequate cargo carrying capacity in terms of both rail and road networks. This has been adversely affecting the development of true multimodal transport/logistics value chains, and has thus been depriving the Indian trade of the benefits of seamless flow of goods.

With containerization of India's export-import trade having grown at 14% CAGR during the period 1992-2005, there are serious deficiencies that have shown up. With the national economy recording an annual increase of over 8% in recent years, there is a clear need to expeditiously put in place additional wherewithal of container handling facilities at ports with appropriate linkages to hinterlands, develop efficient infrastructure on the east coast, where the share of container business has been a paltry 7-8%, substantially enhance the capacity of rail and road networks to and from major container handling ports, improve productivity and efficiency at ports, streamline procedures and regulations with optimal utilization of IT, and reduce rates and charges for different facilities through the logistics chain.

CONCOR hitherto has been the sole operator, transporting containers by rail between ports and the hinterland. Ministry of Railways have issued 15 licences to operators, mostly in the private sector, to build their own ICDs and own rail flat cars or collaborate with other ICD operators, for container train operation.

Trials have been successfully carried out for moving double-stack container trains on non-electrified rail corridors linking some of the 'non-major' ports like Pipavav and Mundra ports in western India and Jaipur. CONCOR has already started running such trains between Jaipur and Gujarat ports. This development has immense possibilities, and has the potential to change the economics and pattern of container transport in the country.

Now with the container handling terminals at ports being developed almost entirely in PPP mode, confidence has steadily built up that ports by themselves may not be much of an impediment. No doubt, ports need to cut down delays and costs. It is also essential that a couple of Indian ports first develop a critical mass instead of dissipating and diffusing the effort at many of them. What is required is to have an integrated development strategy for an efficient logistics output, involving ports, railways, roads, and other stakeholders. In view of the volumes and long distances, rail transport is a clear choice for at least 50% of the containers handled at Indian ports. Rail transport capacity enhancement is an urgent need. The proposed dedicated freight corridors for west-north and east-north will take a few years to materialize. Some viable interim solution appears a clear need. There has been a great expectation of the competitive participation by private sector aspirants in rail transport of containers, but they have to go a long way, developing inland terminals and procuring wagon fleet, while Railways need to innovatively augment their carrying capacity on the network.

Figure 5.6: Inaugural Double Stack Train on India's West Cost

In the context of an overwhelming share of container business originating from, and terminating in the National Capital Region around Delhi, and in adjoining states in the northern and northwestern parts of India, the greenfield 'intermediate' ports along the Gujarat coast – particularly Mundra and Pipavav – may indeed emerge as promising gateways, more so, because these ports are connected by rail to this region without overhead electric wires, which would allow double-stack container trains to operate in the immediate timeframe. In a rapidly evolving environment, new private sector ports like Dhamra on the east coast – between Kolkata and Paradip as also the port at Rewas near New Mumbai, hold a great potential and promise.

Section III:

Facilitation of Multimodal Transport Logistics

Chapter 6

Institutional Framework
Cross-border Impediments

For systematic development, efficient execution, and purposeful monitoring of multimodal logistics, basic institutional mechanisms need to be in place. In this context, as an example India has been well served by a few forward-looking institutions and practices. Information in respect of some of them is briefly given in the following paragraphs by way of illustration for adaptation in different countries of the region with appropriate changes as required.

Inter-Ministerial Committee

In response to a need for an empowered committee to facilitate the development and implementation of the multimodal infrastructure, an IMC (Inter-Ministerial Committee) has been set up for the appraisal and approval of applications for ICDs/CFSs. Ministry of Commerce and Industry, as the nodal agency, coordinates with the Ministry of Shipping, Roads and Highways, Ministry of Railways, and Ministry of Finance for the purpose. It has been so structured that it solves problems and carries out coordination – intra-government and inter-departmental, inter-disciplinary and inter-agency.

IMC is required, in fact, to address itself to the problems of land laws, tariffs, concessions, security, involving other major departments, particularly those dealing with ports, railways, roads, shipping lines, airports, and customs. It also deals with the issues pertaining to procedures, documentation and IT (information technology). Adequate and timely connectivity of rail, road, land and air is a crucial element. For a truly multimodal logistics development, all relevant modes need to supplement each other, including facilities for containers to move by sea, ULDs (unit load devices) by air, road, rail, inland waterways, etc.

A feasibility study precedes the proposal for an ICD/CFS. A copy of the study accompanies the application which, *inter alia*, requires the facility to be economically viable for management, and attractive to users, to have a minimum critical mass, indicative norms for which may be assumed as, for ICD: 800 TEU/month, and for CFS: 150 TEU/month. IMC approval for ICDs/CFSs implies provision of all trade-related facilities; single-window for mandatory clearances, payments, and incentives certification, and presence of Customs, banks, shipping lines and agents, NVOCCs (non-vessel owning common carriers), CHAs (customs house agents), and transport operators.

A constructive way of promoting MT (multimodal transport) is to monitor world-wide developments in transport technologies, both hardware and software. This would avoid 'reinventing the wheel' and making infant-industry mistakes, by 'leap-frogging' into recognised transport choices regarding transport infrastructure, technologies and policies.

Legal and Liability Aspects

As a first attempt to clarify the complicated liability issues in international transport, the *United Nations Convention on International Multimodal Transport of Goods,* the MTO (Multimodal Transport Operator) convention, was developed and initially expressed under the UNCTAD in Geneva in 1980. This general agreement concerning international multimodal transport was signed by 71 States. The MTO convention itself will not come into force, unless ratified by at least 30 States. So far, only ten States are said to have ratified: Burundi, Chile, Georgia, Lebanon, Malawi, Mexico, Morocco, Rwanda, Senegal, Zambia.

Since the MTO convention did not serve the purpose, a substitute emerged in the form of the UNCTAD/ICC Model Rules. A note at Annexure 'B' incorporates the salient features of these Rules. These Rules do not have the status of mandatory laws, but may be incorporated into a (private) contract. They are based on the so-called 'network principle'. This means, provided that the unimodal stage of the transport where the loss occurred can be established, the liability limit that applies is that which corresponds to the national or international law that would have been applied for that stage under a unimodal contract. Since the publication of these Rules, they have been adopted formally in standard documents such as FIATA FBL, 1992 and BIMCO's Multidoc 95. Since the FIATA FBL incorporates some of the MTO concepts, which is the most commonly accepted international multimodal transport document, these Rules have now gained wide acceptance.

The FIATA Multimodal Transport Bill of Lading (FBL) is a carrier-type transport document set up by FIATA for the use by freight forwarders acting as MTO. The FBL can also be issued as a marine bill of lading. The document is negotiable unless marked “non-negotiable”. It has been deemed by the International Chamber of Commerce (ICC) to be in conformity with the UNCTAD/ICC Rules for Multimodal Transport Documents. A freight forwarder acting as MTO or marine carrier issuing a FBL is responsible for the performance of transport. The freight forwarder does not only assume responsibility for delivery of the goods at destination, but also for all carriers and third parties engaged by him for the performance of the entire transport.

By issuing a FBL, the freight forwarder accepts a basic liability limit of SDR 666.67 per package or unit, or SDR 2 per kilogramme of gross weight of the goods lost or damaged, whichever is the higher (Art. 8.3 of the FBL conditions), or, if a multimodal transport does not include carriage of goods by sea or inland waterways, a basic liability limit of SDR 8.33 per gross weight (Art. 8.5 of the FBL conditions). When loss of or damage to the goods can be attributed to a particular stage of transport in a multimodal transport operation, the freight forwarder’s liability is limited according to the mandatory national or international law applicable to this stage of transport (Art. 8,6 a of the FBL conditions).

For the aviation sector, the Montreal Convention has come into force, and 68 States have ratified or acceded to it. It represents an important step towards the creation of an internationally uniform legal framework for air transport, although the Convention applies only in the case of transportation between the various Contracting States.

