Containerization – Building Global Trade Competitiveness

G. Raghuram
Rachna Gangwar

W.P. No.2007-10-03
October 2007

INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD-380 015
INDIA

Containerization – Building Global Trade Competitiveness

G. Raghuram
Rachna Gangwar

Abstract

India has 12 major and 187 non-major ports along its 7517 km coastline. Cargo traffic handled by Indian ports in 2006-07 was 649 mt, of which 80 mt (6.0 mTEUs) was the container traffic. The compounded annual growth rate (CAGR) of container traffic for the past five years (2002-07) was 22.9 per cent. This was higher than the world's average for the same period.

Trade growth, penetration of containerisation, and hub and feeder service structure are the drivers of the container traffic growth. India's export import growth has grown around 24 per cent during 2002-07. Its impact on container traffic growth could be higher, since a greater share of trade is moving towards finished goods requiring containerization. Presently, containerized cargo represents about 30% by value of India's external trade, and this proportion is likely to grow as containerization increasingly penetrates the general cargo trades and increases its share from the current 68 per cent to nearer international levels of around 75-80 per cent [World Bank, 2007]. Considering various growth scenarios and studies, it appears that international trade growth and penetration would result in 21 mTEUs by 2015-16.

Looking at the container traffic growth in the past few years, there seems to be scope for hub operations in India, possibly one each on the east and west coast. As per the projections made by a study of the Jawaharlal Nehru Port Trust, 9 mTEUs of the Indian traffic of 21 mTEUs will be hubbed in 2015-16 [JNPT, 2006]. If 50 per cent hubbing were to take place in India, then 4.5 mTEUs will be hubbed in India, implying transhipment handling of 9 mTEUs. This requires port handling capacity of 30 mTEUs, with 9mTEUs as transhipment at hub ports.

Further, shipping trends will play an important role in deciding whether the Indian ports have potential for hub operations. Hinterland connectivity is a critical area to ensure a seamless flow of containers and improved port productivity. Currently, 30% of the traffic is expected to move hinterland by rail and the remaining is expected to move entirely by road, mostly to nearby CFSs, and some to the interior Inland Container Depots (ICD) [PC, 2006]. There are also issues with respect to evacuation of containers from ICDs. There is a lot of road based congestion due to insufficient infrastructure. Interfacing with customs is another issue.

This paper focuses on issues in marine and port operations, hinterland connectivity, and ICDs; in short, the entire supply chain of container movement for building global trade competitiveness.

Containerization – Building Global Trade Competitiveness[1]

1. Introduction

India has 12 major and 187 non major ports along its 7517 km coastline. The compounded annual growth rate (CAGR) of container traffic in TEUs for the period 2001-06 was 15.1%, which is higher than the world's average for this period. Given the growing economy and international trade, a lot of future potential is seen in this sector. This however would be contingent on the maritime sector being equipped to take the challenges emerging from (i) large shipping vessels and deeper draft at ports (ii) hub and feeder operations at ports and along the coast respectively (iii) hinterland connectivity between port and Inland Container Depot (ICD)/Container Freight Station (CFS) and (iv) terminal development on ports and in the hinterland. Other issues relate to use of Information Technology (IT) and better systems to coordinate with bodies like customs and industrial location policy (especially with respect to Special Economic Zones (SEZs).

2. Potential of Container Traffic

India handled 649 million tons (mt) (569 mt) of cargo traffic in 2006-07 (2005-06). The total container traffic in 2006-07 (2005-06) was 80.0 mt (67.1 mt). In terms of Twenty-foot Equivalent Units (TEUs), it was 6.0 mTEUs (5.0 mTEUs) in 2006-07 (2005-06). Growth rate of container traffic is outstripping the national Gross Domestic Product (GDP) growth rate. Table 1 gives the growth trends of national GDP, total port and container traffic.

Considering the current CAGR of 15.1%, the container traffic after 5 years (2010-11) will be 10.0 mTEUs and after 10 years (2015-16) will be 20.3 mTEUs.

As part of the study conducted by i-maritime and IPA (in May 2006), the container traffic will be 20.9 mTEUs (low estimate) and 24.1 mTEUs (high estimate) in 2015-16.

As per the National Maritime Development Programme (NMDP) forecast, container traffic would increase at 18.3% per annum over the decade 2004-14 and major ports would have 72% share. At this rate of growth, 26.8 mTEUs will be the traffic in 2015-16.

Overall, it appears that 21 mTEUs of originating and terminating traffic is likely to happen by 2015-16 and we need to get prepared for that.

---

[1] Prepared by G. Raghuram and Rachna Gangwar. Indian Institute of Management Ahmedabad. August 2007

This paper is a result of deliberations held in CENTRUM (Containerization for Trade Momentum) 2006 (July 12-13, 2006) and 2007 (August 28-29, 2007), New Delhi and further data collection and analysis by the authors.

We thank the CII Institute of Logistics for providing us the opportunity to participate in the conference and to crystallize the deliberations. The Institute also provided the rapporteurs who had documented the discussions in various sessions. We acknowledge their contribution.

Table 1: Port Traffic

Year	National GDP		Total		Major Ports		Non-Major Ports		Container				
									Major Ports			Total	
	US $b[1]	Growth[2] (%)	mt	Growth (%)	mt	Growth (%)	mt	Growth (%)	mt	000' TEUs	Share** (%)	000' TEUs	Growth (%)
2000-01	409	4.4	368	10.2	281	3.3	87	39.3	32	2468	11.5	2468	13.0
2001-02	441	4.8	384	4.3	288	2.5	96	10.3	37	2886	12.9	2886	16.9
2002-03	467	3.8	419	9.1	314	9.0	105	9.4	44	3366	13.9	3366	16.6
2003-04	554	8.5	466	11.2	345	9.9	121	15.2	51	3900	14.8	3900	15.9
2004-05	633	7.5	522	12.0	384	11.3	138	14.1	55	4233	14.3	4502*	15.4
2005-06	725	9.0	569	9.0	423	10.2	151	9.4	62	4613	14.6	4998*	11.0
2006-07	827	9.3	649	14.1	464	9.7	185[#]	22.5	73	5437	15.8	5964*	19.3

[CMIE, 2007; IPA, 2006]

1At current market prices
2At factor cost (constant prices)
#132 mt from GMB ports
*Includes traffic from Mundra and Pipavav
**Share of container traffic wrt total port traffic

3. Drivers of Container Traffic

The growth of container traffic would be driven by
- International trade growth
- Penetration of containerisation
- Hub and feeder service structure

International Trade Growth

India's export earnings in 2005-06 topped US $102 billion, recording a 23% growth over the previous year. India's import value in 2005-06 reached US $133 billion, recording a growth of 23% over the previous year. The export to GDP ratio reached 14%, while the import to GDP ratio reached 18% in 2005-06. Table 2 gives the growth of India's import export with respect to national GDP.

Table 2: International Trade Growth

Year	National GDP		Exports		Imports	
	US $b[1]	Growth[2] (%)	US $b	Growth (%)	US $b	Growth (%)
2000-01	409	4.4	44.1	20.1	50.1	0.5
2001-02	441	4.8	44.0	-0.4	51.6	3.0
2002-03	467	3.8	53.0	20.6	61.7	19.7
2003-04	554	8.5	63.9	20.5	78.2	26.7
2004-05	633	7.5	83.5	30.7	108.0	38.1
2005-06	725	9.0	102.7	23.0	133.4	23.5
2006-07	827	9.3				

[CMIE, 2007]
[1]At current market prices, [2]At factor cost (constant prices)

While trade was growing at over 20% per annum, its impact on container traffic growth could be higher, since a greater share of trade is moving towards finished goods requiring containerization.

Encouraged by the robust export/import growth, the Prime Minister had set a target of achieving a trade figure of US $500 billion by 2010. About 95% of India's foreign trade by volume and about 77% by value pass through India's seaports. Therefore, any attempt to make a significant increase in the volume of foreign trade would necessarily challenge the adequacy and capacity of Indian ports to handle the projected traffic. [http://www.public-freight.com]

Penetration of Containerization

Presently, containerized cargo represents about 30% by value of India's external trade, and this proportion is likely to grow as containerization increasingly penetrates the general cargo trades and increases its share from the current 68% to nearer international levels of around 75-80% [World Bank, 2007].

Of the principal commodities that India trades in, the commodities that are containerized include engineering goods, agricultural commodities, textiles and readymade garments, pharmaceutical products (bulk formulations) and machinery (auto and electronic).

With increased penetration, and growth in India's trade, container traffic is projected to grow from 4.5 mTEUs per annum. (in 2005) to around 21 mTEUs by 2015 [World Bank, 2007].

Hub and Feeder

Given the container traffic growth in the past few years, there seems to a scope for hub operations in India, possibly one each on the east and west coast. The absence of a hub port means that a significant share of containers leaving an Indian port goes through a feeder, transshipment and mainline movement. This implies additional delay due to the feeder voyage from India to the hub port and then at the hub port while it waits for the mainline ship to call. This has been resulting in delay of anything between 40 hours to 50 hours at an extra cost of at least US $70 per TEU [Business Line, January 28, 2004].

