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Global Ports: Trends and Opportunities

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Executive Summary

The global trade engine sputtered in late 2008 as the world economy took a sudden and unexpectedly sharp downturn. Ports that had struggled to keep up with demand in recent years found their situations reversing in a matter of months. With a bleak economic outlook anticipated in 2009 and only a muted recovery in 2010, trade flows may take some time to regain momentum. Economic turmoil inevitably produces confusion and disruption, but from this, opportunity arises. Such is the case with the world's ports today.

This paper is divided into three sections which progress sequentially. The first section asks the question, how did we get here? To answer this, we review the drivers of global trade, map out the world's primary trade routes, trace the evolution of the shipping industry, and identify a group of global ports that will be the primary focus of the remainder of the paper. Some important preliminary ideas fall out of this section. First, one trade route/trade region quickly emerges from the analysis as having substantially greater potential than the others. Second, for analytical reasons, it is important to narrow the focus to container ports at this point rather than cover all ports in general. And third, there are striking parallels in the evolution of airline/airport competition that offer a roadmap for investors to consider as they evaluate risks and opportunities within the competitive hierarchy of shipping and ports.

The second section drills down into the regions – Asia Pacific, Europe/Mideast/Africa (EMEA), and Americas – to focus on current conditions. Here we review and document key regional trends, with a focus on competitive positioning of individual ports, development plans, and infrastructure linkages into the hinterlands.

The third section briefly reviews investment trends in each region with a focus on long-term opportunities across the world's major container ports. We examined a variety of variables – both national and port level, both qualitative and quantitative. Based on these variables, we developed a scoring process for evaluating global container ports with the greatest potential for future success.

Global Markets and Seaborne Trade

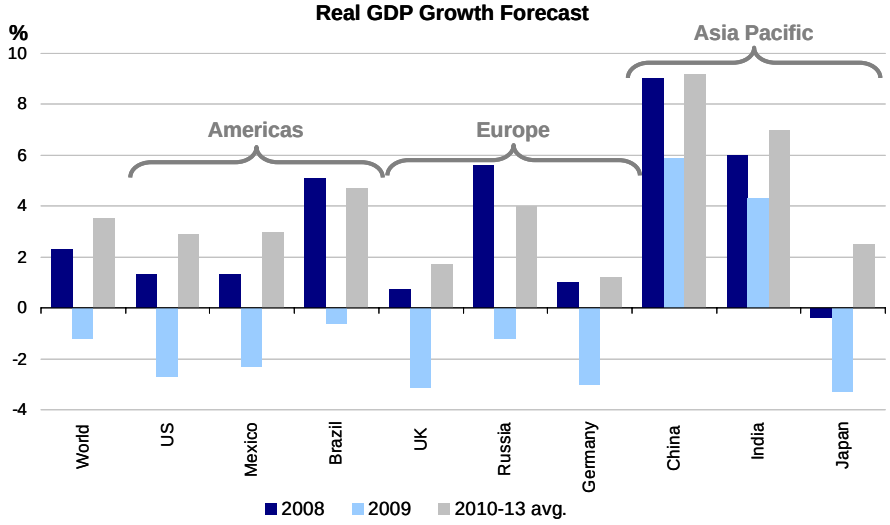
In this section, we review the evolution and current state of seaborne trade from four separate angles. First, we look at the macro-economic drivers of trade, including the political underpinnings. Second, we examine the durability and malleability of global trade routes. Third, we turn to changes in the shipping industry. And finally, we consider the nodes for processing all of this global trade activity – the ports themselves.

Drivers of Global Trade

Three basic variables drive the trade process – supply, demand, and the policy framework that supports markets. This is underscored by a range of supporting trends that involve demographics (population growth, urbanisation, educational attainment), economics (foreign direct investment, capital flows, process differentiation and outsourcing), and governance (regulated markets, transparency). A growing rejection of protectionist philosophies and rising long-term GDP levels across countries underscore the appetite for increasing volumes of trade in the years ahead.