In relation to carriage of goods by road, the Convention on the Contract for the International Carriage of Goods by Road 1956 (as amended in 1978), is in force in the UN–ECE region, as well as in some other Contracting States, including some developing countries.

In relation to sea carriage, there are currently three international conventions in force, viz., the so-called Hague Rules of 1924, the Hague

Rules as amended by the Visby Protocol 1968 (Hague-Visby Rules), and the Hamburg Rules, 1978.

The United Nations Convention on the Carriage of Goods by Sea, 1978 (Hamburg), known as the 'Hamburg Rules', was adopted on 31 March 1978 by a diplomatic conference convened by the General Assembly of the United Nations at Hamburg. The Convention is based on a draft prepared by UNCITRAL. The central focus of the convention is the liability of a carrier for loss and damage to the goods and for delay in delivery. The Convention came into force on 1 November 1992.

For many years, a large proportion of the Carriage of Goods by Sea has been governed by a legal regime centred around the International Convention relating to the Unification of Certain Rules relating to Bills of Lading adopted on 25 August 1924 at Brussels, otherwise known as the 'Hague Rules'. According to the provisions of these Rules, the carrier is liable for loss or damage resulting from his failure to exercise due diligence to make the ship seaworthy, to properly man, equip and supply the ship or make its storage areas fit and safe for the carriage of goods. The Hague Rules contain a long list of circumstances that exempt the carrier from this liability. The Hague Rules have been amended twice since their adoption.

Which, if any, of these different international legal regimes applies in respect of a given international transaction depends on a number of factors, including the question of whether transportation is to or from a Contracting State, and the choice of rules applicable in the jurisdiction where a dispute may be litigated or arbitrated.

In relation to multimodal transportation, no uniform liability regime is in force. Liability continues to be governed by a complex array of diverse international conventions designed for unimodal transportation, regional agreements, national laws, and standard term contracts. In the absence of a uniform international regime of liability in multimodal transport, it is covered by a jigsaw of international rules and conventions. The Hague, Hague-Visby and Hamburg Rules cover maritime transport; the Convention on the Contract for the International Carriage of Goods by Road and the Convention concerning International Carriage by Rail, in some countries, cover international road and rail transport respectively;

while the Warsaw Convention covers global air transport. When a loss cannot be localized and blame attributed, liability often depends on national laws or contractual agreements.

A UNCITRAL (United Nations Commission on International Trade Law) Working Group on Transport Law began deliberations in 2002 towards the development of a new international legal instrument on transport law. The proposed draft instrument is primarily intended to cover sea transport, but would also cover all multimodal contracts that include a sea-leg.

Early on, Lloyds was prepared to insure containers, but backed off when claims proved to be too high. So, in 1971, TT (Through Transport) Club was set up to provide almost every kind of container-related operator with cover against almost any kind of container-related risk. The founding members were shipping lines, soon joined by terminals, stevedores, NVOCCs, container lessors, etc. Lately, the US-based AIG insurance group has been increasingly active in the field, focusing on American ports and terminals.

A smaller 'mutual' called OTIM has also appeared on the scene, but it was not until the launch of Camat Assurance Maritime Ltd. (CAML) that a market really came into being. A major French insurer, Camat was bought by the state-owned insurance group, AGF. In 1990, Contship left TT Club, having secured cover with Lloyds. Contship resigned from TT Club because it felt 'grown up'. When TT club was virtually the only supplier, insurance brokers became sidelined and clients dealt with TT Club direct. Now there is a choice of suppliers.

Legal and liability framework is an extremely important aspect. In India, the Multimodal Transportation of Goods Act (MTGA) has tried to have its own Indian flavour. India's Multimodal Transport Ordinance was promulgated on 16 October 1992 and was subsequently replaced by Multimodal Transportation of Goods Act 1993. The Act brought about some amendments to the Indian Carriage of Goods by Sea Act (1925), the Carrier Act (1865) and the Sale of Goods Act (1930).

For formulating and drafting the law for multimodal transport, government had set up a working group, to determine the liabilities and responsibilities of operators in the multimodal chain for loss of, or damage to, goods. The Working Group based its recommendations on the rules outlined by the International Chamber of Commerce, and took note of the provisions of the United Nations Convention on Multimodal Transport of Goods, 1980. Thereafter, an ordinance was promulgated on 16 October 1992, followed by the Multimodal Transportation of Goods Act passed by Parliament in 1993.

Until the enactment of MTGA, the Foreign Exchange Dealers Association of India (FEDAI) evolved its own rules, laying down responsibilities and liabilities of the combined transport operators. The FEDAI did not confer negotiability title to the goods. Further, such documents were required to be exchanged for regular on-board Ocean Bill of Lading (OBL) at the port, unless the Letter of Credit (LC) specifically permitted the production of the Combined Transport Document (CTD) evolved by FEDAI in relation to the Bill of Lading. Insurance by way of the liability cover for MTOs could be extended by the TT (Through Transport) Club.

The multimodal transport document under the present law covers:

- Contract for the transportation of goods by multimodal transport;
- Negotiable document unless marked non-negotiable at consignor's option; and
- Document of title for delivery of goods to be obtained.

It also serves as an instrument to enforce the provisions of the Act by assigning liabilities and responsibilities to MTO, consignor, consignee, insurer and bankers. Currently, its usage is at a nascent stage; bulk of the trade is done on CTD issued by the liners or NVOCCs.

Tariff Authority

In India, the Major Ports Trust Act, 1963 was amended by the Port Laws (Amendment) Act, 1997 to constitute the Tariff Authority for Major Ports (TAMP) in April 1997. It provides for an independent Authority to regulate all tariffs, both vessel and cargo related, and rates for the lease of properties in respect of Major Port Trusts and the private operators located therein. The role of TAMP has been limited to only major ports (under the jurisdiction of the Central Government). Its approach to tariffs encompasses conflict resolution for settlement of disputes and setting of tariff ceilings.

The Authority is empowered to notify the rates and the conditionalities governing their application. Every notification, declaration, order and regulation of the Authority made under the MPT Act is published in the Gazette of India.

There is no provision for appeal against the orders notified by the Authority. these orders within the system. Aggrieved parties may approach the High Court for redressal. This Authority, however, undertakes review of orders, under exceptional circumstances. The Union Government has the power to modify the Authority's Order or issue 'policy directions' on matters relating to port pricing.

Public-Private Partnership (PPP)

Consistent with India's concerted strategy of blending synergy and strength of the public and private sectors in finance, management and technology, PPP (public-private partnership) has been steadily materialising in infrastructure sectors. A comprehensive PPP model is evident in this sector, encompassing port container terminals, ICDs, CFSs, etc. All new container terminals set up at different Indian major and intermediate ports adopted PPP concept, e.g., the terminals at JN port, Chennai, Tuticorin, Visakhapatnam, Cochin, Mundra and Pipavav ports.

Different formats have been used for PPP in infrastructure in India:

- Build-operate-transfer
- Creation of a separate entity
- Annuity-based projects
- Turnkey contracts
- Viability gap funding

The following PPP models have been explored for different services and aspects:

- Management contracts
- Viable revenue share
- Variable concession period

- Intermodal rail networks have been developed as PPP projects, linking Gujarat coast ports by Pipavav Rail Corporation and Kutch Railway Company.
- Public sector Central Warehousing Corporation generated an ingenious model for its CFSs being managed and operated by private sector enterprises.
- Several inland CFSs are uniquely managed as public-public partnership – CONCOR as a Central sector PSU joined hands with many state warehousing corporations to optimally manage and operate them.
- Dry port development in India itself is a good blend of private sector and state sector: 108 of dry ports have been set up by different public sector corporations, and 69 others by private companies.
- Some private sector companies among the 15 licensed container train operators are now registered with the government owned Indian Railways (IR) for owning rolling stock, building terminals, and operating container trains in addition to CONCOR, which has so far exclusively operated container carrying trains.