In the absence of a hub port in India, a majority of the country's containers are currently transshipped through other ports ie Colombo (just south of India), Singapore (east), Dubai and Salalah (west). Handling these through the Indian transshipment terminal would result in savings of between Rs 6,000 and Rs 16,000 per TEU for the Indian exporter.

The reasons for a hub port not evolving in India are
- insufficient traffic
- cabotage law
- insufficient infrastructure including draft requirement for a mainline ship

The advantages of having a hub port in India would be
- feedering time to other ports would reduce
- the revenue from the transshipment remains with India
- marine side traffic from and to the hub port will move faster and cheaper

Table 3 gives the container traffic and transshipment at Indian ports. As can be seen, the percentage of transshipment is a very small share of the total traffic, implying that Indian ports are really not providing hub services.

Table 3: Container Traffic and Transshipment at Major Ports

Year	Total Container Traffic		Transshipment	
	000' TEUs	Growth (%)	000' TEUs	%
2000-01	2468	13.0	25	1.0
2001-02	2886	16.9	169	5.9
2002-03	3366	16.6	187	5.6
2003-04	3900	15.9	208	5.3
2004-05	4233	8.5	162	3.8
2005-06	4613	9.0	181	3.9
2006-07	5437	17.9		

[IPA, 2006]

In terms of port traffic, for every transshipment container handled at a hub port, two more handlings would be required at ports, one at the same hub and another at the feeder port. Developing India's container ports to enable direct calls by mainline vessels would provide Indian shippers better access to global markets.

Table 4 gives certain forecasts made by Jawaharlal Nehru Port Trust (JNPT) for total container traffic in India, where again the figure is 23 mTEUs for the year 2016. Of this, 12 mTEUs are expected to be direct shipment, 9 mTEUs from neighbouring hubs and nearly 2 mTEUs as transshipment (implying 1 mTEU will actually be feedered on the coast).

Table 4: Forecast of Direct and Hub Traffic

Year	Total Container Traffic (000' TEUs)	Stuffed + Empty (Container Trade)					Trans shipment (000' TEUs)	%
		Direct Shipment		Hub Shipment		Total (000' TEUs)		
		(000' TEUs)	%	(000' TEUs)	%			
2006	5503	2856	51.9	2336	42.5	5192	312	5.7
2011	11492	5888	51.2	4803	41.8	10691	802	7.0
2016	**23105**	**12140**	**52.5**	**9057**	**39.2**	**21197**	**1908**	**8.3**
2021	44603	25032	56.1	15333	34.4	40365	4238	9.5
2026	82581	51613	62.5	22120	26.8	73733	8848	10.7

[Forecast by JNPT, presentation to World Bank, May 2006]

As per the projection above, 9 mTEUs (43%) of the Indian traffic of 21 mTEUs will be hubbed in 2015-16. Of the hubbed traffic, 0.95 mTEUs (11%) will be hubbed in India, implying a transhipment of 1.9 mTEUs.

This is conservative. Hubbing in India can and should develop. If 50% hubbing were to take place in India, then 4.5 mTEUs will be hubbed in India, implying transhipment handling of 9 mTEUs. About 7 more mTEUs will need to be handled at hub ports. This

requires port handling capacity of 30 mTEUs, with 9 mTEUs as transhipment at hub ports.

As per discussions in CENTRUM 2006, currently, 35% of the containers handled in the west coast ports are bound for destinations closer to the east coast. This is the optimal route due to cargo aggregation.

Given the above three drivers of container growth, we can get an insight into the break-up of the traffic across various port clusters, as per a World Bank study. Relevant excerpts of this are given in Annexure 1. The ports in the western region (Mumbai and Gujarat) would handle at least 66% container throughputs in the country, followed by the ports in the southern region at 27% and the balance at the eastern region ports.

As per this projection, the eastern ports are underleveraged. With specific interventions in terms of terminal related services and connectivity, the regional balance can move in favour of the eastern ports.

4. Shipping Trends

Looking at the current as well as the future shipping trends that are likely to emerge, it would be the era of large mother vessels, with a minimum of 6000-8000 TEU, and a few as big as 12,000-14,000 TEU. These ships would make only a few calls at mega hub ports to/from where cargo movement would be by transshipment and feedering through the present age ships of 4000 TEU and below. These future generation vessels would require drafts between 13-15.5 mtrs. These ports would also need the infrastructural facilities like wide berthing, high crane handling capacity, quicker and safe loading and unloading capabilities, and direct shift of containers to the feeder vessels.

Table 5, which gives the evolution of container shipping vessels in different periods, clearly indicates that the size of the vessels along with their draft requirement are on the increasing trend. Therefore, the ports should be geared up for deepening their draft for accommodating such types of vessels.

Table 5: Evolution of Container Shipping Vessels

Generation	**Period**	**Length** (meter)	**Draft** (meter)	**Size** (TEU)
Post Suezmax	2006-	397	15.5	>12,000
Suezmax	2005-06		15	10,000-12,000
Post Panamax Plus	2000-05	335	13-14	5,000-10,000
Post Panamax	1988-00	275-305	11-13	4,000-5,000
Panamax class	1980-88	250-290	11-12	3,000-4,000
Cellular Containership	1970-80	215	10	1,000-2,500
Converted Cargo Vessel/Tanker	1956-70	135-200	<9	500-800

[http://www.solentwaters.co.uk]

Emma Maersk (DWT 156,907, overall length 397m, beam 56m, hull height 30m, draft 15.5m) owned by the AP Moller-Maersk Group, when launched in August 2006 became the world's largest container ship ever built, and as of today the largest ship in use. (The largest ship ever built was the supertanker Knock Nevis, now retired). Officially, as stated by Maersk, Emma Maersk is able to carry around 11,000 TEUs. However, as per standard shipping calculations, it can carry between 13,500 to 14,500 TEUs [http://en.wikipedia.org].

Exhibit 1 (Annexure 2) gives the type-wise distribution of container carrying vessels in the world. The fully cellular vessels have now become the standard, providing 83.1% capacity in 2007. Exhibit 2 gives the size-wise distribution, indicating that 8,000+ TEU ships will constitute over 30% share of container movement.

The next generation will be the Malaccamax ship, with 18,000 TEUs of 200,000 DWT, 470 meter long, 60 meter wide, 16 meter of draft, with more than 100 MW power for 25.5 knots. This is expected to be the limit before a major restructuring of world container trade routes [http://en.wikipedia.org].

Hence, we can conclude that hub ports in India should aim for at least 16 meter draft and feeder ports upto 12 meter draft.

5. Potential Hub Ports in India

Given the reality of transshipment and feedering, it is important to focus on few ports on both the coasts with deep draft. The key requirements of a transshipment terminal are its strategic location, potential to reduce total transport cost using 'hub and spoke' arrangement, financial savings in terms of lower land values, less need for dredging and the facility to receive higher-capacity vessels to reduce overall fleet costs. Table 6 shows the container traffic handled at ports (including the non-major ports of Mundra and Pipavav) in 2006-07 and 2005-06. Table 7 provides a comparative analysis of various ports in terms of their physical and efficiency parameters for hub operations.

Table 6: Port-wise Container Traffic

			2006-07		2005-06	
S No	**Port**	**Operating Company**	**Total** (000' TEUs)	**%**	**Total** (000' TEUs)	**%**
1	JNPT	1. Port 2. DP World 3. AP Moller/Concor	3298	55.3	2667	53.4
2	Chennai	1. DP World 2. PSA International/SICAL	798	13.4	735	14.7
3	Mundra* (MPSEZ)	DP World	393	6.6	299	6.0
4	Tuticorin	PSA International/SICAL	377	6.3	321	6.4
5	Kolkata	Port	240	4.0	203	4.1
6	Cochin	DP World/Concor	227	3.8	203	4.1
7	Kandla	ABG	177	3.0	148	3.0
8	Pipavav*	AP Moller	135	2.3	86	1.7
9	Mumbai	Port	128	2.1	156	3.1
10	Haldia	Port	110	1.8	110	2.2
11	Visakhapatnam	DP World	50	0.8	47	0.9
12	New Mangalore	Port	17	0.3	10	0.2
13	Mormugao	Port	12	0.2	9	0.2
14	Paradip	Port	2	0.0	4	0.1
	Total		**5964**	**100.0**	**4998**	**100.0**

[CI Magazine, 2007; Indian Infrastructure, 2007; IPA, 2006]
*Non-major and private ports, both under GMB

In addition,

(i) A second container terminal at MPSEZ is nearing completion for operations.
(ii) Hazira port in Gujarat, owned by Shell Gas BV is being developed and will be operated by PSA for 1 mTEU per annum,
(iii) Dholera Port, owned by JK Group and Adani Group will develop a container terminal,
(iv) Maroli port in Gujarat has tendered for bidding for a container terminal,
(v) An off-shore container terminal (700 meter) at MPT for 0.8 mTEUs, to be developed by Gammon and Dragoddar
(vi) Rewas container terminal in Maharashtra is being developed by Reliance Logistics Investment
(vii) Dighi container terminal in Maharashtra is being developed by Balaji Infrastructure Project Ltd
(viii) Vizhinjam in Kerala is being tendered for an international container transshipment terminal (in competition to Vallarpadam in Cochin), and
(ix) A 0.5 mTEU per annum container terminal at Kulpi in West Bengal is being developed by DP World.

