TENDENCY OF WORLD CONTAINER TRANSPORTATION AND IT'S IMPACT ON INDONESIAN CONTAINER NETWORK AND PORT DEVELOPMENT

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ABSTRACT

Since the introduction of containerization, container throughput in the world has continuously increased. The sustained growth of container trade has been accompanied by the globalization of container shipping market which indicated by emerging very large vessel, performing alliances, concentration in liner shipping, and restructuring container network lead to hub and spoke network. The above tendency of world container transportation has given significant impact on Indonesian container port. This paper analyzes the effect of world container market and globalization in liner shipping over Indonesian container port. The poor performance, physical constrain, lack of the hub port are the main problem facing container port in Indonesia. Development of container hub port, increasing private sector participation, improvement port facility and performance, changing technology and information systems, increasing quality services are the key factors for development of Indonesia container port in order to survive on severe global container port competition.

Keywords: globalization, container port, development strategy

1. INTRODUCTION

In the process of globalization, containerization is continuing to make a vital contribution to the rapidly growing international trade. It provides shippers with safe, easy and relatively cheap access to international markets in any part of the world through a highly integrated, efficient network of trunk routes and feeder services utilizing transshipment opportunities. The sustained growth of container trade has been accompanied by the globalization of container shipping market. Severe competition among container shipping has forced owners to implement innovative, productivity-enhancing and cost-cutting strategies. Successively larger vessels have been employed on mainline trades. New service patterns have evolved, including 'Round-the-World' and 'Pendulum' services.

In their search for cost reduction and faster transit times, lines have reduced the number of port calls, leading to the growth of 'hubs' or 'load centers' and the evolution of feeder networks. Very large ('mega') carriers' are emerging and lines are entering into various types of strategic alliance. Currently, 4,000-6,000 TEU vessels already dominated major Asian deep-sea trades. Since 2002, ships in excess of 6,500 TEU have come into operation on Asian routes and some carriers are considering constructing and deploying even larger ships. Increased concentration in liner shipping makes it vitally important for a port to keep its existing shipping company tenants. However, increased vessel size gives shipping lines incentives to look for ports with deeper access channels, berthing areas, and higher dockside and terminal efficiency to reduce the turn-around-time. It will also reduce the number of port calls to maximize the productivity of "mega vessel".

Globalization in liner shipping has already had a significant impact on Indonesia container network and port development strategy. With the continuing growth in trade through Indonesia's ports, the increasing rate of containerization, and anticipating globalization in

liner shipping, there is a broad range of initiatives of port development strategy. This paper analyzes the effect of world container market and globalization in liner shipping over Indonesian container port. The paper consists of seven sections. The next section, we discuss about development of container market in the world. Section three explores the tendency of container transportation. Section four analyzes problems of Indonesian container port. In section five and six we discuss about Indonesian container network and port development strategy. Conclusion is presented on section seven.

2. DEVELOPMENT OF CONTAINER MARKET IN THE WORLD

Since the introduction of containerization, container throughput in the world has continuously increased due to economic growth, and several other factors including container penetration of general cargo trades, the movement of empty containers and increased trans-shipment. Owing to a combination of these factors, container throughputs have increased even in periods of regional recession, as was the case during the Asian economic crisis. Figure 1 shows the growth in world container trade. In 1973 container throughput was 15.0 million TEU and in 2005 it was 387.7 million TEU. It means the growth in world container trade reach almost twenty six-fold during four decades with average annual growth of 10.8 percent.