For the first container terminal in the port sector in India to be developed and operated by a leading global shipping line (P&O Ports, Australia), JN Port, functioning as a landlord port for this purpose, facilitated P&O ports to establish a container terminal at the port. The Nhava Sheva International Container Terminal (NSICT) so set up has been a clear success: involving a 30-year concession on a build-operate-transfer basis, at an estimated cost of Rs. 1,000 crore, the terminal has heralded successful private sector participation in the port sector. Besides deriving an attractive rate of return on capital investment, it has succeeded in handling the projected/targeted traffic level well ahead of the stipulated time. The terminal, operational since 1999, has achieved high productivity and fast turn-round of container vessels.

All new container terminals at Indian ports – Chennai, Tuticorin, Visakhapatnam, Kochi, Mundra and Pipavav, besides additional two terminals at JN port itself have all been assigned to the leading shipping lines or from amongst the leading global container terminal operators.

Like the JN Port, CONCOR has followed the 'landlord' model and enlisted from among top world shipping lines and terminal operators to join hands and develop large state-of-the-art CFSs within the ICD premises, for example, at Dadri in Uttar Pradesh, close to Delhi. A few large CFSs have recently been developed in PPP mode through collaboration between CONCOR and shipping lines as well as other private sector developers and operators.

Facilitation

Globalisation and internationalization of trade and commerce have triggered new dynamics of development, which demands a different mindset. Markets respect no borders, no nationalities, thereby making way for unimpeded, seamless products, with ruthless pressure to reduce transaction costs. This calls for:

- Appropriate rail/road connectivity
- Simplification, rationalisation of procedures/practices
- Efficiency, productivity in handling, transportation, storage
- Optimal utilisation of assets and manpower
- Direct stuffing of commodities
- Promoting factory stuffing / destuffing of containers: door-to-door transit.

Customs Clearance: Customs clearance at border crossing has been an extremely important activity, traditionally involving delays on account of cumbersome procedures and complex regulations. Of late, customs administration in India has taken a number of initiatives to simplify and rationalize documentation and processes with a view to significantly expediting the clearance of exports and imports. Some of the important initiatives in this regard include:

- Fast Track Clearance and Green Channel facility for assessing various types of cargo and prescribing the procedure for efficient Customs clearance.
- Risk Management System (RMS) as a measure of trade facilitation and for selective screening of only high-risk cargo for customs examination.
- A special customs clearance procedure for authorized persons (Accredited Clients) having good track record.

– Risk Management System (RMS) with the 'Accredited Client's Programme' (ACP) as its major components has been introduced from November, 2005 in a phased manner.

To strike an appropriate balance between trade facilitation and enforcement, a large number of consignments are allowed clearance based on the importer's self-assessment, without examination. Concurrent audit is replaced by post-clearance audit for importers. Post-clearance audit is carried out on Bills of Entry selected by the Risk Management System.

Accredited Clients form a separate category to whom assured facilitation is provided by way of a small percentage of consignments selected on a random basis by the RMS, allowed clearance on the basis of self-assessment at all locations in the country where EDI and the RMS are operational.

Faster delivery system has been provided for by creating separate areas in the port premises clearly earmarked for immediate delivery of cargo to specified accredited importers.

For Accredited Clients scheme, an importer should have imported goods valued at Rs. 10 crore (Rs. 100 million) in the previous financial year; or paid more than Rs. 1 crore of Customs duty in the previous financial year or paid Central Excise duty of over Rs. 1 crore. The shipper should have filed at least 25 Bills of Entry in the previous financial year, should have no cases of Custom, Central Excise or Service Tax booked against him in the previous three financial years. Also he should not have any cases booked against him under any of the allied Acts.

It has been laid down that quality of the submissions to customs should be good, measured by the number of amendments made in the bills of entry submitted by the importer in relation to the classification of goods, valuation and claim for exemption benefits. The number of such amendments should not have exceeded 20% of the bills of entry during a financial year.

The importer should have no duty demands pending on account of non-fulfilment of export obligation. He should have reliable systems of record keeping and internal controls.

It would be mandatory for the accredited clients under the ACP to file bills of entry using digital signatures. Bills of entry must be filed by the Accredited Clients through the Indian Customs and Central Excise Electronic Commerce/Electronic Data Interchange Gateway (ICEGATE) facility and duty paid though such clients' bank accounts at the designated bank.

Concomitantly, it has been emphasized that IT platform needs attention by way of inter-linkages between concerned agencies and operators – customs, shipping lines, ports, NVOCC/freight forwarders, customs brokers, banks, customer's online trace and track system, internet access, web-enabled online data entry, online accounting and money transfer.

A few other measures towards trade facilitation by customs authorities entail simplified procedure for amendment of IGM, simplified customs procedure for transshipment between gateway port and dry port (ICD/CFS), LCL (less than container load) carrying containers are allowed movement from one CFS to another CFS for final consolidation/stuffing, besides facility for customs messages exchanging with ports, airports, ICDs/CFSs, CONCOR, banks and DGFT (Directorate General of Foreign Trade), and facility of customs duty payment through more banks and via e-banking. Customs clearance facility will be available round the clock, on the basis of 24x7 operations.

EDI: With the proliferation of computers and the use of tele-transmission techniques, it has become possible to rationalize the processing and transmission of information. EDI (electronic data interchange) is generally defined as: "the computer-to-computer transfer of commercial and administrative transactions using an agreed standard to structure the data pertaining to that transaction. EDI covers the exchange of structured messages. A set of electronic data interchange for administration, commerce and transport became known under the acronym EDIFACT.

It was the development of containerisation that led to the introduction of EDI into the world of transport. Each contract of carriage involved large numbers of units which led shippers and carriers to use computers to record the information necessary for an efficient transport service.

Containerised goods are rarely sold at sea. There is no need for a document of title to be issued for them. Such voyages are often short and may be completed before paper bills of lading arrive at the discharge port. This can lead to delay in the delivery of goods. A sea waybill is the best form of documentation for such a trade as it does not have to be presented at the discharge port. In these circumstances, the use of computerised waybills has become widespread.

EDI has resulted in the development of a sophisticated logistics industry. Many transport operators have become specialists in logistics. They receive the EDI messages from the retailers and manage complete supply chains including stocking and and delivery.

Fraud is quite common even where paper is used. Indeed, the delay in delivery of paper bills of lading to discharge ports can itself lead to fraud. In considering bills of lading, authentication is particularly important. One kind of system designed to meet this problem is based on digital cryptography. The sender has a secret numerical cipher which he uses to encrypt his message. The receiver has access to the public key which can be used to decrypt the sender’s messages.

There have been a few experiments in the use of electronic bills of lading. The seadocs system provided a central registry (legally the agent of the traders) which held the paper bill and registered changes of ownership. The carrier could refer to this registry to ensure delivery to the correct party. The ceebol system relies on banks, acting as the carrier’s agents in issuing electronic bills. Another suggestion is that there should be a bill of lading in the form of a smart card: a plastic card with a programmable chip which the carrier could issue to the shipper; it could be presented to the shipper’s bank to obtain payment on the letter of credit, the bank would then authorise the issue of another card by the buyer’s bank. As for the needs of banks in relation to documentary credits, these are governed by the ICC Uniform Customs and Practice for Documentary Credits which do not allow for electronic messages.

The United Nations Commission on International Trade Law has had a working group devoted to electronic data interchange which has been in the process of producing draft model statutory provisions designed to overcome legal obstacles to the use of EDI.

The increasing concern with intermodal and end point inventory holding and handling costs, improved supply chain management, demands for just-in-time delivery, and seamless intermodal transfer, intermodal transportation is under increased pressure to change its role and improve its technology. At the same time, global financial transactions increasingly use integrated satellite communications systems. This assures that financial and documentation transfers require very little time and are in fact performed in real time now as in the case of electronic funds transfer at the completion of a service.