Given the current economic situation, 2009 will be a distracting and disruptive bump in this long upward road, but the current downturn is unlikely to force a permanent shift in the long-term trajectory of open-market policies. While worldwide GDP forecasts for 2009 are discouraging, the long-term view for global trade remains positive. For now, ports show acute sensitivity to national and global economic conditions. Freight flows have already responded quickly to the shifting economic environment. Looking ahead to the eventual economic recovery, the focus will return to emerging markets, including the BRIC countries.[1] Global Insight's latest forecast (Exhibit 1) shows that slower growth in some of the BRIC countries will still outpace developed-world countries in 2009 and beyond.

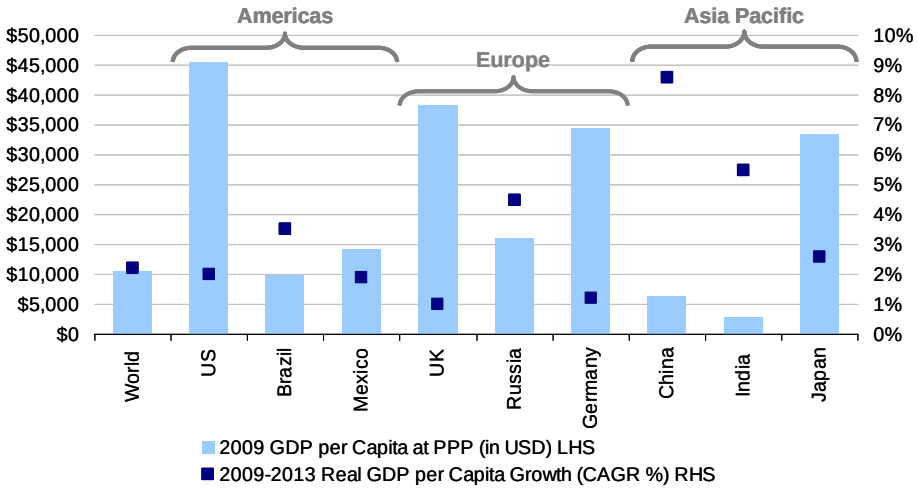
Exhibit 1
Real GDP Growth Forecast



Source: IHS Global Insight, 2009 Q1 Forecast

Current forecasts of GDP per capita (Exhibit 2) underscore the themes of rising levels of wealth, with BRIC showing the strongest long-term growth potential. Still, this type of analysis should always be read in context. In Japan, for example, the surprisingly robust outlook for per-capita GDP growth may be due more to a stagnant denominator (population) than to a sharp increase in the numerator (GDP).

Exhibit 2
Rising Levels of Wealth

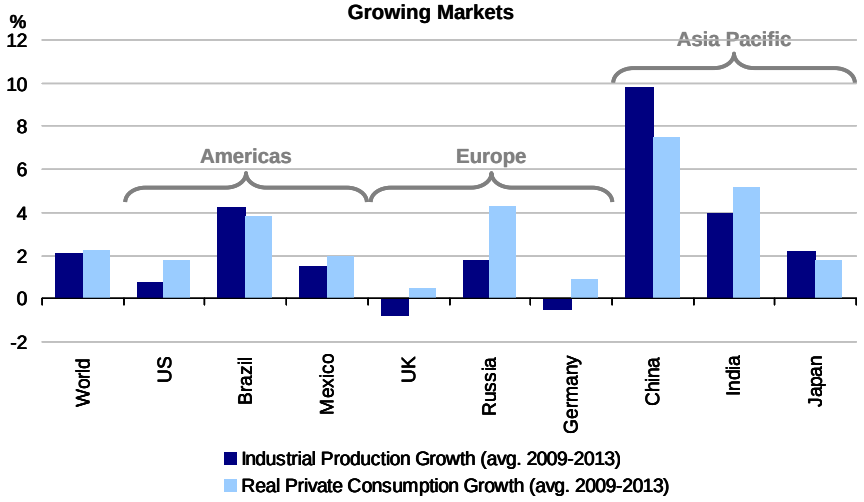


Source: IHS Global Insight, 2009 Q1 Forecast

[1] The BRIC countries are Brazil, Russia, India, and China.