Table 7: Hub Operation Readiness

Readiness Level	West	South	East
High	JNPT, Mundra, Pipavav	Cochin, Chennai	Visakhapatnam
Medium	Kandla, Mumbai	Tuticorin	
Low		New Mangalore, Mormugao	Kolkata, Haldia, Paradip

[CRISIL, 2006]

The readiness level is based on the maximum vessel size at berth, high speed equipment, average turnaround time, average pre-berthing time and average parcel size. As per the CRISIL Infrastructure Advisory study, hub ports could be Mundra, Pipavav, JNPT, Cochin, Chennai and Visakhapatnam.

About 50% of the containers exported through Indian ports are transshipped at some point prior to reaching their overseas destination. Approximately 30% of containers are transshipped in either Colombo or Singapore/Klang and another 5% in Dubai or Salalah. About 50% of the container traffic is not transshipped and moves on the same vessel to the final destination port. In the case of JNPT, this proportion is above 80%. Of Indian containers transshipped in Singapore/Klang, Chennai and Kolkata account for 68%, while for Colombo the eastern and southern ports account for 87% [World Bank, 2007].

Table 8 gives the share of direct and hub shipments for JNPT and the other ports in the country.

Table 8: Direct and Hub Shipments

Per cent

	JNPT	Other Ports	Total
Share of Container Traffic	55	45	100
Direct	80	13	50
Through Hub	20	87	50

It is useful to note that while 80% of JNPT traffic is direct, 87% of all the other ports is through a hub.

Overall, water depths are low in Indian ports compared to those of neighbouring regional hubs. Table 9 gives the draft available in the various ports.

Table 9: Maximum Draft

S No	Container Terminals	Draft (meter)
1	JNPT	12.5
2	Chennai	13.4
3	Tuticorin	10.8*
4	Mundra	17.5*
5	Kolkata	7.5*
6	Cochin	12.5
7	Mumbai	10.7
8	Kandla	11.7
9	Haldia	10.0
10	Pipavav	12.5*
11	Visakhapatnam	15.0
12	New Mangalore	10.5
13	Mormugao	12.5
14	Paradip	11.5

[World Bank, 2007; *Port Website, 2006]

In contrast, Colombo, for example, one of the main hubs for transshipping Indian container cargo, has a draft of 15 metres. This is proposed to be increased further to 17 metres and eventually 20 metres. JNPT, the largest container port in the country has a draft of only 12 metres. JNPT currently handles vessels of upto 4000 TEUs compared to 8500 TEUs at Colombo. Despite handling a higher volume of traffic than Colombo (Exhibit 3), JNPT is constrained by its deficient draft from offering cheaper and higher quality services, i.e. higher frequency and lower transit times. Other ports in the region like Singapore, Dubai, Port Klang etc have drafts of at least 15 meter and can accommodate vessels upto 11,000 TEUs.

Exhibit 4 gives the traffic handled at the top 20 container ports of the world. It is interesting to note that the share global throughput of the top 20 ports was 75.9% in 1970. It dropped to 49.6% in 1980, obviously due to a proliferation of container ports. However, since then the share of the top 20 ports has been increasing in a marginally steady manner to reach 56.3% in 2006, showing the trend of concentration due to transshipment and scale economies in the bigger ports.

> The market for hub services is highly dependent on patterns of ocean container trade and a specific port's location. Perhaps even more important is the economics of the transshipment business. Rates for transshipping containers are relatively low, typically US $35 per lift. In addition, there is little if any loyalty among customers and a carrier can easily exit the terminal at short notice, giving the carrier a high degree of bargaining power. Ideally the line-haul carrier should have a long-term stake in the facility to ensure its viability [World Bank, 2007].

Based on commercial criteria, JNPT would be the logical choice for a hub port on the west coast. However, from an infrastructure perspective, neither does the JNPT have the draft for the current (and future) generation vessels nor the evacuation capability. Mundra is better placed as far as draft is concerned. As far as evacuation is concerned, while JNPT is congested, significant investments for evacuation capacity are on the anvil.

Visakhapatnam is the most viable port for hub operations on the eastern coast. It is in the centre of the India's eastern coast, and can even service Bangladesh and Myanmar. It has a natural water depth of 20 metres within a nautical mile from the coast due to which there is minimal capital dredging requirement. The sea drift there is such that maintenance dredging requirements are also less.

6. Hinterland Connectivity

Hinterland connectivity is probably the most critical area to ensure a seamless flow of containers and improved port productivity. It is an essential part of a world class logistics system that India needs to develop with a strategic focus.

Exhibit 5 provides a comparative insight of the productivity at JNPT. The terminal operated by DP World (developed and operated until 2005 by P&O Australia) has a high level of performance, both in terms of TEUs per crane/year and TEUs/meter quay/year. This terminal has set new benchmarks in terms of efficiency.

> JNPT is the most efficient container port in the country and is the preferred port for a majority of the country's container traffic, presently accounting for about 55% of the total. Table 10 presents the distance, travel time and cost of moving a container from the Delhi area to JNPT and to alternate ports. As shown in the table, even though the Gujarat ports are located a little closer, they take almost twice as long to reach. The east coast ports not only take much longer, but also cost more than twice as much in inland haulage charges. These differences restrict competition, and JNPT therefore enjoys a dominant position on account of both its better overall shipping service offerings and its superior hinterland connectivity. The Gujarat ports on the other hand, continue to lose out to JNPT due to their relatively poor connectivity, despite enjoying a closer proximity to the north-western hinterland which generates a majority of the container traffic. Even cargo destined for China or other south east Asian countries prefers to be routed through JNPT, rather than ports like Chennai on the east coast which though closer to the destination offer poor connectivity to the northern hinterland [World Bank, 2007].

Table 10: Inland Haulage Costs for Delhi Container Traffic to JNPT vs Other Ports

Port	**Distance from Delhi** (Km)	**Rail Transit Time** (Hrs)	**Haulage Costs** (Rs/TEUs)	
			Rail*	Road
JNPT	1388	48	18750	32000
Mundra	1295	80	16650	20000
Pipavav	1333	70	17000	24000
Visakhapatnam	1700	67	22450	66000
Chennai	2100	90	30000	70000

[World Bank, 2007]
*Excludes terminal charges of roughly 30%

Rail Evacuation

Currently, 30% of the JNPT traffic is expected to move hinterland by rail and the remaining moves entirely by road, mostly to nearby CFSs, and some to interior ICDs. Rail capacity is barely sufficient for current demand. As per discussions in CENTRUM 2006, CONCOR monopoly has been a deterrent to quality service. Competition has now been permitted and 15 licenses have been issued, as listed in Table 11. However, many of the licensees have signed up with CONCOR to have access to their wagons and ICDs, as required by the license conditions. This has distorted the competition to an extent.