Information technology has infiltrated all aspects of intermodal transport operations, from scheduling and routing, planning and control to cargo tracking. As a result, cargo movement and transport vehicle flows are integrated accurately, thereby assuring that these movements and flows are coordinated and matched. This, in turn, reduces the amount of idle transport vehicle capacity and the movements in the performance, cost, and reliability of intermodal transportation. Origin to destination times and costs of transport have been greatly reduced, while reliability and flexibility of the systems have been greatly increased.

EDI can be used to electronically transmit documents, such as purchase orders, shipping notices, receiving advices, and other standard business correspondence. EDI has enabled the concept of Just-In-Time inventory to be implemented. Information about the movement of containers and goods has to be arranged faster than the containers and the goods themselves. Information has to be available at the destination before the goods themselves. This requires that ports should have fully computerised Cargo Management System; container yard operators must be integrated with container yards; trucking and transport agencies should be computerised with the integration of tracking systems; railways should have automated freight operation information system; regulatory agencies, such as customs should be fully automated; and shipping lines too should have computerised Cargo Management System.

All related agencies must be linked into an EDI community system which could be established around the customs trade offices, or ports. The community must include customs, ports, freight forwarders, customs house agents, cargo agents, shipping lines, steamer agents, airports, airlines, and air cargo agents.

EDI has to be viewed essentially as a business rather than a technical issue. The growing power and speed of information processing is reshaping the shipping and port industry. IT has transformed shipowners into value-added logistics service providers. Electronic commerce will spur demand for shipping services by increasing trade volume in general.

There is an increasing need felt to place priority on reforming the various complex customs systems in the ports, with an emphasis on the governments to achieve customs harmonization. This would include simplifying, harmonizing, and automating the procedures and systems required in obtaining customs clearance for cargo. One advanced IT of its kind is the PORTNET at the Port of Singapore. The PORTNET creates value for port users in many areas, including the on-line booking of resources, e-fulfilment of port services, facilitation of billing services, customs clearance and linkage to government agencies.

A paradigm shift is noted in terms of shippers' expectations regarding their logistics chains, including the container logistics industry in terms of competition. Using new technologies, such as the wireless, Internet, data mining and some already deployed technologies, including RFID (Radio-frequency identification device) tags, sensors, etc., packages, 'tell' what and where they are; warehouses 'talk' to each other; trucks, 'converse' with central computer systems and weather systems to optimize routes; important information finds the decision maker wherever he or she is; shelves restock themselves and signal changes in customer tastes.

The challenges before the container logistics sector are to acquire, assimilate and integrate these technologies, solutions, etc, into their systems so as to provide the shippers with a true integrated, multimodal transport and logistics value chains, and the benefits of visibility, control and seamless flow of goods.

Automation, i.e. the use of advanced IT system can help improve productivity. By implementing more intelligent IT systems in existing manned terminal operations, it is estimated that labour and equipment efficiency can be increased by about 20%, and container stacking density by a further 20% or more. Secondly, the use of advanced IT system enables the pooling of trucks and yard cranes, real-time grounding, advanced grounding and stacking strategies, and prescheduling pick-ups and deliveries with substantially shortened turn-rounds. It also enables the use of unmanned handling equipment.

Although it is recognized that most developing countries can ill-afford to always opt for the latest state-of-the-art technologies on consideration of cost and compatibility with existing assets, a steady and conscious attempt will need to be made to adopt new technologies to remain in the game and compete.

Thamesport in the UK, Hutchisson's Hong Kong International Terminals (HIT) 6+7, and Pasir Panjang in Singapore all opted for automated yard cranes. Rotterdam's major operator, ECT opted for unmanned yard cranes and transportation vehicles at its Delta terminal on the Maasvlakte. Since early 2000, Wan-Hai has aimed for manned trucks transporting containers to and from the automated cantilevered RMGs (rail mounted gantries) at its Japanese terminal near Tokyo. Kalmar and Patrick have been experimenting with unmanned straddle carriers in Brisbane, Australia.

Security

Several ingenious methods adopted by terrorists in recent years have led to a number of security initiatives taken in respect of container traffic. For long, containers carrying arms, narcotics, even terrorists and illegal immigrants have managed to escape security. There are several instances, one of an Al Qaeda terrorist who made himself comfortable, armed with a laptop, two mobile phones, a bed and a toilet, he had travelled halfway across the world to destination US, till the container he had made his home in was finally detected. Another case was still more bizarre. Post-9/11, ABC News borrowed 15 pounds of uranium from a state lab and hid it in a cargo container, to test the US government's preparedness in preventing a 'dirty bomb' attack. The shipment reached

New York via Austria and Istanbul. "Seven countries, 25 days, 15 pounds of uranium, and not a single question" noted the ABC correspondent who successfully smuggled the lethal cargo into New York.

Among a number of surveillance and other measures, ports have in many cases installed hi-tech scanners – GaRDS and 9 MeV, for example, at JNP, which have helped check several cases of fraud. The adoption of the International Ship and Port Facility Security (ISPS) Code by the International Maritime Organization (IMO) and the proliferation of transport security-related measures have prompted studies aiming at reporting on relevant security-related developments.

The ISPS Code, which aims at enhancing maritime security on board ships and at the ship/port interface, came into force on 1 July 2004. While the need for enhanced security measures is widely accepted, it is also generally recognized that the implementation of the new international maritime security regime entails additional investments and expenditure by affected parties as well as changes to operational procedures and business practices.

Both the ISPS Code and the SOLAS amendments came into force in July 2004. Among other statutory instruments developed and implemented at various national and regional levels, the most significant initiatives are those introduced by the United States. They include the US Maritime Transportation Security Act (MTSA) of 2002, that incorporates mandatory and voluntary ISPS provisions, the Container Security Initiative (CSI), the Customs-Trade Partnership against Terrorism (C-TPAT), and the 24-hour advance vessel manifest rule, commonly known as the '24-hour rule'.

One of the more important recent international developments in this regard was the adoption in June 2005, under the auspices of the World Customs Organization (WCO), of a new Framework of Standards to Secure and Facilitate Global Trade. It establishes a set of 17 standards, which are supplemented by detailed technical annexes. The Framework focuses on ensuring close customs-to-customs cooperation and establishing solid customs-to-business partnership relations. It concentrates on four main areas, in particular the harmonization of advance electronic cargo information requirements for inbound, outbound and transit shipments; the implementation of a consistent risk management approach to address security threats; the definition of benefits to businesses that meet minimal supply chain security standards and best practice; and mandatory outbound inspection of high-risk containers upon reasonable request by the member receiving the cargo. By 11 October 2005, 116 customs administrations had indicated their intent to implement the Framework.

Landlocked Countries

Twelve of the ESCAP region's landlocked developing countries (LDCs), among the world's 30 such countries, include Afghanistan, Bhutan, the Lao People's Democratic Republic and Nepal as among the least developed countries (LDCs), while Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan and Uzbekistan are the economies in transition.

LDCs are widely dispersed around the globe. Notwithstanding their location in four different countries, all LDCs share common problems of geographical remoteness and dependence on trade and transport systems of neighbouring and coastal countries. Even within transit countries, the pace of development in areas remote from the coast has been slower as the distance from the sea increases. The delivered costs of imports are higher, and exports less competitive. The inflow of foreign direct investment is also adversely affected. A typical landlocked developing country has transport costs that are as a rule 50% higher, and volumes of trade that are 60% lower than in the countries with coastal access.

In terms of the ESCAP's analysis in *Transit Transport Issues in Landlocked and Transit Developing Countries* (2003), landlocked countries suffer serious disadvantage owing to their lack of territorial access to seaports and the prohibitive cost of airfreight. They perforce rely on the transport of goods by land through one or more neighbouring countries. Several regional and subregional networks provide transport infrastructure linkages to, and through, the landlocked countries of Asia. 'Missing links' in the networks continue to constrain route choice, while insufficient capacity on some corridors and the poor quality of the infrastructure add costs and time to the transit process.