Exhibit 3 shows how supply and demand indicators are expected to regain momentum over the medium to long term, especially in BRIC. Industrial production in China will rise faster than its private consumption over the next four years, indicating the role China will play as a producing and exporting country. In both India and Russia, private consumption growth will outpace industrial production growth. This indicates primary structural differences among these BRIC economies, and it offers insight into the drivers of future port activity in terms of exports versus imports. Despite the global slowdown, both indicators imply a certain level of resilience in the Asia Pacific region since both variables are seen as proxies for import and export activities.

Exhibit 3
Growing Markets



Source: IHS Global Insight, 2009 Q1 Forecast

Despite an upbeat long-term outlook, the economic and trade picture in 2009 appears gloomy. The global economic downturn is in full swing at the world's ports. As of January 2009, container traffic at the combined Los Angeles and Long Beach ports was off 16 percent from the same month in 2008.[2] These two ports form the major gateway into the U.S. for Asian-produced consumer goods, and their container traffic volumes began to plummet amid the pre-Christmas import season in 2008 just as U.S. consumer confidence levels were turning dismal.[3]

Exhibit 4
Baltic Dry Index

Note: Baltic Dry Index (BDI), also known as the "Dry Bulk Index", is a composite of sub-indices that reflects the cost of shipping raw materials by sea. The index covers various sizes of dry bulk carriers, consisting of Panamax, Capemax and Supramax. BDI is often considered a pure leading economic indicator and good barometer for global trade volume because it tracks the cost of shipping raw materials for production, which is typically an area with low levels of speculation. Changes in the index can provide insight on global supply and demand trends in real time. The index can be quite volatile when global demand changes abruptly because the supply of ships is considered to be inelastic, due to the long time and high cost required for production.

Source: Bloomberg, 24 February 2009

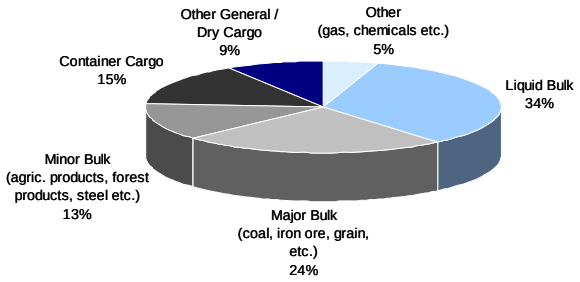
[2] Port of Los Angeles and Port of Long Beach websites, accessed 26 February 2009.
[3] The Conference Board, "The Conference Board Consumer Confidence Index Plummets to an All-Time Low," 28 October 2008.

The global container port industry has shown resilience during recessions in the past. During the Asian financial crisis in 1998, global container port volumes grew by 8 percent, and during the most recent US recession in 2001, global container port volumes grew by 5 percent.[4] This time around, however, the downturn has hit the container industry with more intensity.[5] With complete data for 2008 not yet in, Drewry estimates preliminary global container growth of 7.2 percent for the year, slowing further to just 2.8 percent in 2009.[6] Aspects of trade other than container traffic have faced even grimmer prospects, as lending has frozen up in the bulk shipping industry (e.g., iron ore, grain, and cement) amid the global credit squeeze.[7] Demand for roll-on/roll-off cargo ("ro-ro"), which by definition consists largely motorised vehicles, has been significantly impacted in the short term. Within the bulk shipping industry, some types of cargoes have held up better than others.[8] After peaking in May 2008, the Baltic Dry Index (BDI), a closely watched barometer for the bulk shipping industry, plummeted 94 percent before bottoming in early December. Since late 2008, however, the BDI has begun to move upward, a sign that demand for raw materials is again on the upswing – and a glimmer of hope from a key leading indicator in the shipping industry.

Evolution of Global Trade Routes

Our analysis for this paper began by assembling various lists of top global ports. The ports ranked by container volumes differed sharply from those measured strictly by the weight of the goods processed. We began initially with 104 ports, but sorting these would-be apples and oranges into a singular and definitive ranking of top ports was not realistic. We shall return to this discussion of port rankings later in the paper. We introduce the topic here only to underscore the relationship of port specialisation to global trade routes.