Table 11: List of Players for Rail Container Operation

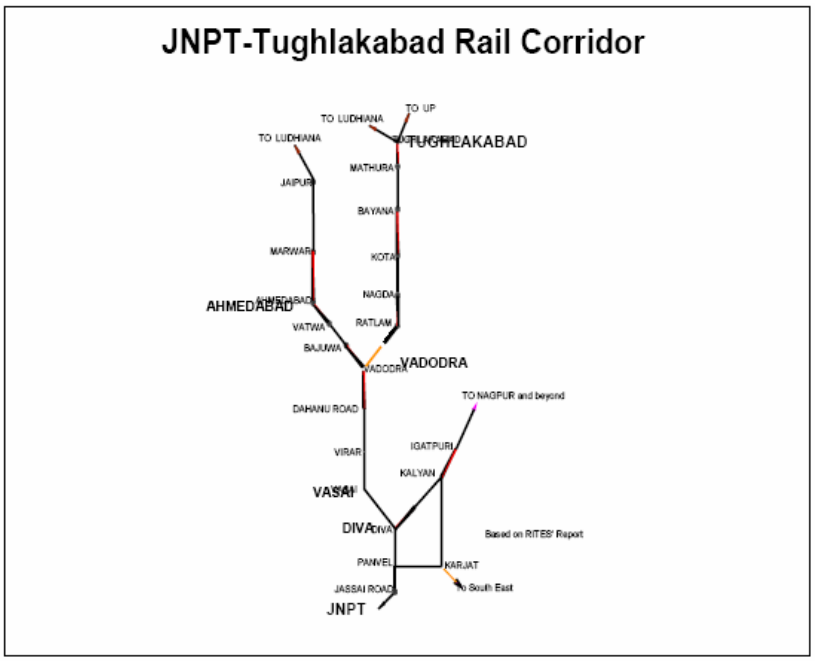
	Name of Company	**Associated with**
Category I: Rs 50 Crore (can operate on all routes)		
1.	Adani Logistics	Adani Group
2.	CWC (own ICD)*	
3.	CONCOR (own ICD)*	
4.	Dinesh/ETA	
5.	Gateway Rail Freight (own ICD)*	Gateway Distriparks
6.	Hind Terminals and MSC Agency*	Hind Terminals (subsidiary of Sharaf Group, UAE), Mediterranean Shipping Company (Geneva)
7.	India Infrastructure and Logistics*	APL India (subsidiary of NOL, Singapore), Hindustan Infrastructure Project and Engineering
8.	Container Rail Road Services**	DP World
9.	Reliance Infrastructure Leasing	Reliance (ADAG)
10.	SICAL Logistics (own ICD)	
11.	KRIBHCO	
Category II: Rs 10 Crore (can operate on all routes except JNPT/Mumbai – NCR)		
1.	Delhi Assam Roadways	
2.	Innovative B2B Logistics Solutions*	Bagadiya Shipping and Bothra Brothers
3.	Boxtrans (India) Logistics Services*	JM Baxi & Co
4.	Pipavav Rail Corporation	

*Out of the 15 licensed operators, seven have started operations
**Will start in September, 2007

Presently, for instance, it is estimated that the transport cost of a container from Delhi to Mumbai Port is almost half the total logistics costs of delivering it to a destination in Europe. Inadequate capacities in the hinterland transport modes often lead to higher costs and delays on account of sub-optimal mode choices, circuitous routing and congestion in the hinterland transport links.

The Tughlakabad-JNPT (Delhi-Mumbai) line, one of the most highly trafficked corridors in the country is a case in point (Figure 1). With an average line capacity of 50 trains per day, it has been handling over 67 trains per day, operating at a capacity utilization of 135%t, and several sections are being operated at 160% utilization levels. Roughly 40 trains on this corridor are passenger trains, leaving a limited capacity for freight trains, which have a lower priority. Congestion at the railways' Tughlakabad ICD near Delhi and on the line itself has resulted in a poor reliability of service, and high value cargo such as containers, which form the majority of the traffic on this corridor, is increasingly shifting to road transport. Presently, less than one-third of the containerized cargo in this corridor is being carried by the Railways. On average, 9,000 loaded trucks move over this corridor everyday, aggregating around 30 mt annually of road freight traffic [World Bank, 2007].

Figure 1: Rail Connectivity Mumbai to North-Western Hinterland



[World Bank, 2007]

The overall data related to hinterland flows at JNPT in Table 12. JNPT faced an acute congestion in 2004. Since then, a third container terminal has been commissioned, bringing the total throughput capacity to 4 mTEUs. A fourth terminal being considered is

likely to double the capacity. This will impose serious constraints on the facilities around the port, unless they are addressed concurrently [Raghuram, 2006].

Table 12: Hinterland Flows at JNPT Per cent

Import	
ICD by Rail	33.3
ICD by Road	4.0
En Bloc CFS	59.7
Green Channel	3.0
Export	
ICD by Rail	22.6
ICD by Road	7.5
CFS by Road + Buffer Yard	26.5 + 7.7
Factory Stuffed under Excise Seal – RTS	35.7

[Chaudhuri, A, 2006]

To provide for the rail based evacuation, the Dedicated Freight Corridor Corporation of India Ltd (DFCCIL) has been set up in 2006, with its first phase being the JNPT to Tughlakabad/Dadri and Ludhiana to Son Nagar via Dadri corridors. The western corridor will have container trains as its driving traffic.

For 21 mTEU, at 30% movement by rail, and 90 TEU per train, over 190 trains would need to run per day. (Currently, about 40 trains are running per day, over 25 of which are on the JNPT Tughlakabad corridor). Double stack would ease this to about 120 trains per day. About 35-45% of these would be on the stretch near JNPT, picking up an additional 25-30% from the Gujarat ports.

PPP model with ports and related stake holders should be used for rail capacity development. Kutch Railway Corporation and Pipavav Railway Corporation are examples. The DFCCIL should evolve appropriate models, based on past experience and future requirements.

Road Evacuation

To provide for the road based evacuation, while the National Highways Development Programme is providing inter-regional connectivity with some success, not all port based connectivity projects have been successful. Three such project contracts were recently annulled.

Beyond just the four laning of highways, expressway connectivity to the ports to service major flows would be essential. The currently envisaged future phases of NHDP do not provide for this.

In terms of local road connectivity around ports and ICDs, there is no explicit planning for consequential trailer movements for empty containers and empty trailer movements. Recent studies show that these could be as high as six to seven movements per TEU [Raghuram, 2006]. Similarly, there is no planning for trailer parking, maintenance, facilities for drivers etc. These could lead to avoidable congestion and first/last mile problems.

PPP model for roads around ports can be used with ports and ICD/CFS operators as the stake holders. A need for immediate attention would be the ICD at Tughlakabad.

Coastal Shipping and Inland Waterways

The potential of coastal shipping and inland waterways is untapped and needs to be developed to lessen the load on the railways and road networks and bring down the costs since cost of cargo movement by sea is significantly less than the cost by road and rail. Feedering from an Indian transshipment port would naturally be a coastal movement.

The possibility of a dedicated sea corridor with inter-port connectivity needs to be explored. Integration with coastal and inland water transport for evacuation needs proactive consideration.

ICD/CFS Infrastructure

Given that ICD/CFS business is open to anybody, there would not be a concern regarding the supply. The concepts of SEZs and Free Trade Warehousing Zones would only further facilitate such infrastructure. The conditions imposed on the private rail container operators reinforce the same direction.

However, the following would need intervention.

- *Location and access, giving consideration to distance to manufacturing units, local connectivity with minimum traffic interference*
- *Customs and bonded warehouse*
- *Rail connection to gateway ports*
- *Parking spaces and maintenance facility*

7. Other Issues

Information Technology (IT)

While IT use for container logistics would be commercially driven, policy and industry level interventions would be necessary to develop standards, networking and information sharing, and even knowledge products. Technologies such as Radio Frequency Identification Device (RFID) and Global Positioning System (GPS) should be leveraged to achieve effectiveness and efficiency.

Domestic Traffic

While container movement has been primarily viewed in the context of international trade, domestic container movement is slowly picking up and needs focus for development. Most of the domestic container movement is expected to be by rail (Concor). During 2006-07, out of over 2 mTEUs moved by Concor, nearly 0.4 mTEUs were for the domestic market (Table 13).

Table 13: CONCOR Traffic

In TEU

Year	International	Domestic	Total	Annual Growth (%)
1996-97	424,741	278,801	703,542	-
1997-98	491,481	230,238	721,719	2.6
1998-99	576,790	225,156	801,946	11.1
1999-00	664,490	243,329	907,819	13.2
2000-01	755,670	291,304	1,046,974	15.4
2001-02	905,058	326,775	1,231,833	17.7
2002-03	1,031,925	351,238	1,383,163	12.3
2003-04	1,251,618	350,501	1,602,119	15.8
2004-05	1,376,516	351,460	1,727,976	7.9
2005-06	1,556,714	373,848	1,930,562	11.7
2006-07	1,715,661	389,605	2,105,266	9.0

[CI Magazine, 2007]

This would also create an opportunity for customised containerization. For example, while the standard container does not permit double stacking under electric traction wires, specially designed lower height containers for automobiles have permitted double stacking under wire. Opportunities in customized containerization should be leveraged, as specific segment volumes increase.

Leasing and Manufacture

Availability of containers, wagons, tractor/trailers and cranes as support equipment is critical. India does not have enough manufacturing base for such equipment. China is currently the world leader in this domain. There is big opportunity for India to develop a manufacturing base, not only to cater to our requirement, but also for the export market.

In the context of containers, leasing by non-shipping line owners has been leveraged internationally for efficient use of containers. However, the share of the leased fleet has dropped from 50% in 1981 to 40% in 2006 (Exhibit 6). With better IT for container tracking, the leased fleet has utilizations over 90%, with the cost of leasing showing a decreasing trend (Exhibits 7).

Exhibit 8 gives the annual global manufacture of containers, which stands at over three million in 2006. Exhibit 9 brings out the profile of container manufacturers, showing Japanese dominance in 1978, Korean dominance in 1992 and Chinese dominance in 2006. At even US $1500 per TEU, India should be able to compete by manufacturing containers at less than Rs 60,000 per TEU. The manufacturing base in India is small and could do with a focus on incentivized growth.