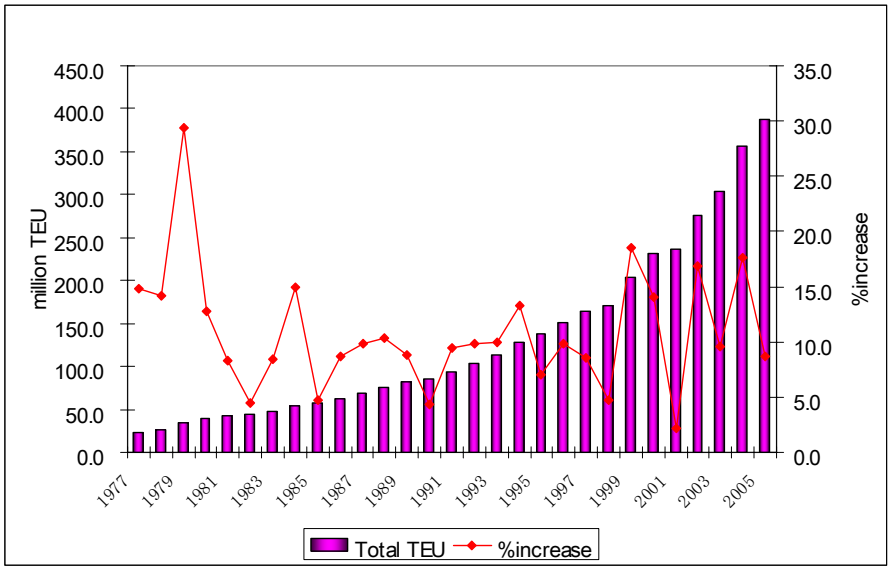

Figure 1. Growth in world container trade, 1973-2005
Source: Containerisation International Yearbook, various years, and UNCTAD (2007)

3. TENDENCY OF CONTAINER TRANSPORTATION

3.1 Increases in vessel size

As response to the increase in worldwide demand of liner shipping, intense competition, and the existence of economies of vessel size, the size of container vessels has increased dramatically. Economies of vessel size come up from the technical characteristics of container shipping that is the capital cost per container slot falls as vessel size increases, while the ratio of operation cost per unit of cargo carried also decline as vessel size increases. Given such economies, the size of the largest container vessels has increased in regular steps. Three generations of container ship entered on service between the mid-1960s and the mid-1980s (see Table 1). By the mid-1990s the largest container ships employed on mainline trades had a capacity of about 4,500 TEU.

Table 1. Growth in size of containership

Year	Class/type	Maximum Capacity (TEU)
1964-1967	First generation	1000
1967-1972	Second generation	1500
1972-1984	Third generation	3000
1984-1995	Fourth generation	4500
1995/96 onwards	Fifth generation	over 6000

Source: Cullinane, K, et. al (2000)

The capacity of first and second generation was less than 1000 TEU and 1500 TEU. Third and fourth generations are those ships classified as Panamax as they are still capable to pass the Panama Canal. The historical tendency for ship size to increase re-emerged in the mid 1990s with the emergence of fifth generation classified as post-Panamax as they are no longer able to pass the Panama Canal. There is considerable debate over the future of very large container vessels. Operationally, Hapag Lloyd has 7,200 TEU vessels while Hanjin and other Asian shipyards have developed blueprints for vessels of 8,400 TEU and above. In August 2000, Ocean Shipping Consultants predicted that vessels of 12,500 TEU vessels would be introduced by 2010 (*Shipping Times*, 28 August 2000). There has been some discussion of the technical and commercial feasibility of introducing 18,000 TEU – Malaccamax – container vessels in the long run. Figure 2 provides illustration of growth in size of containership more clearly.

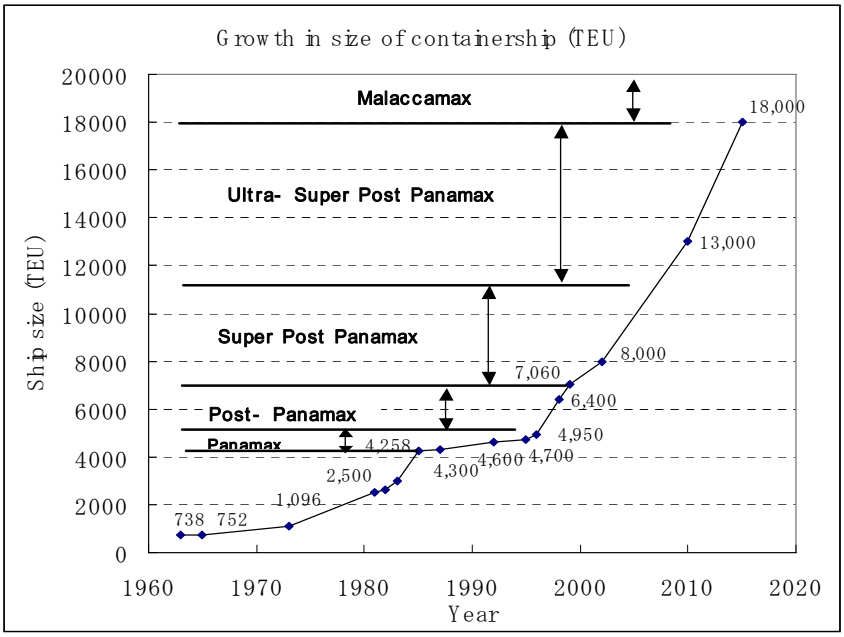

Figure 2. Growth in Size of Containership
Source: Japanese Government, Ministry of Land & Transportation, 2004