Exhibit 5
World Seaborne Trade by Main Loading Categories (2007: 8.1 Billion Tons)



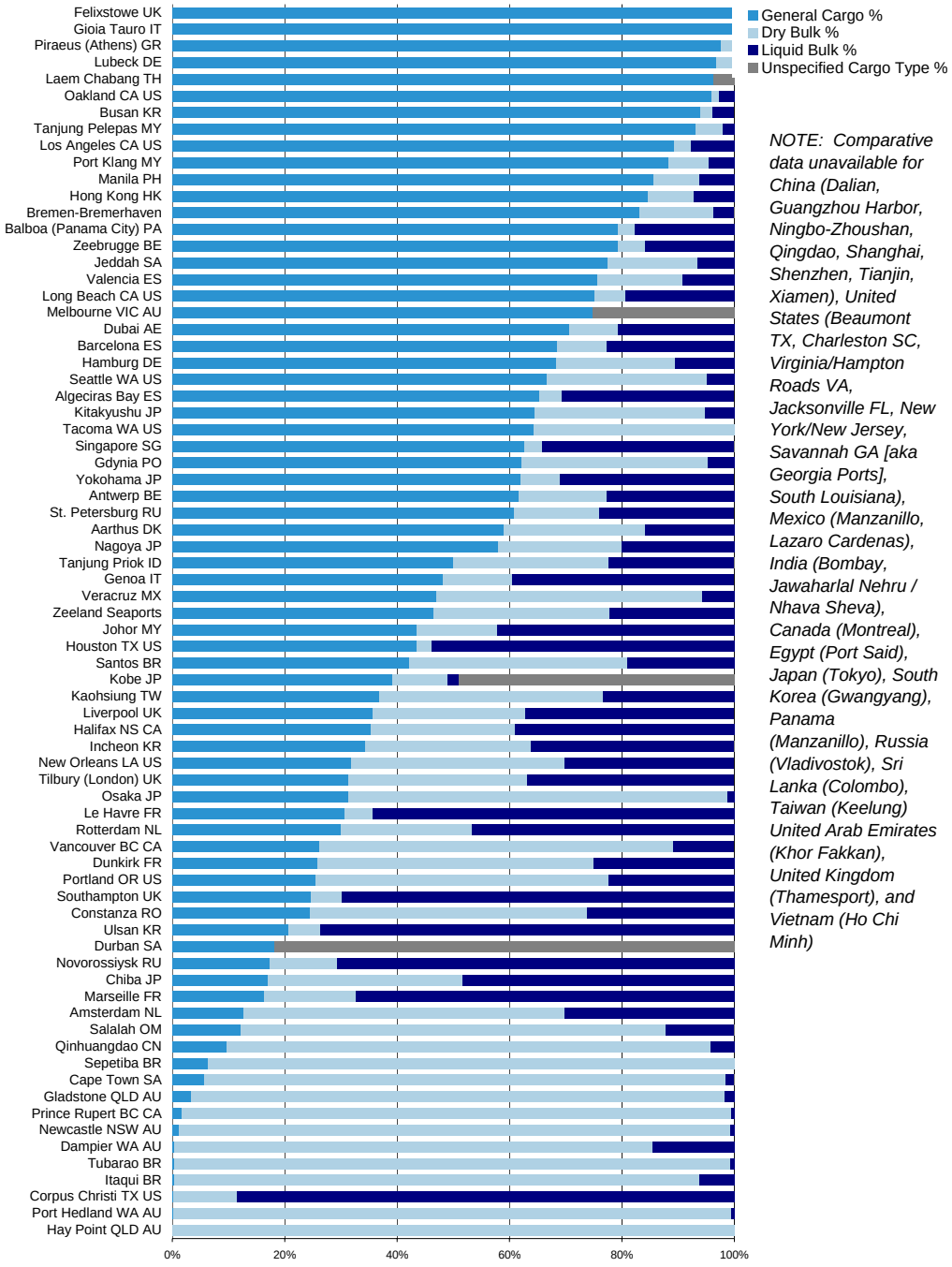
Note: Difficulty of effectively comparing cargo types by weight (or any other unit of measure) is illustrated in this exhibit which shows container traffic with a mere 15 percent of world market share.