Location Policy of Industries Including SEZs

As part of evolving world class export and import logistics, the government has embarked on the policy of developing SEZs. As on July 31, 2007, 135 SEZs had been notified under the SEZ Act apart from the 19 that were operational prior to the SEZ Act of 2005. Of the 154 SEZs (Table 14), 67 are manufacturing driven while the rest are IT and IT enabled services based. Of the 67, 39 are coastal and the rest 28 are away from the coast and would hence require focus on connectivity.

Table 14: Location of SEZs

	Coastal	**Non-Coastal**	**Total**
Manufacturing	39	28	67
IT/ITES	24	63	87
Total	**63**	**91**	**154**

As far as possible, it would be a good idea to locate SEZs near ports. The same would apply for industries, where a focus on appropriate zoning of industrial development to minimize connectivity requirements with planned linkages including by Inland Water Transport would be essential. Gujarat has been proactive in this through a policy of port led industrial development.

Regulation

It is important to ensure appropriate regulation for the following:

Licensing

Issues of ensuring sufficient competition, along with capability to deliver with appropriate national security would be key criteria in licensing. There have been debates on private sector monopoly, when P&O Australia won the bids and operated many terminals in the South Asian region. P&O Australia has now been taken over by DP World and the same issue continues. Exhibit 10 provides an insight into the concentration of terminals (62% of throughput in 2006) operated by the top five terminal operating companies.

There are guidelines on there being at least two operators in a port and no more than two terminals per operator. These guidelines need to be reviewed and linked with TEU capacity and not number of terminals.

Security

Security was a matter of concern in the context of Hutchison bidding for Chennai Even DP World had to give up some of its US acquisitions due to perceived security concerns.

Operational security at ports including screening of containers has gained significance after 9/11.

Port Tariffs

While India has a Tariff Authority for Major Ports (TAMP), the question has often been raised as to whether we need the TAMP, and even if so, whether the regulation should be cost based. Recently the PSA International operated container terminal at Tuticorin port resisted the reduction in tariffs imposed by TAMP and consequently reduced their throughput.

It would appear that with the number of terminals that India has and is developing, competition is increasing and the market itself can regulate the tariffs.

Shipping Line Conferences

In the container shipping business (which is a hangover of liner business), cartel like conferences of shipping lines operated in route based markets to control schedules and tariffs. While these were frowned upon, they were never regulated. Recently, the Competition Commission of India raised the issue that such conferences were anti competitive and that shipping lines should set tariffs and compete independently.

Independent of conferences, there is an increasing market concentration in the container shipping business. Exhibit 11 gives a perspective on the concentration of container shipping among the top 20 carriers, which has increased from 38.8% in 1990 to 72.7% in 2006. This is reflective of the mergers and acquisitions, which seem to be a rather continuous activity of this business.

Customs

Customs need to become more process friendly with increased usage of green channel. The data gathered by customs, especially with Electronic Data Interchange, can be used to create much required Origin Destination (OD) data for traffic profiling.

Cabotage

The cabotage rules of not allowing foreign flag vessels for coastal shipping need to be reviewed. The main trade of is between protection for Indian flags versus more competition and supply. In today's world of liberalization led growth, it would appear that cabotage must be lifted as a matter of long term policy. An attendant measure would be to provide the same concessions to coastal shipping as international shipping. As was voiced in CENTRUM 2006, cabotage should not become a sabotage!

Other Areas of Regulation (which are not being elaborated)

- Environment and conservation
- Safety
- Quality of service
- Dispute resolution

8. Concluding Issues

Based on the above analysis, the following issues need consideration:

- Landlord port with privately operated terminals would be the way forward. Existing ports should be empowered for this
- There should be clear delineation of roles between landlord and operator. This does not exist at JNPT presently (JNPT vs JNPCT)
- The public port authority will focus more on
  - **landlord function** such as long-term planning, infrastructure development, asset management
  - **regulatory function** such as maritime safety, environment protection and fair competition, and
  - **co-ordination function** such as coordination among governmental agencies, maritime organizations, decision-making authorities and planners of the city, under the commonly shared long- range policy and planning
  - **facilitation/promotion function** such as provision of port EDI, inter-port cooperation and strategic marketing
- There is not enough focus on scale of container terminals. This is necessary to drive down costs.
- Tendering and bidding should be done in a time definite manner. There should be a flexible framework in place for terminal development by private parties under a landlord port. There are significant beauracratic delays (eg second terminals in Tuticorin and Chennai). Labor is not always in favour and needs to be dealt with.
- Global tendering would be essential to get the most competitive supply. Dredging is an example.
- Acts governing ports and related activities need to be reviewed and liberalized (MS Act, IP Act, Maritime Trade Practices Act, etc).

- Training to bring in a supply chain and marketing mind set among executives of all stakeholders in this sector is critical. OD data on port traffic should be systematically gathered and published. IPA should drive this with support from Customs and Concor. EDI based data would help.
- Top management stake holding, especially through the civil service, is not compatible with strategizing port development. Technocrats, with appropriate incentives and accountability should be brought in.

The largest increases in container traffic are expected to occur in the western region, with the Mumbai and Gujarat port clusters together requiring capacity additions on the order of 10 mTEUs, from about 4 mTEUs now to over 14 mTEUs by 2015. Of this about 6 mTEUs of capacity is expected to be needed in the Mumbai cluster, and another 4 mTEUs in the Gujarat cluster. The other cluster where a large increase in container traffic is expected is in the Cochin/Tuticorin cluster where an additional 4 mTEUs of capacity will be needed. These three port clusters would then account for 14 mTEUs of the 16 mTEUs of additional capacity needed for container traffic through the year 2015. Achieving this level of capacity increases in the Mumbai, Gujarat and Cochin/Tutitcorin clusters would largely address the container traffic requirements through the year 2015.

The 191 mt or 15 mTEUs capacity shortfall for container traffic projected for 2015 would only partially be filled by capacity expansions planned under the NMDP. The NMDP envisages the creation of an additional 11 mTEUs of container handling capacity in the near term. The remainder would need to be developed in the State ports sector primarily through private investments, and some of these are already being planned or under implementation such as at Mundra and Rewas. The investments proposed under the NMDP include large expansions of container handling capacity at Tuticorin, Cochin, JNPT and Mumbai port. This appears to fit well with the strategy of developing container facilities where the demand is greatest (the western and southern ports) and in the southern cluster which has proximity to international shipping routes [World Bank, 2007].

For 30 mTEUs per annum, as per normal international standards of 1000 TEUs per annum per mt of berth length, we need 30 km of berth length. By JNPT standards where demand is continuously available and productivity is high, this could be as low as 15 km. However, providing for a reasonable 70% occupancy, we need 21 km. At 300mts per berth, this translates to 70 berths. Currently we have 27 berths. An additional nine berths have been signed up as stated earlier in this paper. So there is a need for atleast 30 more berths. While this is a target, market forces will drive the actual berth development.

The additional investment required could be of the order of US $7.5 billion based on a 300 mts berth cost of US $250 million (Rs 1000 crore). With JNPT standards, and focusing on Suezmax vessels at hub ports, berth productivity can be doubled and the investment requirements brought down. A detailed cost benefit analysis, keeping in view

the costs of accommodating large vessels and benefits of increased productivity including due to hubbing in India needs to be carried out.

Indian infrastructure for logistics is poor compared to world class and at best reactive to demand. There is need for continued focus on quality infrastructure development with speed. Commercialization and private involvement through PPP contracts is the key for building global trade competitiveness through containerization.

References

1. Chaudhuri, A (2006). 'De-regulation within the Rail Market,' Presentation.
2. CI (2007). Containerization International, 40th Anniversary Issue, 2007.
3. CI (2007a). Containerization International, May, 2007.
4. CMIE (2007). Centre for Monitoring Indian Economy
5. CRISIL (2006). CRISIL Infrastructure Advisory Study.
6. Drewry (2006). 'Container Shipping Services from Asian Ports,' Drewry Maritime Services, New Line, December 2006.
7. i-maritime and IPA (2006). 'India Port Sector Strategy – Demand and Capacity Assessment Study,' Draft Final Presentation, May 08, 2006.
8. IPA (2006), 'Major Ports of India,' Indian Ports Association, New Delhi.
9. Levinson, Marc (2006). 'The Box,' Princeton University Press, New Jersey.
10. Raghuram, G (2006). 'A Diagnostic Study of Jawaharlal Nehru Port Trust,' Working Paper No 2006-04-09, Indian Institute of Management, Ahmedabad, April 2006
11. World Bank (2007). 'India: Port Sector Development – Possibilities for Accelerating Growth,' June 26, 2007.
12. http://en.wikipedia.org
13. http://www.solentwaters.co.uk
14. http://www.public-freight.com

Annexure 1: Excerpts from World Bank Study

While container traffic has grown across the country, the growth has not been uniform. The bulk of the demand originates in the north-western hinterland which accounts for close to 70% of the container cargo in the country. The western ports catering to this vast hinterland have experienced a container traffic growth rate of 16.9% between 2000 and 2005 and western ports handled roughly 3.1 mTEUs in 2005. JNPT near Mumbai alone accounted for over 55% of the containers handled in the country. The Southern hinterland is the next largest, accounting for roughly a quarter of the container demand, and traffic there grew at an average of 13.9% per annum during 2000-05. Based on the growth and industrialization trends in these regions of the country, it is unlikely that a major shift in the relative size of these regional shares will occur in the near term.