The ESCAP study findings revealed that each landlocked country had access to the sea through more than one country, apart from Nepal and Bhutan, where sea access passes through India, that each of the landlocked countries had a traditional or predominant route, and the movement of goods on such a route could be improved with better transport facilitation. The study further highlighted that a corridor approach was needed in identifying and dealing with non-physical bottlenecks. The study emphasized the need for a mechanism that would bring together the national trade and transport committees of all the landlocked countries so that they could share their experiences and compare best practices.

The UN Millennium Declaration urged for an increase in financial and technical assistance to LDCs to help them overcome the impediments of geography. This call has been echoed at major UN conferences in Brussels, Monterrey, Johannesburg and particularly in Almaty. The 2003 Almaty International Ministerial Conference of Landlocked and Transit Developing countries helped forge a global partnership to tackle the economic marginalization of LDCs.

A snapshot of infrastructural facilities existing in some of the region's landlocked countries, together with practices they follow, is given below:

Kazakhstan and Uzbekistan: Railway transport provides the backbone for container and bulk cargo transport, connecting Central Asian republics with ports on the Baltic Sea, Black Sea, Mediterranean and Persian Gulf, as well as the Pacific. Parallel to the formalization of the European railway networks, ESCAP is promoting the formulation and formalization of the Trans-Asian Railway among member countries and its integration into transport network.

Following the break-up of the Soviet Union, emergence of new independent countries in Central Asia, and adoption of a socialist market economy by China, potential and economic scenario in the region is characterized by a steady dismantling of barriers. Regional economies have become increasingly interdependent as is manifest in an unprecedented growth in regional trade and tourism. There has been a perceptible need for, and emphasis on, infrastructure capacity enhancement and efficiency upgrade on linkages between countries. The opening of the CIS countries to international trade has resulted in a dramatic increase in road transport with extension to more distant destinations. The railway networks of the CIS countries and China, Iran and Turkey provide rail transport linkages for Central Asia and Caucasus.

The railway organizations in Central Asia, in cooperation with the railways in China, Russian Federation and Ukraine, transport substantial cargo volumes. For example, some containerised shipments from the Republic of Korea to Uzbekistan were delivered from ports in China to the Kazakh border at Druzba/Alashankou within seven days by block trains. The consignments took further two days to reach the destination. Complex operational processes and procedures accompany border crossings by rail, like changes of locomotive and crew, break-of-gauge operations, marshalling, technical inspections, and preparation of rail transfer documents. Institutional procedures include customs check of railway bills against wagon lists and cargo documents, customs inspections, veterinary and phytosanitary controls.

Rail transport competes with the road transport. Where transport operators arrange unit shipments for the import of consumer goods, rail transport offers competitive alternatives in terms of price. The transit time of conventional rail transport, which varies between 30 and 35 days for a single wagon, is *prima facie* less efficient. Existing break-of-gauge points at Druzba/Alashankou (China/Kazakhstan), Sarakhs (Turkmenistan/Iran) and Brest (Belarus/Poland) are found to be major operational hindrances.

Lao People's Democratic Republic: Road transportation is the dominant transport mode in Laos, carrying an estimated 90% of all traffic. Around two-fifths of the population still live more than six km from the nearest road and more than 25% of all district centres do not have year-round road access. The development plan concentrates on rehabilitating and improving the arterial road network, establishing National Route 13 as the spine of the national road system running north-south from the border with China to the border with Cambodia, and also developing the critical east-west links with Thailand and Viet Nam.

It has been estimated that around 95% of Laos' transit trade moves through the ports in Thailand, while the remainder moves through ports in

Viet Nam. Thailand is considered a convenient transit corridor, notwithstanding high inland freight charges, with the majority of traffic passing over the Friendship Bridge between Thanaleng, Laos, and Nong Khai, Thailand, across the Mekong River. Despite access to the ports of Viet Nam, the difficult terrain and inadequate infrastructure as well as a number of other procedural and administrative barriers hamper transit traffic. Capacity constraints limit the potential of these ports to handle the traffic.

The Government of Laos has expressed its interest in extending rail links from Vientiane to Nong Khai, thereby connecting directly to the railway network in Thailand. Thailand has provided assistance for the detailed design of a 3.5 km rail link from the middle of the Friendship Bridge to Thanaleng, while Republic of Korea has granted technical assistance for the preliminary design of a 12.5 km rail link from the Friendship Bridge to Vientiane. Under the ASEAN-backed Singapore-Kunming Rail Link Project, a spur line has been proposed, linking Vientiane with the northern Viet Nam city of Ha Tinh.

While concrete steps are being taken to improve the route from Vientiane to Danang Port in Viet Nam, the route is still underutilized owing to a number of problems, including the poor condition of the main east-west road, Route 9. Besides, transit costs associated with the route through Danang Port are higher.

Trade within the Greater Mekong Subregion (GMS) has benefited from improvements in infrastructure, as well as cooperation in trade facilitation. The GMS agreement has been designed to harmonize individual bilateral agreements among the member countries.

The Mekong River flowing for a distance of 1,865 km along the length of Laos from north to south is an important means of transport, particularly for mountainous areas – inaccessible by road. With the Quadripartite Agreement on Commercial Navigation among China, Laos, Myanmar and Thailand signed in April 2000, and the zero tariff agreement signed between China and Thailand on fruit and vegetable imports, it is expected that freight carried by inland water transport between these countries will increase significantly. In particular, the route through the Golden Triangle area, where Laos, Myanmar, Thailand and China share borders, has the potential to stimulate economic activity and transit transport volumes.

Transit and transport costs associated with the goods imported through Bangkok Port in transit to Laos are higher than those for exports. Goods, released at Bangkok, are thereafter moved to the dedicated warehouse for transit cargo. At the border crossing, there is need felt for transactions to be facilitated.

Mongolia: Mongolia, one of the world's largest landlocked countries, has two large neighbours as its most important trading partners, the Russian Federation and China. The United States of America has emerged as a major export market.

Railway has been the backbone of Mongolia's transport network, while roads are used by people living in and around urban conurbations. The relatively poor road network limits road transport within Mongolia. Mongolian Railway is a Mongolian-Russian joint venture, owned 50% by each side. Rail carries the bulk of Mongolian cargo: spur rail lines connect major coalmines and the copper mine at Erdenet. The total rail length is about 1,800 km, which serves its three largest agglomerations, namely, Ulaanbaatar, Darkhan and Erdenet.

Mongolia has a transit transport agreement with the Russian Federation. It also has transit and road transport agreements with China. Trucks from Mongolia are prohibited from entering China, while Chinese trucks are permitted to travel up to the nearest Mongolian border town. China, Mongolia and the Russian Federation have been negotiating a draft framework agreement on transit transport,

The only Chinese seaport currently used for Mongolian transit traffic is the new port of Xingang, operated by the Port of Tianjin Authority. Mongolia can use at least six Russian seaports. An ESCAP analysis has focussed on four alternative transit corridors: via Tianjin in China, by rail or by a combination of road and rail; via Vladivostok/Vostochny in the Russian Federation, by rail; and via Belarus, an overland rail route to Western Europe.

Anwarul K. Chowdhury and Sandagdorj Erdenebileg in their book, *Geography Against Development: A Case for Landlocked Developing Countries*, analyse the impact of geographical handicaps on external trade and economic development of landlocked developing countries and identify practical solutions to address them: they analyse factors which hamper the effective participation of these countries in international trade and economic development, examine the corridor approach for establishing efficient transit systems, outline the challenges faced and efforts made in different landlocked subregions. They describe international conventions essential for securing freedom of transit and day-to-day transit operations. Besides, they also outline international support measures for establishing efficient transit transport systems.