3.2 Alliances, acquisitions and mergers

Like many other industries, the global container shipping industry has been undergoing a period of restructuring and consolidation in the 1990s, reflected in formation of global strategic alliances, merger and acquisition. Alliances, acquisitions and mergers have been seen as elements of an industry-wide strategy to return to profitability via cost cutting and rationalisation (UNCTAD, 1998).

The current alliances began on August of 1995, which four alliances had been announced (Brooks, 2000a) as shown in Table 2, (1) The Global alliance, comprised APL, MOL, OOCL and Nedlloyd, (2) The Grand alliance made up of Hapag-Llyod, Neptune Orient Line (NOL), Nippon Yusen Kaisha (NYK), and P&O, (3) Maersk and Sea-Land, and (4) The alliance of Hanjin, DSR-Senator and Cho Yang line. The pattern of alliances changed dramatically between 1995 and 2001. In 1997, there was the reorganization of the two most important global alliances, i.e. the Grand Alliance and the Global Alliance, due to the creation of P&O Nedlloyd (January 1997) and the takeover of APL by NOL (April 1997).

Table 2. Changing alliances

Alliance	1995 members	1997 (December)	2003 (October)
Global alliance (New World Alliance)	APL MOL OOCL Nedlloyd	APL (NOL) Hyundai MOL	APL (NOL) Hyundai MOL
Grand Alliance	Hapag-Llyod NOL NYK P&O	Hapag Llyod MISC NYK P&O Nedllyod	Hapag Llyod MISC NYK P&O Nedllyod OOCL
Maersk/Sea-land	Maersk Sealand	Maersk Sea-Land	
Tricon/Hanjin (United Alliance)	Cho Yang DSR-Senator Hanjin	Cho Yang DSR-Senator Hanjin	
Cosco/K-Line/ Yang Ming		Cosco K-Line Yang Ming	CKYH Alliance: Hanjin/DSR Senator UASC K-Line Yang Ming COSCO

Source: Brooks (2000b) and Junior, et al (2003), Nottebom (2004)

By performing alliances, the parties agree on utilization of vessels, including joint vessel route assignments, itineraries, sailing schedules, the type and size of vessels to be employed, additions and withdrawal of capacity, ports and port rotations on a global scale. In other words, each participant's services are fully integrated into one operating system. Participants in alliances may include national and cross-traders, as well as conference and non-conference lines (*World Trade Organization,* 1998).

3.3 Concentration in liner shipping

The trend to larger ships and performing alliances, mergers and acquisition has been accompanied by a clear tendency toward concentration or consolidation of carriers in liner shipping in attempt to capture economies of scale and scope. Concentration in liner shipping means that relatively larger shipping companies are increasing their market share at the expense of the remaining smaller players (ECLAC, 1998). Although this process is not new, it has gained strength and is particularly affecting ports and shipping services in developing regions. Table 3 shows this trend. The Market share of the top 20, which is dominated by members of alliances, reported by *contanerisation international* controlled by 38.8% of TEU capacity in 1990, 41.6% in 1992, 43.7% in 1993, 46.2% in 1994 and almost 50% in 1995. Even, in 2005, the top 20 controlled 71% of world total capacity.