As shown in Table given below, the port clusters expected to have the largest volumes in 2015 are the Mumbai cluster with a traffic volume of 10 mTEUs (using 12 tons of cargo per TEU on average), the Gujarat cluster with around 5 mTEUs, and the Cochin/Tuticorin cluster with about 4 mTEUs. Present container handling capacity at India's ports is estimated to be around 5.7 mTEUs, and achieving a handling capacity in excess of 21 mTEUs by the year 2015 presents an enormous challenge. What is most noteworthy in the Table is the increase in projected traffic at some port clusters (Visakhapatnam, Gujarat, Cochin/Tuticorin) where the projections call for a 10 to 20 fold increase by 2015.

Region	**Port Clusters**	**Traffic** (mt)		**Share** (%)		**Increase**
		2005	**2015**	**2005**	**2015**	**2015/2005**
Eastern	Kolkata	4.4	8.5	8	4	1.9
	Paradip	0.0	0.1	0	0	4.3
	Visakhapatnam	0.6	12.9	1	5	20.1
	Total	**5.1**	**21.1**	**9**	**8**	**4.2**
Southern	Chennai	9.9	25.3	17	10	2.6
	Cochin/Tuticorin	5.5	46.3	10	17	8.4
	New Mangalore	0.1	0.4	0	0	2.6
	Mormugao	0.1	0.4	0	0	3.0
	Total	**15.6**	**72.4**	**27**	**27**	**4.6**
Western	Mumbai	31.3	116.7	54	44	3.7
	Gujarat	6.1	57.5	11	22	9.4
	Total	**37.4**	**174.2**	**64**	**66**	**4.7**
	Grand Total	**58.1**	**267.5**	**100**	**100**	**4.6**

The factors driving future traffic demand in the various port clusters are (i) regional economic growth and creation of new manufacturing sites, (ii) improvements in port connectivity that make specific ports more accessible, (iii) changes in Indian and global shipping patterns that impact routing decisions of Indian shippers and (iv) actions by local governments and port managers to increase the port's reach in the country's

container trade. The first two drivers can be modeled and their impact on future traffic volumes estimated. The third driver can also be modeled, though with less precision as it is a daunting task to predict how future global shipping patterns will evolve and impact shippers routing decisions. The fourth driver is dependent on decisions at the local level that create competitive edge and determine who gains and loses market share. The last is the focus of a strategy development and business planning activity now being undertaken by each of the Major ports at the urging of the Planning Commission.

Western Ports' Container Traffic

Ports in the western region (Mumbai and Gujarat clusters) are expected to continue to dominate India's container trades, handling at least two-thirds of the container throughput in the country in 2014-15. This forecast of market share reflects the proximity of western ports to major manufacturing and consumption centers in the north-western hinterland, and their access to the extensive container services circulating in the Arabian Sea area. While the regional shares of traffic remains relatively stable, there could be a significant shift in the division of traffic handled among the ports in the region.

JNP is forecast to remain India's major container port, but it is expected to face increasing competition from ports in the Gujarat region. The private ports of Mundra and Pipavav in Gujarat have already made significant in-roads into the container traffic of the northwestern hinterland and other Gujarat ports have similar plans. Connectivity issues for the Gujarat ports are being resolved through various innovative public-private partnership arrangements for road and rail connectivity. In Maharashtra, the proposed Rewas-Aware port south of Mumbai, could also create additional competition for JNP. So the current JNP/Mumbai 57% share of container traffic will likely be eroded as competition in the region increases. However, while JNP's market share may decline, the absolute volume of cargo will continue to increase and is expected to almost quadruple over the period to 2015.

Southern Ports' Container Traffic

As shown in Table 2.2, traffic through southern ports is expected to increase more than four-fold between 2005 and 2015, with a market share of 27%. The NMDP traffic projection for these ports is even more bullish, envisaging the four southern ports of Cochin, Tuticorin, Chennai and Ennore handling 4 mTEUs in 2011-12, or 32% of the total throughput in Indian ports. The forecasts implicitly assume that hinterland connectivity of these ports will be improved in a timely manner.

Traffic growth at Cochin will be dependent on the development of the International Container Transshipment Terminal (ICTT) at Vallarpadam. The recent acquisition of P&O Ports by Dubai Ports World gives the latter control of ICTT as well as Colombo Port which is an established transshipment terminal with major expansion plans of its own (Colombo South Harbor, see Box 2.1). Developments are also planned at Tuticorin where the Port of Singapore has the concession for container terminal development. All

of these facilities coming on stream should create the conditions for strong competition in the transshipment business and provide shippers with adequate options for efficient container services.

Eastern Ports' Container Traffic

Ports in the east are handicapped in so far as container traffic is concerned by 1) a limited manufacturing base, 2) distance from the main international shipping routes, and 3) poor connectivity to the markets and manufacturing centers of northern India. The latter could be corrected with infrastructure improvements but the former two are more difficult constraints. Consequently, container traffic at the eastern ports show limited potential overall. Among eastern ports, however, Vizag port shows high growth primarily due to the fast developing state of Andhra Pradesh in its hinterland and its growing consumer economy.

While some Eastern ports would appear logical gateways for containers moving between India and the far-east, it is often more economical to service this trade using the west coast ports which have better access to the mainline container services in the Arabian Sea. Another factor affecting the availability of direct shipping services from the east coast to the Far-east is the systemic imbalance of empty containers heading east from the Gulf countries which results in low freight rates on exports from India to the Far-east. Consequently, east coast ports are expected to continue to rely on feeder services to hubs such as Colombo and Singapore which will allow them to take advantage of this systemic imbalance.

[World Bank, 2007]

Annexure 2: Global Data on Containerization

Exhibit 1: Type-wise Distribution of World Container Carrying Vessels

1980

Vessel Type	**No of Ships**	**No of Ships** (%)	**Capacity** (TEU)	**Capacity** (%)
FC	831	32.4	799,101	52.3
MP	1,279	49.9	489,533	31.5
Others	455	17.7	248,314	16.2
Total	**2,565**	**100.0**	**1,527,948**	**100.0**

[CI Magazine, 2007]

2007

Vessel Type	**No of Ships**	**No of Ships** (%)	**Capacity** (TEU)	**Capacity** (%)
FC	4,040	46.7	9,858,547	83.1
MP	3,119	36.1	1,177,334	9.9
Others	1,490	17.2	833,080	7.0
Total	**8,649**	**100.0**	**11,868,961**	**100.0**

[CI Magazine, 2007]
FC=Fully Cellular, MP=Multi-purpose

There has been a polarization towards fully cellular ships at the expense of multi-purpose/semi-containerships. These ships have an advantage over other types due to guided and fast loading. In 1980, the share of fully cellular ships to the total ships was 32.4% which increased to 46.7% in 2007. In terms of world container capacity, in 1980, fully cellular ships accounted for 52.3% share. This increased to 83.1% by 2007.

Exhibit 2: Size-wise Distribution of Capacity and Share of Fully Cellular Fleet

2007

Size (TEU)	**No of Ships**	**No of Ships** (%)	**Capacity** (TEU)	**Capacity** (%)
8,000+	117	2.9	1,011,867	10.3
5,000-7,999	417	10.3	2,484,406	25.2
2,000-4,999	1,301	32.2	4,175,063	42.3
Below 2,000	2,204	54.6	287,211	22.2
Total	**4,040**	**100.0**	**9,858,547**	**100.0**

[CI Magazine, 2007]

2007 (Orderbook)

Size (TEU)	**No of Ships**	**No of Ships** (%)	**Capacity** (TEU)	**Capacity** (%)
8,000+	162	13.7	1,511,883	32.5
5,000-7,999	170	14.4	1,042,383	22.5
2,000-4,999	436	36.9	1,575,309	33.9
Below 2,000	413	35.0	516,097	11.1
Total	**1,181**	**100.0**	**4,645,672**	**100.0**

[CI Magazine, 2007]

Economies of scale have dictated an upward trend in sizes of container ships in order to reduce costs. 8,000+ TEU ships currently account for only 2.9% of the total ships and 10.3% of the capacity of the fully cellular fleet. However, 13.7% of the fully cellular fleet ships booked in 2007 are of 8,000+ TEUs which will account for 32.5% of total ship capacity.