Globalisation engenders growth of supply chains, emphasising interdependence of economies, also necessitating institutional capacity building for facilitation of international trade and transport in landlocked and transit countries. It is increasingly realised that non-physical bottlenecks in international trade and transport need to be minimised.

Typifying problems encountered by countries in the region for cross-border commercial exchanges, whether they be in Central Asia, ASEAN, SAARC, BIMSTEC or elsewhere, an ADB (Asian Development bank) study each for SAARC countries and Central Asian Republics brought into focus several generic issues and aspects. Concluding its analysis of trade barriers, ADB maintained that "… significant barriers to trade in Central Asia are high transport costs and long and unpredictable transit times for international shipments to and from the CARs and their difficult topography but also…" to deficiencies of the CARs transport networks, and high costs and low quality of transport and logistics services in the region. In addition, there are difficulties with the movement of goods and transport equipment across borders and through the territories of the CARs and neighbouring countries.

Lack of infrastructure facilities, such as inland container depots (ICDs), particularly at border crossings, to support logistics activities such as consolidation and distribution of goods, and speedy, secure transshipment between road and rail services compounds the problem. Time-consuming border crossings and customs procedures complicate non-standard documentation. Harmonization of technical and operational standards is a clear need. For vehicles, key issues include commercial operating rights, vehicle registration, vehicle technical standards, traffic rules and signages, driving licences, third party liability and temporary importation of vehicles for the purpose of carrying goods and people across national frontiers. With regard to natural persons, key requirements entail passports, visas, border permits, health inspections, personal effects, and currency.

At the global level, several international conventions establish the right of access to the sea and facilitate transit transport for landlocked countries. These include the Convention and Statute of Freedom of Transit, Barcelona, 1921; the Convention on Transit Trade of Land-locked States, New York, 1965; and the United Nations Convention on the Law of the Sea, 1982.

TIR *(Transport Internationaux Routiers)* Convention is the UN Road Transport Protocol. The adoption of the protocol facilitates seamless road-based trade and travel across national boundaries. It is administered by IRU (International Roads Union). The TIR system operates through the issue of a document called *TIR Carnet*. With the *TIR Carnet*, a truck carrying international goods can avoid detailed screening and physical inspection at borders. At the port of entry, there are advantages for containers arriving under TIR by sea. No third party is involved, leading to reduced delay and, therefore, reduced costs. There is no need for detailed Customs declarations and inspections, which can be done in inland Customs stations in the originating and destination countries. The implementation of this system would require ratification by the countries through legislative action and also forming an apex road transport association in each country that can become an affiliate body of IRU.

Of late, a growing concern has been observed on the part of both landlocked and transit countries to become increasingly aware of the prospect of landlocked countries becoming ‘land-linking’ countries, and providing transit countries with alternative routes to international markets. Some specific action points for landlocked and transit countries to follow would include:

- Simplification and harmonization of transit documents, particularly between neighbouring countries along transit routes;
- Minimization/elimination of customs inspection of goods in transit and simplification of customs formalities, while, at the same time, recognizing security concerns by introducing guarantee systems, as appropriate;
- Reduction and simplification of transit fee systems and associated charges;
- Establishment of a one-stop shop where joint customs inspection can be undertaken and other forms of collaboration promoted;
- Establishment of a 'single-window' facility at the national level to facilitate the processing of all transit transport-related documents at one location.
- Prioritization of transport infrastructure investment requirements for transit transport, including those for intermodal transport;
- Establishment of logistics facilities and inland container depots as consolidation/distribution hubs, particularly at border crossing points;
- Development of competing transport routes to reduce costs and improve service in consultation with landlocked countries and transit countries;
- Improvement of operations and efficiency of each transit route.

ICT (information and communication technology) applications would assist customs authorities in performing their duties and in building a data bank of information, besides effectively increasing the efficiency of various processes within the transport sector, providing connectivity between neighbouring countries and increasing the ability of shippers to track their goods. For this purpose, it would help to computerize customs systems and the transmission of information with respect to goods in transit, and introducing and developing ICT systems along major transit routes from the point of origin to the point of destination, including maritime transport.

The interoperable electronic systems are designed to connect all stakeholders in trade and transport activities so that information can flow among them seamlessly, thereby minimizing manual interventions. The use of ICT, when implemented in conjunction with the harmonization of customs systems and documentation, can help accelerate the progress of current initiatives to simplify trade and transport. ICT is especially effective when pre-clearing goods, vehicles and drivers before they arrive at a customs post; and engaging in risk management and selective processes. Harmonization of customs risk-management systems, of valuation processes and of databases would enhance the cross-border trade by road and rail among the landlocked developing countries. At present, all activities tend to be conducted sequentially. With the implementation of the ICT-based ‘single window’ system, the document inspection or pre-clearance can be conducted before the goods and the vehicles reach the border.

Section IV:
The Way Ahead

The Way Ahead

The new global economic architecture today is manifest in the integration of domestic and external markets, mobility of capital, reduction in trade barriers and tariffs, emergence of regional trade blocs and free trade agreements, outsourcing of goods and services, and geographic spread of production.

The current general global environment signifies winds of change. As production processes go increasingly global and services are constantly value scaled, logistics and supply chain management assume a strategic function. Customers' business challenges drive demand for increasingly complex value chains all along the production-distribution cycle, and industry is faced with continued price competition.

The End of Geography

The insignificance of geography, distance and time coupled with steady reduction in transport costs in real terms determine a new paradigm in global trade and commerce as much as in the whole gamut of logistics framework. There is an emphasis on integrated seamless flow of goods from origin to destination. New instruments of combined transport systems, freight integrators, inter-country transit networks all help bridge continents.

Some profound changes have marked the world infrastructural landscape: discrete activities are being unbundled; infrastructure is being separated from operations; competitive impulses in the rail sector are determining new benchmarks of productivity and efficiency; 'landlord' ports are attracting private sector investments and technologies. As the state shifts from its role of provider to facilitator of services, new instruments of growth evolve through public-private partnerships.

Container Transforms Mobility Technology

The container or 'the box' has been the single most significant driver of transformation in mobility technology. Containerisation has gradually become the key factor of multimodal transport, thereby enabling through transportation of cargo from origin to destination without intermediate transshipment at transfer points. Integrated transport over different modes has brought in its wake, speedier transit, reduction in handling, packaging, insurance and inventory costs, and prevention of loss and damage to goods.

The genesis and development of containerization of cargo have generally kept pace with the rising expectations of speedier and cheaper transport. As the container helps bridge continents, it facilitates growth of global commerce with diverse value adding services. Time has become the cutting edge. Information has appeared as an important glue that binds the interminable stages in the supply chain. Technology finds new answers to problems and challenges – building competitiveness and driving growth. The virtues of modal integration are all too evident.

Changing Logistics Scene

As Peter Drucker has succinctly stated *"The last frontier of management to conquer is logistics and supply chain management".* It is attracting attention as never before. Industry and trade look for end-to-end integrated solutions – with ever increasing levels of efficiency and economy. There is constant quest to increase ship size and port capacity. New giants sailing on the high seas already with 12,500 TEU each on their decks are driving, ports to develop container terminals equipped with new genre of cranes and movers. Mergers and acquisitions consolidate carriers as well as terminal operators, in turn, upscaling the landside facilities and necessitating far higher levels of evacuation to hinterland.

Mergers and alliances lead to concentration. Global networks of ocean carriers as well as terminal operators strive to secure a larger pie. Integrated intermodal services entice leading lines to extend their traditional role and reach; they look for their own seamless door-to-door service products and packages across the continents, from origin to destination. Today, ocean carriers integrate into ports, inland terminals and landside transport links. Multimodal operators integrate into the reverse of this chain. Railways combine with port terminals. Freight forwarders extend service boundaries.