Source: Prof. Dr. Manfred Zachcial, ISL, presentation at the Maximising Port Capacity Conference, Barcelona, 24/25 September 2008

The infrastructures needed to support different types of port operations such as containers, ro-ro, or bulk liquids vary sharply, and often so do their ownership structures and ownership diversity. Major ports in Australia and Brazil, for example, are often located in rather remote locations and handle little more than the mined commodities they export. The mining companies themselves are sometimes tied to the port ownership. The ships to haul these mined commodities and the hinterland infrastructures to support them often differ from the infrastructure for container traffic. One might make similar arguments about ports that specialise in bulk agricultural commodities (e.g., New Orleans) or even more so, those that specialise in bulk liquids (e.g., Houston) where tankers, pipelines, holding tanks, and refineries form the supply-chain infrastructure. The global trade routes that move these goods differ considerably from the trunk routes for container ships.

[4] Drewry Shipping Consultants, Ltd., "Key issues in the port and terminal sector," 5 March 2009.
[5] UBS Investment Research, "UBS Global I/O: Container Shipping," 12 December 2008.
[6] 2009 Toughest Test for Container Industry," Maritime News, 16 January 2009.
[7] Wright, Robert, "Falling rates leave challenges ahead," Financial Times, 19 November 2008.
[8] British coal imports represent a notable example of such bulk commodity resilience. The UK imports coal almost exclusively for electricity generation, according to Drewry.

Exhibit 6
Distribution of Cargo Types for Selected Ports (Percent of Total Weight)



NOTE: Comparative data unavailable for China (Dalian, Guangzhou Harbor, Ningbo-Zhoushan, Qingdao, Shanghai, Shenzhen, Tianjin, Xiamen), United States (Beaumont TX, Charleston SC, Virginia/Hampton Roads VA, Jacksonville FL, New York/New Jersey, Savannah GA [aka Georgia Ports], South Louisiana), Mexico (Manzanillo, Lazaro Cardenas), India (Bombay, Jawaharlal Nehru / Nhava Sheva), Canada (Montreal), Egypt (Port Said), Japan (Tokyo), South Korea (Gwangyang), Panama (Manzanillo), Russia (Vladivostok), Sri Lanka (Colombo), Taiwan (Keelung) United Arab Emirates (Khor Fakkan), United Kingdom (Thamesport), and Vietnam (Ho Chi Minh)

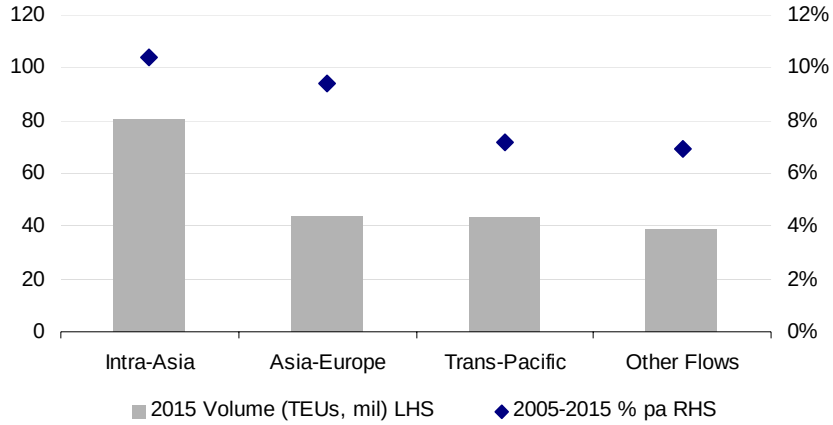
Note: General cargo includes containers.