Exhibit 3: South Asian Ports' Throughput

Port	**2006** (TEU)	**Change** (%) **2006/2005**
India		
Jawaharlal Nehru Port*	3,300,000	45.6
Chennai*	870,362	18.4
Mundra**	393,000	31.7
Tuticorin*	377,102	17.5
Kolkata*	344,324	9.7
Cochin*	225,000	10.8
Kandla*	176,000	18.4
Mumbai*	138,201	-11.5
Pipavav**	135,167	65.4
Visakhapatnam*	52,000	4.0
New Mangalore*	17,290	79.2
Bangladesh		
Chittagong**	882,411	12.6
Mongla*	20,000	-21.7
Pakistan		
Karachi***	1,065,000	-7.1
Port Qasim**	633,500	17.1
Sri Lanka		
Colombo**	3,079,132	25.4
Total	**11,708,489**	**22.8**
Share of Global Throughput	3.2%	

[CI Magazine, 2007a]
*fiscal year April 1 to March 1 (2006/07)
** calendar year 2006
*** estimate for fiscal year 2006/07 (July- June); other estimates based on first 8-11 months' performance are italicised

Exhibit 4: Top 20 Container Ports

	Port	**Region**	**Traffic** (TEU)	**Port**	**Region**	**Traffic** (TEU)
	1970			**1980**		
1	New York/New Jersey	ECNA	930,000	New York/New Jersey	ECNA	1,947,000
2	Oakland	WCNA	336,364	Rotterdam	N Europe	1,900,707
3	Rotterdam	N Europe	242,328	Hong Kong	East Asia	1,464,961
4	Seattle	WCNA	223,740	Kaohsiung	East Asia	979,015
5	Antwerp	N Europe	215,256	Singapore(PSA)	South-east Asia	916,989
6	Belfast	N Europe	210,000	Hamburg	N Europe	783,323
7	Bremen/Bremerhaven	N Europe	194,812	Oakland	WCNA	782,175
8	Los Angeles	WCNA	165,000	Seattle	WCNA	781,563
9	Melbourne	Australasia	158,127	Kobe	North-east Asia	727,313
10	Tilbury	N Europe	155,082	Antwerp	N Europe	724,247
11	Larne	N Europe	147,309	Yokohama	North-east Asia	722,025
12	Virginia	ECNA	143,231	Bremen/Bremerhaven	N Europe	702,764
13	Liverpool	N Europe	140,419	Baltimore	ECNA	663,000
14	Harwich	N Europe	139,627	Keelung	East Asia	659,645
15	Gothenburg	Scandinavia/Baltic	128,270	Busan	North-east Asia	632,866
16	Philadelphia	ECNA	120,000	Tokyo	North-east Asia	631,505
17	Sydney	Australasia	117,985	Los Angeles	WCNA	620,988
18	Le Havre	N Europe	107,995	Jeddah	Red Sea	562,792
19	Anchorage	WCNA	100,731	Long Beach	WCNA	553,709
20	Felixstowe	N Europe	93,099	Melbourne	Australasia	512,864
	Total		**4,069,375**	**Total**		**17,269,451**
	Share of global throughput		75.9%	Share of global throughput		49.6%
	Global Total		**5,363,235**	**Global Total**		**34,805944**

[CI Magazine, 2007]
ECNA= East Coast North America, WCNA= West Coast North America

	Port	Region	Traffic (TEU)	Port	Region	Traffic (TEU)
	1990			**2006**		
1	Singapore	South-East Asia	5,223,500	Singapore	South-East Asia	24,792,400
2	Hong Kong	East Asia	5,100,637	Hong Kong	East Asia	23,230,000
3	Rotterdam	N Europe	3,666,666	Shanghai	East Asia	21,710,000
4	Kaohsiung	East Asia	3,494,631	Shenzhen	East Asia	18,468,900
5	Kobe	North-east Asia	2,595,940	Busan	North-east Asia	12,030,000
6	Los Angeles	WCNA	2,587,435	Kaohsiung	East Asia	9,774,670
7	Busan	North-east Asia	2,348,475	Rotterdam	N Europe	9,690,052
8	Hamburg	N Europe	1,968,986	Dubai	Middle East	8,923,465
9	New York/New Jersey	ECNA	1,871,859	Hamburg	N Europe	8,861,545
10	Keelung	East Asia	1,828,143	Los Angeles	WCNA	8,469,853
11	Yokohama	North-east Asia	1,647,891	Qingdao	East Asia	7,702,000
12	Long Beach	WCNA	1,598,078	Long Beach	WCNA	7,290,365
13	Tokyo	North-east Asia	1,555,138	Ningbo	East Asia	7,068,000
14	Antwerp	N Europe	1,549,113	Antwerp	N Europe	7,018,799
15	Felixstowe	N Europe	1,417,693	Guangzhou	East Asia	6,600,000
16	San Juan	Caribbean	1,381,404	Port Klang	South-east Asia	6,320,000
17	Bremen/Bremerhaven	N Europe	1,197,775	Tianjin	East Asia	5,900,000
18	Seattle	WCNA	1,171,090	New York/New Jersey	ECNA	5,092,806
19	Oakland	WCNA	1,124,123	Port Tanjung Pelepas	South-east Asia	4,770,000
20	Manila	East Asia	1,038,905	Bremen/Bremerhaven	N Europe	4,450,000
	Total		**44,367,482**	**Total**		**208,162,855**
	Share of Global Throughput		52.4%	Share of Global Throughput		56.3%
	Global Total		**84,642,133**	**Global Total**		**369,719,521***

[CI Magazine, 2007]
* Provisional

In 1970, the total container traffic was 4.0 mTEUs. In 2006, Singapore alone handled 24.8 mTEUs. There has been a tremendous shift in the throughput. Scale economy, more players (ports), consolidation and bigger ships were some of the factors that accounted for huge throughputs. Asia gained market share in the past 40 years and currently dominate the 2006 container throughput league. In 1970, there was only one Asian port in top 20 lists, the port of Yokohama in Japan. In 2006, 12 out of 20 top ports were from Asian countries. China alone handled more about 50% of traffic in 2006.