The 141,000 km Asian Highway and 81,000 km Trans-Asian Railway projects have elicited great interest in different countries of the region, to suitably align their rail and road networks and plan for missing links to be built for these two major building blocks to impart a new dimension to linkages across the continents. For speed and capacity enhancements, there are ambitious projects already on the anvil, including high speed passenger rail corridors as well as dedicated freight corridors.

The US carriers Sea-Land Service and APL kicked-off this integration in the 1980s, and have gradually evolved into full logistics service providers. AP Moller-Maersk set up APM Terminals as a separate entity to the liner company and transferred its head office to The Hague. Other liner companies which also manage and control several terminals include MOL, K Line, Evergreen, NYK and CMA CGM, chiefly in joint-ventures with DP World.

There are upwards of 400 companies worldwide, offering liner and feeder-type container services. Today, Maersk Line, APL, NYK Line, Mitsui OSK Lines, Hanjin Shipping Co., OOCL, CMA CGM – and many more in the liner shipping industry – are more than just ship operating companies. All of them deploy more than a quarter of a million TEU slots and control in excess of 100,000 TEU of containers in their liner services. They have invested heavily in other sectors of the industry as well, including marine terminals, trucking and rail ventures, consolidation and deconsolidation services, value-added logistics services, such as labelling, demand forecasting and order processing.

A telling example of advanced infrastructure is integrated transport logistics systems. Various service providers, who previously concentrated primarily on specific steps in the process, are now providing services that not only integrate the disparate components of cargo flow, but also include cargo tracking, document processing, customs clearance, inventory management extending through warehousing, and time-definite, door-to-door distribution, and express pick-up.

Concomitant to the development of adequate port terminal for handling gigantic vessels, commensurate landside facilities with efficient rail and road networks become a critical factor. Kim Fejfer, CEO of APM Terminals, recently explained the implications: “If a 10,000 TEU vessel can generate up to 5,000 discharge containers and another 5,000 containers to be loaded per vessel, even at 250 berth moves per hour, the vessel will be tied-up alongside for two days! For two days these ships will monopolise not only an entire berth but an entire yard… At today's productivity in the most efficient ports, we are doing half that at best….".

Container terminal operations are becoming ever more complex. A mainline port of call now needs to offer cranes with an outreach of 65 metre – able to operate across 23 rows of containers – and a trolley speed of 240 metre per minute. Twin-lift spreaders have become a necessity. Tandem lift spreaders able to simultaneously lift two 40-foot containers is due to become a norm at hubs.

As the quayside equipment gets bigger in line with the vessel, terminal yards will undergo a transformation. Handling a mega vessel will require 20 RMGs at 2.5 unit per quay crane, and 56 trucks at seven per quay crane. A series of buffer zones will be needed, to reorganize the links between quay, yard and gates into independent cycles.

Equitable Growth: Sharing Benefits

Containerisation has reduced international transport costs for some much more than the others. Landlocked countries and inland locations in countries with poor infrastructure may have a tougher competitive situation now than in breakbulk days.

Further penetration of containers from ports to inland destinations was a logical extension of the massive growth in international trade, resulting in the setting up of dry ports, Inland Container Deports (ICDs) and Container Freight Stations (CFSs), as also the emergence of land-bridging. The establishment of dry ports especially in landlocked and transit countries would help build intermodal interfaces as nodes which provide connectivity with coastal areas; they also become a focus for the development of production capacity that stimulates economic development.

Asia Gallops: Challenges To Overcome

Accounting for almost half of the worldwide volumes of container traffic, Asia dominates the scene. As Asia gallops ahead, the region throbs with new expectations. The Asian Highway network across 32 countries and the Trans-Asian Railway network spanning multiple railway systems in the region have the potential to lend a new dimension to transit routes specially between Asia and Europe in addition to providing efficient integrated intermodal infrastructure across the region. These projects envisage the development particularly of remote hinterlands of coastal nodes which so far have remained outside the mainstream of industrial and economic development.

A string of dry ports, inland container depots, container freight stations, logistics centres, freight villages *et al* aims at harmonious and inclusive growth of respective areas.

In view of the inextricable link between transport and international trade as well as economic growth, the disadvantaged parts of the region, especially the landlocked developing countries need to be facilitated by way of efficient and cost-effective transit of their traffic. The Almaty Programme of Action, 2003 enshrines salient steps that may be taken towards this objective. Development of intermodal interfaces as nodes and the establishment of dry ports in landlocked as well as transit countries has been specifically emphasized.

The share of freight cost in import values of developing countries in 2001 was as high as around 8.7% against 5.1% of the developed countries. For some landlocked countries, it may even go up to 30%. What is needed are more complete, integrated logistics services, involving the use of ICT and multimodal transport operations.

There is need for a uniform international framework for the development of multimodal transport. Lack of globally accepted multimodal transport legal framework and proliferation of national and regional rules or practices constitutes some of the weaknesses of multimodal transport.

Countries in the region have varying levels of intermodal infrastructure. And they face differing challenges (both physical and institutional) in upgrading existing or creating new intermodal infrastructure, or in promoting the use of these systems.

No Need to Reinvent the Wheel

As the region steadily moves ahead gearing to global benchmarks, there is an emphatic message that the countries in the region need to develop procedures and systems in tandem with the physical wherewithal of structures and networks, revamp and reorient relevant rules and practices to secure optimal gains, reduce transaction costs and delays. Institutional mechanisms need to be in place and best practices elsewhere in the region must be imbibed and adopted. Instead of reinventing the wheel, it will be expedient to learn from each other, share the wisdom and experience of cost-effective models established elsewhere and bring about a region-wise harmonization for interoperability as well.

There has been considerable discussion in this paper on India's multimodal format and programmes deliberately dealt with in detail. It may serve as an illustration for developing the requisite infrastructure for integrated multimodal networks for an optimal distribution of economic activities in a country as also to adequately service important industrial and commercial nodes. A special stress has been laid on appropriate institutional mechanisms to be in place for legal and liability regime as well as for regulating and coordinating responsibilities for healthy, efficient and competitive infrastructure and operations to flourish, and for sustainable development to be ensured.

Annexures

Annexure 'A'

Dry Ports: Trans-Asian Railway Network

America	(1) Gyumri, (2) Yeravan
Azerbaijan	(1) Yalama, (2) Baku, (3) Ali Bairamli, (4) Astara, (5) Djulfa
Bangladesh	(1) Tongi, (2) Dhaka, (3) Chittagong
Cambodia	(1) Phnom Penh, (2) Sihanoukville
China	(1) Alashankou, (2) Lanzhou, (3) Guangzhou, (4) Xian, (5) Zhengzhou, (6) Lianyungang, (7) Beijing, (8) Tianjin, (9) Shenyang, (10) Changchun, (11) Dalian, (12) Jinan, (13) Shanghai, (14) Qingdao
Democratic People's Republic of Korea	(1) Nampo, (2) Tumangang, (3) Rajin, (4) Chongjin
Georgia	(1) Samtredia, (2) Tbilisi, (3) Poti, (4) Batumi
India	(1) Dhandari Kalan, (2) Dadri, (3) Tughlakabad, (4) Jaipur, (5) Jodhpur, (6) Rewari, (7) Moradabad, (8) Ahmedabad (9) Agra, (10) Nagpur, (11) Madurai, (12) Tuticorin, (13) Mumbai, (14) Kolkata, (15) Visakhapatnam, (16) Kanpur, (17) Haldia
Indonesia	(1) Jakarta, (2) Cirebon, (3) Kertapati, (4) Semarangtawang, (5) Surabayapasarturi, (6) Gedebage, (7) Belawan, (8) Teluk Bayur
Islamic Republic of Iran	(1) Razi, (2) Tabriz, (3) Djulfa, (4) Quzvin, (5) Tehran, (6) Zahedan, (7) Khorramshahr, (8) Esfahan, (9) Bandar-e-Amirabad, (10) Fariman, (11) Mashad, (12) Sarakhs, (13) Bandar Abbas
Kazakhstan	(1) Kokshetav, (2) Astana, (3) Karaghandy, (4) Dostyk, (5) Semipalatinsk, (6) Uralsk, (7) Aktobe, (8) Tyuratam, (9) Kzyl-Orda, (10) Chinikent, (11) Djambul, (12) Almaty, (13) Aktau Port