Table 3. Top 20 carriers' share of total liner shipping capacity, 1997-2005

Year	World Total Capacity * (TEUs)	Top 20 Carriers' Capacity (TEUs)	Share (%)
1997	5,265,745	2,669,210	51
1998	5,878,214	3,113,455	53
1999	6,021,107	3,345,200	56
2000	6,536,841	3,723,400	57
2001	7,270,533	4,269,032	59
2002	7,750,564	4,766,399	61
2003	8,354,000	5,277,277	63
2004	8,835,000	5,924,572	67
2005	9,355,000	6,641,003	71

Source: Containerisation International, various years
Note: * Includes Fully cellular, Ro-ro and Non-cellular

3.4 Liner shipping services network

a. Round-the-world, pendulum and multi-string services

Due to the intense competition in container markets, in the last two decades carriers have reshaped their liner shipping networks through the introduction of new types of round-the-world services, pendulum services, and multi-string services, especially on the main east-west trade lanes (Notteboom, 2002). Since vessels employed on 'Pendulum' services, unlike those employed in RTW services, are not required to transit the Panama Canal, post-Panamax vessels may be used. The number of multi-string services expanded greatly during the 1990s. Owners offering multi-string services broaden the scope for direct calls by operating a number of strings, each of which offers different port calls and/or a different port rotation.

b. Multiport direct call versus hub-and-spoke networks

Since the early days of containerisation, the shipping and ports industry has considered a possible change from direct call or `multiport' itineraries (Baird, 2002). Cullinane et al. (1999) suggest that direct calls by mainline vessels are being rationalised as carriers seek higher levels of return from their assets. Container lines have sought to minimise costs by limiting the number of port calls. Cargo to and from the region served by a hub port is handled by feeder shipping and/or by land transport. The trade-off between feeding and extra handling costs, and the extra costs of calling at an additional port should be evaluated to determine the degree of load centering or `hubbing'. Wijnolst, (2000) concluded that the hub-feeder system could only be competitive if there was a substantial percentage of containers on the deep-sea vessel that are not feedered (ie about 35%± 45%).

4 PROBLEMS OF INDONESIAN CONTAINER PORT

4.1 Poor performance

There are many ways of measuring port performance/productivity, namely, physical indicators, factor productivity indicators, and economic and financial indicators (Bichou et al, 2004). Physical indicators generally refer to time measures and are mainly concerned with the ship. Berth occupancy rate is the percentage of time vessels are berthed at port. Turnaround time is total time between arrival and departure for all ships divided by number of ships. Working time is total time that berthed ships were actually worked for all ships divided by the number of ships (UNCTAD, 1976). The performance of Indonesian ports reflected by berth

occupancy rate, vessel turnaround time and working time ratio is relatively poor as shown in Table 4. Overall, the simple average for berth occupancy rate for all ports was 59 percent (*Directorate of Ports and Dredging*, 2004). This suggests that with increased growth in trade volumes by sea, and the increasing containerisation of that trade, dramatic increases in delay and waiting times can be expected in the near future.

Table 4. Indonesian port productivity indicators at major container port

Port	Berth occupancy Rate (percent)	Turn-arround Time (hours)	Working time (hours)	Working time percent of turn-around
Tanjung Priok	65.9	84.3	47.4	56.2
Tanjung Perak	79.4	144.6	34.2	23.7
Belawan	63.0	67.9	19.2	28.3
Makasar	56.3	135.5	97.4	71.9
Tanjung Emas	58.3	78.0	48.8	62.6
Panjang	38.7	54.9	16.1	29.3
Banjarmasin	71.5	47.9	22.7	47.4
Pontianak	35.1	45.7	18.8	41.1
Palembang	60.5	61.9	15.7	25.4

Source: Directorate of Ports and Dredging, Operational of Port, 2004

4.2 Physical constraints

Another major problem of container port is the lack of infrastructure available in each port as shown in Table 5. Only a few of commercial ports have container terminals, equipped with the necessary cranes and other moving equipment. In some smaller commercial ports, ships must use their own gear. In other cases particular shipping lines keep own their equipment at the port, but to ensure their own competitive advantage do not make it available to other shippers. Space for container storage and stuffing is extremely limited in many Indonesian ports. As a result, users typically must transport their containers to and from their factories or yards raising overall distribution costs. Port depth appears to be a major problem in virtually every port in Indonesia. Indonesia's particular geographic and climatic conditions results in very few natural deep-water harbors and a river system prone to serious siltation that restricts port depth. For many ports, continuous dredging is a very real and expensive reality.