Exhibit 5: Container Berth and Crane Productivity Across Ports

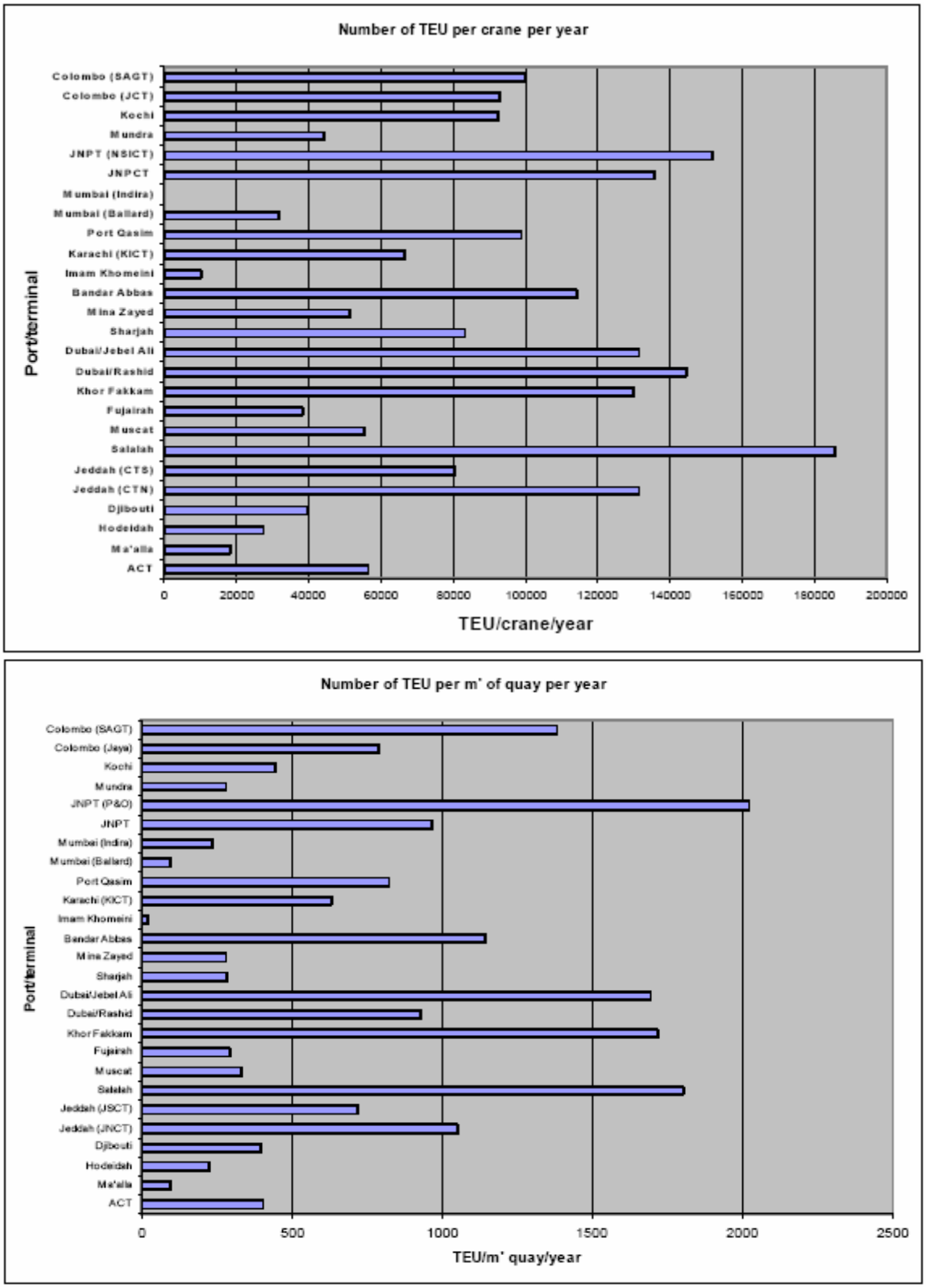


Exhibit 6: The Leasing Hierarchy

	Company	**Fleet** (TEU)	**Company**	**Fleet** (TEU)
	1981		**2006**	
1.	CTI	360,000	Textainer Group	1,525,000
2.	Flexi-Van Corp	245,000	Triton Container	1,390,000
3.	Transamerica ICS	215,000	Florens Group	1,245,000
4.	Sea Containers	205,000	TAL International	970,000
5.	Itel Containers	185,000	GESeaCo	925,000
6.	Interpool Group	160,000	Interpool Group	760,000
7.	Xtra Inc	90,000	CAI	670,000
8.	Contrans GmbH	90,000	Capital Lease	520,000
9.	Catu Containers	50,000	Cronos Container	405,000
10.	Trans Ocean Leasing	40,000	Gold Container	365,000
11.	ICCU Containers	40,000	UES	275,000
12.	Nippon Intl Container	35,000	Carlisle Leasing	150,000
13.	Textainer Group	15,000	GVC	145,000
14.	CLOU-Compass	15,000	Amficon Leasing	120,000
15.	Hansetanier	15,000	XINES	120,000
16.	IEA	15,000	Waterfront Leasing	90,000
17.	Nippon Container Lease	13,000	CARU	60,000
18.	Ideal container	13,000	Blue Sky Intermodal	55,000
19.	X-County Leasing	12,000	Bridgehead Services	40,000
20.	Shirlstar Container	12,000	Exsif Worldwide	35,000
	Total	1,825,000	**Total**	9,865,000
	Top 20 Share	**94.8%**	**Top 20 Share**	**95.9%**
	Global Lease Feet	1,925,000	Global Lease Feet	10,290,000
	Share of Total (Leased+Owned) Container Fleet	50.0%	Share of Total (Leased+Owned) Container Fleet	40.0%

[CI Magazine, 2007]

Exhibit 7: Global Lease Fleet

Year	**Fleet Size*** (TEU)	**Utilization** (%)	**Per Diem Rate**** (US $)
1966	5,000	95.0	1.50
1970	120,000	85.0	1.50
1974	465,000	78.0	1.20
1978	1,030,000	85.0	1.80
1982	2,050,000	80.0	1.85
1986	2,315,000	75.0	1.40
1990	2,755,000	90.0	1.80
1994	4,350,000	87.0	1.35
1998	6,190,000	81.0	0.85
2002	8,010,000	83.5	0.60
2006	10,290,000	92.0	0.70

[CI Magazine, 2007]
* Year-end
**New build 20ft placed on five year term

Exhibit 8: Global Production

Year	**Annual Output** (TEU)	**Annualized 20ft Price** (US $)
1966	40,000	1,500
1970	130,000	2,000
1974	185,000	1,800
1978	475,000	2,500
1982	460,000	2,000
1986	430,000	1,700
1990	805,000	2,700
1994	1,150,000	2,300
1998	1,480,000	1,700
2002	1,740,000	1,350
2006	3,050,000	1,850

[CI Magazine, 2007]

Global production of container boxes in terms of annual output has increased by 76 times in past 40 years. The sector has changed fundamentally in terms of its geographical speed, the type/size of the company involved, its scale of operation and cost structure, and even the materials and construction techniques used.

Exhibit 9: The Box Building Hierarchy

Company	Country	Output (TEU)	Company	Country	Output (TEU)	Company	Country	Output (TEU)
1978 (Japanese Dominance)			**1992 (Korean Dominance)**			**2006 (Chinese Dominance)**		
Tokyu Car	Japan	115,000	Hyundai Precision	South Korea*	230,000	CIMC Group	China	1,565,000
Hyundai Precision	South Korea	25,000	Jindo Corp	South Korea*	90,000	Singamas Group	China*	585,000
Officine Franchin	Italy	18,000	EHIC Group	Taiwan*	70,500	CXIC Group	China	280,000
Nippon Fruehauf	Japan	17,500	Hyosung Metal	South Korea*	50,500	Jindo Corp	China (S Korea)	165,000
Nippon Strick	Japan	17,000	Signgamas Group	China	45,000	Hyundai Mobis	China (S Korea)	90,000
Ste Trailor	France	16,500	Union Container	Taiwan*	45,000	Maersk	China (Denmark)	65,000
Morteo Soprefin	Italy	16,000	Bangkok Cont Ind	Thailand	40,500	China Shipping	China	55,000
Nippon Trailmobile	Japan	15,000	Hung Myung Ind	South Korea	40,000	EHIC (Malaysia)	Malaysia	50,000
Alna Koki Co	Japan	13,500	AIC Group	Taiwan*	36,500	PT Aspex Kumbong	Indonesia	40,000
Fruehauf France	France	11,500	CIMC Group	China	35,000	Hung Dao Container	Vietnam	15,000
Other		210,000	Other		452,000	Other		140,000
Total		**475,000**	**Total**		**1,135,000**	**Total**		**3,050,000**

[CI Magazine, 2007]
*Also includes overseas production

Exhibit 10: Leading Container Terminal Operating Companies

		2006 (mTEU)	**2005** (mTEU)	**Change** (%)
1.	Hutchison Port Holdings	56.5	51.8	9.0
2.	PSA International	51.3	41.2	24.5
3.	APM Terminals*	47.1	40.0	17.8
4.	DP World	42.1	35.0	20.3
5.	Cosco Pacific	32.8	26.1	25.7
	Total	**229.8**	**194.1**	**18.4**
	Share of Global Throughput	62.1%	55.0%	7.1%

[CI Magazine, 2007]
*CI Estimate

The top operators control 62.1% of total container handling activity, up from 55.0% in 2005. All of the terminal operating companies have grown very strongly over the past five years. PSA and APM terminals, mainly through securing operating concessions, HPH through a mix of organic growth and acquisitions and DP World by buying several of its rivals, including CSX World Terminals in 2005 and P&O Ports in 2006. Until 1990, global stevedores really did not exist, with only Hutchison Port Holdings having sizable operations outside of its Hong Kong base which was in China.

Exhibit 11: Top 20 Ocean Carriers

	Carrier	**Traffic** (TEU)	**Carrier**	**Traffic** (TEU)
	1990		**2006**	
1.	Evergreen	130,916	AP Møller-Maersk [1]	1,600,012
2.	Sea-Land Service	115,367	Mediterranean Shipping Co	937,145
3.	Maersk	94,703	CMA CGM [2]	597,677
4.	NYK	78,148	Evergreen [3]	539,801
5.	Mitsui OSK Lines	70,338	Hapag-Lloyd	448,840
6.	APL	66,380	Cosco	385,368
7.	OOCL	58,117	China Shipping Container Lines	339,545
8.	K Line	55,462	Hanjin Shipping [4]	328,307
9.	Cosco Shanghai	54,505	APL	323,319
10.	Hapag-Lloyd	53,178	NYK [5]	313,049
11.	Hanjin Shipping	49,621	Mitsui OSK Lines	284,848
12.	P & O Containers	49,368	OOCL	268,502
13.	Yangming	46,817	CSAV [6]	249,885
14.	Zim Israel Navigation	44,916	K Line	241,772
15.	Nedlloyd Lines	40,335	Yangming	223,192
16.	Baltic Shipping Co	36,760	Hamburg Sud [7]	217,018
17.	Neptune Orient Lines	35,294	Zim Integrated Shipping Services	213,795
18.	ScanDutch	32,948	Hyundai Merchant Marine	153,850
19.	CGM	29,040	Pacific International Lines [8]	141,391
20.	Delmas Vieljeus	31,204	Wan Hai Lines	117,767
	Total	**1,173,413**	**Total**	**7,925,083**
	Top 20 Share	**38.8%**	**Top 20 Share**	**72.7%**

[CI Magazine, 2007]
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

The top 20 carriers accounted for 38.9% of the total fleet capacity in 1990, which increased to 72.7% in 2006. Several mergers and acquisitions took place during this period. Out of the 20 top carriers, 13 were from Asia in 2006, holding a fleet capacity share of 46.6%.