Kyrgyzstan	(1) Alamedin, (2) Osh, (3) Vientianne
Malaysia	(1) Padang Besar, (2) Ipoh, (3) Butterworth, (4) Port Klang, (5) Setia Jaya, (6) Kajang, (7) Segamat, (8) Pasir Gudang, (9) Tanjung Pelepas
Mongolia	(1) Sukhbaatar, (2) Ulaanbaatar, (3) Zamyn Uud
Myanmar	(1) Mandalay, (2) Yangon
Nepal	(1) Birgunj
Pakistan	(1) Quetta, (2) Karachi, (3) Qasim, (4) Faisalabad, (5) Peshawar, (6) Multan, (7) Lahore, (8) Islamabad, (9) Rawalpindi
Republic of Korea	(1) Seoul, (2) Mokpo, (3) Gwangyang, (4) Busan
Russian Federation	(1) Saint Petersburg, (2) Ekaterinburg, (3) Moscow, (4) Bryansk, (5) Smolensk, (6) Nizhniy Novgorod, (7) Utyak, (8) Lokot, (9) Novosibirsk, (10) Krasnoyark, (11) Irkutsk, (12) Naushki, (13) Zabaykalsk, (14) Grodekovo, (15) Khasan, (16) Nakhodka, (17) Vladivostok, (18) Vostochny, (19) Ryazan, (20) Novorossisk, (21) Volgograd, (22) Rostov, (23) Aksarayskaya, (24) Astrakhan, (25) Samur, (26) Makhachkala
Singapore	-
Sri Lanka	(1) Colombo
Tajikistan	(1) Khudjand, (2) Kanibadam, (3) Dushanbe II, (4) Kurgan Tube
Thailand	(1) Bangkok, (2) Ladkrabang, (3) Laemchabang, (4) Map Ta Put
Turkey	(1) Istanbul, (2) Ankara, (3) Samsun, (4) Mersin, (5) Iskenderun
Turkmenistan	(1) Turkmenbashi, (2) Ashgabat, (3) Sarakhs
Uzbekistan	(1) Angren, (2) Bekabad, (3) Kokand, (4) Margilan, (5) Andizhan, (6) Namangan, (7) Ulugbek, (8) Bukhara, (9) Tinchlik, (10) Kungrad, (11) Karshi, (12) Termez
Viet Nam	(1) Lao Cai, (2) Yen Vien, (3) Hanoi, (4) Haiphong, (5) Ho Chi Minh City, (6) Halong

Annexure 'B'

UNCTAD/ICC Rules for Multimodal Transport Documents

These Rules were framed with a view to ensure orderly development of multimodal transport and to determine equitable international contracts with respect to the liability of the parties involved in carriage of goods by multimodal transport. These rules apply when they are specifically incorporated into the contract of carriage whether in writing orally or otherwise.

Multimodal transport contract is a single contract entered into by the consigner with a multimodal transport operator (MTO) when the carriage of goods by at least two different modes of transport is involved. The contract is evidenced by a document called Multimodal Transport Document (MTD). The contract can be replaced by electronic data interchange messages as permitted by applicable law. The contract can be issued in (a) a negotiable form or, (b) in a non-negotiable form indicating a named consignee.

Liability of Multimodal Transport Operator

MTO is liable for loss of or damage to the goods due to the fault or neglect of the MTO or his servants or agents. He is also responsible for loss or deterioration caused due to delay in transit. The liability arising from delay in carriage however, is subject to the caveat that MTO is not liable for loss if the consigner has failed to make a declaration of interest in timely delivery which has been expressly accepted by the MTO. Delay in delivery is not only considered when the goods are not delivered within the time expressly agreed upon but also, in the absence of such agreement, within the time which it would be reasonable to expect having regard to the circumstances of the case. If the goods are not delivered within ninety consecutive days following the date of delivery, the claimant can, in the absence of evidence to the contrary, treat the goods as lost.

The MTO is also absolved of the liability for loss, damage or delay in delivery with respect to goods carried by sea or inland waterways when such loss, damage or delay during such carriage is caused by act, neglect, or default of the master mariner, pilot or the servants of the carrier in the navigation or in the management of the ship or due to fire. However, when loss or damage is attributed to the unseaworthiness of the ship, defence can be raised that due diligence was exercised to make the ship seaworthy at the commencement of the voyage.

Assessment of compensation for the loss of or damage to goods is done based on the value of such goods at the place and time of delivery to the consignee or at the place and time when, in accordance with the multimodal transport contract, they should have been so delivered. The value of the goods is determined according to the current commodity exchange price or, in the absence of both these, by reference to the normal value of goods of the same kind and quality.

Unless the nature and value of the goods are declared by the consignor before the goods are taken in charge by the MTO and specific mention made in the MTD, liability of MTO is limited to the value determined according to the basis specified in the Rules.

When the loss of or damage to the goods occurs during one particular stage of the multimodal transport, in respect of which an applicable international convention or mandatory national law would have provided another limit of liability if a separate contract of carriage had been made for that particular stage of transport, then the limit of the MTO's liability for such loss or damage shall be determined by reference to the provisions of such convention or mandatory national law.

If the MTO is liable for loss arising from delay in delivery, or as consequential loss there from, the liability of the MTO shall be limited to an amount not exceeding the equivalent of the freight under the multimodal transport contract. The aggregate liability of the MTO shall not exceed the limits of liability for total loss of the goods.

The MTO is not entitled to the benefit of the limitation of liability if it is proved that the loss, damage or delay in delivery resulted from a personal act or omission of the MTO done with the intent to cause such loss, damage or delay, or the act was done recklessly and with the knowledge that such loss, damage or delay could probably result from such act or omission.

The consignor is deemed to have guaranteed to the MTO the accuracy, at the time the goods were taken in charge by the MTO, of all particulars relating to the general nature of the goods, their marks, number, weight, volume and quantity and, to the dangerous character of the goods, as furnished by him or on his behalf for insertion in the MT document. The consignor has to indemnify the MTO against any loss resulting from inaccuracies in or inadequacies of the particulars referred to above. The right of the MTO to indemnity in no way limits his liability under the multimodal transport contract to any person other than the consignor.

Unless notice of loss of or damage to the goods, specifying the general nature of such loss or damage, is given in writing by the consignee to the MTO when the goods are handed over to the consignee, such handing over is prima facie evidence of the delivery by the MTO of the goods as described in the MT document. However, where the loss or damage is not apparent, the same prima facie effect shall apply if notice in writing is not given within 6 consecutive days after the day when the goods were handed over to the consignee.

The MTO stands, unless otherwise expressly agreed, discharged of all liability under these Rules unless suit is brought within 9 months after the delivery of the goods, or the date when the goods should have been delivered, or the date when failure to deliver the goods would give the consignee the right to treat the goods as lost.

These Rules apply to all claims against the MTO relating to the performance of the multimodal transport contract, whether the claim be founded in contract or in tort.

These Rules apply whenever claims relating to the performance of the multimodal transport contract are made against any servant, agent or other person whose services the MTO has used in order to perform the multimodal transport contract, whether such claims are founded in contract or in tort, and the aggregate liability of the MTO of such servants, agents or other persons shall not exceed the limits otherwise specified in the Rules.

These Rules only take effect to the extent that they are not contrary to the mandatory provisions of international conventions or any national law applicable to the multimodal transport contract.

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The Institute provides substantive support to various regional initiatives – BIMSTEC, SAARC, Mekong-Ganga Cooperation, etc. It promotes human resource development by organizing training courses for the personnel from member countries of the region.

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