Table 5. Terminal facilities of selected major container port in 2004

Port Name	Province	Classification	Terminal Facilities in 2004					
			Berth	Max. Depth (m)	Length (m)	Crane	Storage (TEU)	Cont. Yard (m2)
Tanjung Priok	Jakarta	Full Cont. term.	13	14	2,988	29	39,000	1,626,000
Tanjung Perak	East Jawa	Full Cont. term.	1	11	1,450	11	9,000	400,000
Belawan	North Sumatera	Full Cont. term.	2	11	850	3	7,292	139,727
Makasar	South Sulawesi	Full Cont. term.	2	12	500	5	7,616	114,416
Tanjung Emas	Central Jawa	Full Cont. term.	1	10	345	3	7,400	70,000
Panjang	Lampung	Semi Cont. term	1	12	300	2	4,745	45,000
Banjarmasin	South Kalimantan	Semi Cont. term	1	9	510	2	2,000	30,000
Pontianak	West Kalimantan	Semi Cont. term	1	6	100	1	n.a	25,000
Palembang	South Sumatera	Semi Cont. term	1	10	150	1	n.a	46,000

Source: Port Authority and Port of the World 2006

4.3 Lack of a transshipment port

Currently, most Indonesian exports and imports moving by sea are shipped via the port of Singapore. Most large transoceanic ships do not make direct calls at Indonesian ports and most international shipping services from Indonesia are merely feeder services to Singapore. Even most of Indonesia's intra-Asia trade is transshipped through Singapore. Development of an effective transshipment port understandably represents an important priority for the government's maritime policy. With the volume of containers almost 3 million per annum, the port of Tanjung Priok has potentiality to attract transoceanic service direct calls. It is essential that port facilities should be developed systematically as gateways, which could be called by several kinds of international container trunk route services such as Transpacific service and Europe/East-Asia service.

5 LINER SHIPPING SERVICES NETWORK FROM/TO INDONESIA

Most of seaborne trade from/to Indonesia is form/to Asian countries as shown in Table 6. An example, direct call services frequency from Tanjung Priok port as the biggest container port to Asian countries accounted for 88 calls/week, while services frequency to Europe and Oceania only 1 call/week, and no direct call to American countries. Container movements from/to America still use Singapore, Hong Kong, and Taiwan port as the transshipment port. The port performance, facilities, and depth of berth seem to be reasons of few frequency of direct call from trunk line route services which usually employ the big vessels. The table also indicates most of direct call services to Indonesia container port are dominated by Singapore, Malaysia and Japanese port. Figure 3 shows container port network in Indonesia. There are four main ports that usually used to export and import cargo, namely, Tanjung priok, Tanjung Perak, Belawan, and Mekasar port.

Table 6. Direct call services frequency per week to Indonesian container port

	Port Call					
Country	T. Priok	T. Emas	T. Perak	Belawan	Panjang	Palembang
Singapore	25	13	13	4	10	2
Malasyia	14	11	7	4	8	
Thailand	1				1	
Philippines	8	1	4			
Japan	12	1	6	2		
Korea	6		3	1		
Hong Kong	9	2	7	2	1	
China	5	1	2		1	
Taiwan	8	2	5	2		
Oceania	1					
Europe	1					

Source: Containerisation International Yearbook 2006

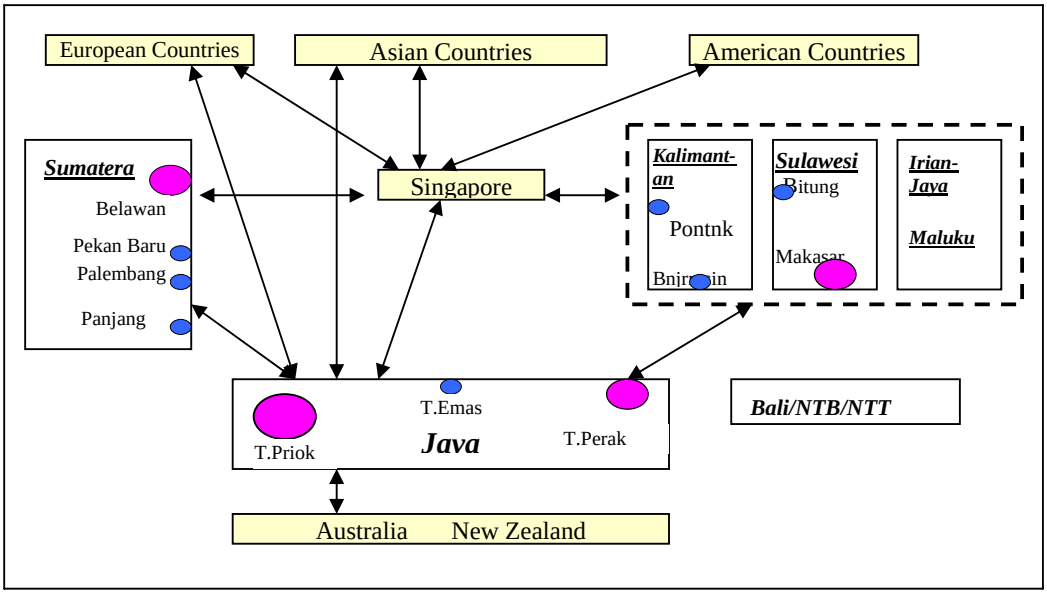

Figure 3 Container port networks in Indonesia
Source: compiled from table 6.

6. Development strategy of Indonesian container port

6.1 Developing the hub port

More than 80% of international cargo of Indonesia is transported through Singapore feeder service and transshipment cost in Singapore bring about the high cost of this transportation. In order to minimize transportation cost, a more efficient and effective container cargo transport system should be established in Indonesia, including direct call by intra-Asia long distance container service and international trunk line container services. For the development of an international hub port in Indonesia, volume of the OD containers in the hinterland should be mainly considered. The port complex of Tanjung Priok/Bojonegara has the potential of becoming an international container "hub port," that would attract direct calls of transoceanic liner shipping services. Such a development, together with further development of the Surabaya port of Tanjung Perak, could result in a significant reduction in Indonesia's shipping costs for exports and imports.

6.2 Increasing private sector participation

Increasing private sector participation is necessary not only as a means to fund this modernisation program, but also as a means to introduce worlds best practice, technology and know-how. Moreover, if designed and implemented carefully, increasing private sector participation should result in the injection of much needed competition into the port sector, leading to better port services at lower prices. A general rule of thumb within the privatisation literature is that whenever privatisation is carried out in a competitive environment (or in a situation where abuses of market power are effectively constrained by the regulatory environment) there are net welfare benefits to the community by way of better quality services (or goods), delivered in a more responsive and at lower prices. Privatisation in a non-competitive environment typically results in the transfer of a monopoly from the public sector to the private sector, with little or no benefits for the consumer or user.

6.3. Improvement port facility and performance

As mentioned previously, physical constraints and port performance seems to be the problems of Indonesia container port. Port authority should take an action to improve the existing port

in order to increase the competitiveness of port. The container port should be developed with port facility with high-level productivity and international standards. International shipping lines are operated on extremely tight schedules under the hard competitive shipping market. Delay on schedule causes a heavy cost burden to the shipping lines. As a result, terminal operators are always requested to provide shipping lines with quick dispatching service for vessel arriving at the port. Preparation of documents should be also be done long before the vessels arrival, and terminal operators are required to provide shipping companies with punctual operations not to interfere with shipping schedule. In order to cope with the above situation, the terminal operators should improve their management and operations in Indonesia.

6.4 Changing technology and information systems

The economics of container ship operations are critically dependent on port productivity. The increasing containerization of world trade brings major technology changes in both shipping and port. The introduction of mega-ships will lead to structural changes, including an extension of the "hubbing" concept. This means that trans-shipment (feeder vessel to mainline vessel) may be concentrated in fewer regional ports. These hub ports will need post-Panamax cranes, deep water, a large amount of back-up land and efficient intermodal connections. The larger container vessel pose new problem and challenges for ports. To begin with, not many of Indonesian container ports have the draft or maneuvering room to accommodate the bigger vessels. Even if there were no such physical limitation, the ports would find themselves unable to handle vessels of such size with existing technology.

6.5 Quality supporting services

Drewry (1998) reported that shippers tend to choose Singapore because they benefit from faster transit times, less congestion and greater range and frequency of services, even though it is more expensive than others port in the region. Hence, the underlying fact is that Singapore, besides the port infrastructure, is able to provide reliable and quality services to meet shippers' demand. In this sense, despite the fact that Tanjung Priok have made tremendous investments in terms of upgrading port capacity and equipment, what is lacking now is quality supporting services.

6.6 Infrastructure and institutional support for a total logistics centre

Due to global shifts in international production, especially in distributed offshore production, transportation and logistics become critical in the just-in-time production practiced by most multi-national manufacturers today. Therefore, it appears that the development of an efficient multimodal environment and a total logistics service sector is necessary. Recent trends in transportation and shipping practices point out clearly that shipping lines are not the only major customers of ports. Ports also have to accommodate other users such as shippers and consignees, distribution companies, storage companies, manufacturers and so on. Therefore, the ability to control the transportation chain by offering more value added services to these customers would definitely boost the competitiveness of ports.

7. CONCLUSION

Globalization in liner shipping which indicated by increasing vessel size and performing alliances, concentration in liner shipping, and restructuring container network lead to hub and spoke network, has already had a significant impact on Indonesia container port development strategy. As the biggest archipelago country in the world with over 17,000 islands, the existence of sea transportation in Indonesia play important role as the engine of growth, trade

and development. The poor performance, physical constrain, lack of the hub port are the main problem facing container port in Indonesia. The port complex of Tanjung Priok/Bojonegara has the potential of becoming an international container "hub port," that would attract direct calls of transoceanic liner shipping services. Such a development, together with further development of the Surabaya port of Tanjung Perak, could result in a significant reduction in Indonesia's shipping costs for exports and imports. Beside that, increasing private sector participation such as dedicated terminals which means to facilitate the development of integrated services and to bind shipping companies to terminals; improvement port facility and performance such as increasing port productivity, port depth, handling equipment; changing technology and information systems; and increasing quality services are the key factors for development of Indonesia container port in order to survive on severe global container port competition.

8. REFERENCES

Baird, A.J. (2002): "The Economics of Container Transhipment in Northern Europe", *International Journal of Maritime Economics*, 4, pp. 249-280.

Bichou, K., and Gray, R. (2004): "A logistics and Supply Chain Management Approach to Port Performance Measurement", *Maritime Policy & Management.* Vol.31, No.1, pp. 47 - 67.

Brooks, M.R. (2000a): *Sea Change in Liner Shipping: Regulation and Managerial Decision Making in a Global Industry* (Oxford, Pergamon Press).

Brooks, M.R. (2000b): "Restructuring in the Liner Shipping Industry: A Case Study in Evolution", http://www.mgmt.dal.ca/sba/cibs/a013-papers/DP-176.pdf

Containerisation International Yearbook, Informa, UK, various years

Cullinane, K.P.B and Khanna,M (1999), Economics of Scale in Large Container Ships. *Journal of Transportation Economics and Policy* 33 (2), 185-208.

Cullinane, K. and Khanna, M. (2000): "Economics of Scale in Large Containership: Optimal Size and Geographical Implication", *Journal of Transport Geography*, 8, pp. 181-195.

Directorate of Ports and Dredging (2004): "*Operational Port"*, Indonesian Port Corporation.

Drewry (1998): *South East Asian Shipping, The Fundamentals of Opportunities and Uncertainty*, Drewry Shipping Consultants, London.

ECLAC (1998): Concentration in Liner Shipping, Its Causes and Impacts for Ports and Shipping Services in Developing Regions (LC/G.2027), United Nations publications.

Junior, G.A.D.S., Beresford A.K., and Pettit, S.J. (2003): "Liner Shipping Companies and Terminal Operators: Internationalisation or Globalisation?" *Maritime Economics & Logistics*, 5, pp. 393-412.

Notteboom, T.E. (2002): "The interdependence between liner shipping networks and intermodal networks", *Proceedings of IAME Panama Conference, 2002*, Panama.

Shipping Times, 28 August 2000

THEO E. NOTTEBOOM, 2004, Container Shipping And Ports: An Overview, Review of Network Economics Vol.3, Issue 2 – June 2004, pp. 86-106.

UNCTAD (1976) *Port Performance Indicators* (United Nation, Geneva).

UNCTAD (1998) *Review of Maritime Transport, 1998* (United Nation, Geneva).

UNCTAD (2007) *Review of Maritime Transport, 2007* (United Nation, Geneva).

Wijnolst, N. (2000): "Ships, Larger and Larger: Containerships of 18,000 TEU ± Impacts on Operators and Ports", *Dynamar Liner Shipping 2000 Workshop*, London, 19th May, 13-29 (Dynamar: Rotterdam)

World Trade Organization (1998): "Maritime Transport services", http://www.wto.org/english/tratop_e/serv_e/w62.doc.