Source: RREEF Research, Heideloff, Christel, and Manfred Zachcial (editors), Shipping Statistics Yearbook 2007, Institute of Shipping Economics and Logistics (ISL), Bremen: December 2007

In terms of strategic trade routes, it is not difficult to imagine how different the paths are that these unique cargo types follow. Bulk liquids may find origins and destinations near major exploration or processing areas, including the Gulf of Mexico and the Persian Gulf. Bulk mined commodities are exported in great quantities from the ports of Australia, Brazil, Chile, and Canada. Bulk grains from the world's great farmlands may source from ports near the mouths of the Mississippi River or the Rio Plata. As recently as the mid-1990s, bulk shipping (dry and liquid) accounted for more than two-thirds of the value of all seaborne trade, but the ratio has slipped over the past decade to about 45 percent as container traffic has grown.[9] Recent forecasts indicate that liquid and dry bulk could grow at 3-5 percent annually, much less than expected for container trade.[10]

The routes of container ships do not depend on the location of mines, farmland, oilfields, or refineries. Instead, their strategic paths connect diverse nodes of production and consumption, often using a hub-and-spoke system not unlike that used by passenger airlines. Two major strategic routes fall neatly out of this analysis. The first is Asia-Europe (which funnels through the Suez Canal and the Straits of Malacca and Gibraltar). The second is Trans-Pacific (with current Panama Canal upgrades likely to impact this route in the years ahead). Yet these two major strategic trade routes take a back seat to the region with the biggest growth potential of all. As production has risen within the Asia Pacific region, so too have intra-regional trade flows. The UN now forecasts that by 2015 intra-regional container trade within Asia will be almost as extensive as Asia-Europe and Trans-Pacific trade combined.[11]

Exhibit 7
Growth Forecast for Container Trade Along Strategic Routes

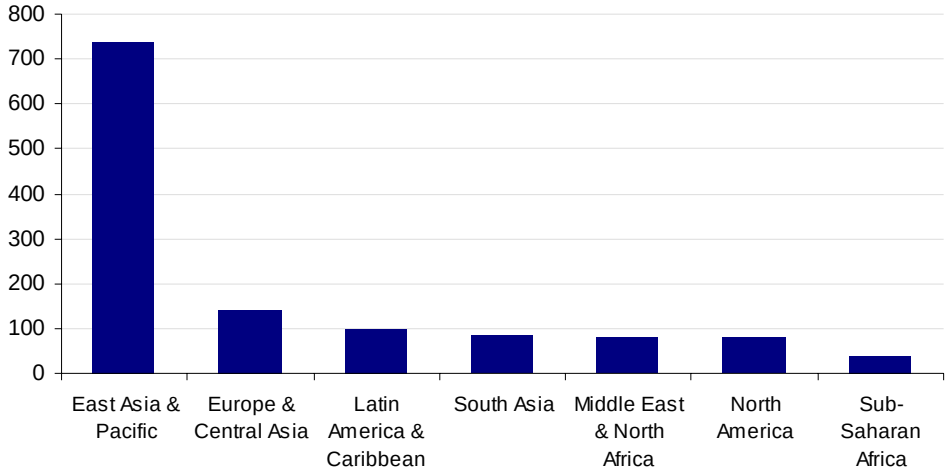


Source: Nations, Economic and Social Commission for Asia and the Pacific, "Regional Shipping and Port Development: Container Traffic Forecast, 2007 Update," p. 43

According to the UN, more than 700 new container berths will be needed in East Asian ports by 2015 to accommodate the anticipated growth in global container trade. This is far more capacity than is needed in any other region of the world.[12]

[9] Balbour, Frederik, "Why Ports are Hot Properties," Business Week, 29 March 2006.
[10] Prof. Dr. Manfred Zachcial, ISL, presentation at the Maximising Port Capacity Conference, Barcelona, 24/25 September 2008.
[11] United Nations, Economic and Social Commission for Asia and the Pacific, "Regional Shipping and Port Development: Container Traffic Forecast, 2007 Update," p. 43.
[12] United Nations, Economic and Social Commission for Asia and the Pacific, "Regional Shipping and Port Development: Container Traffic Forecast, 2007 Update," p. 58.

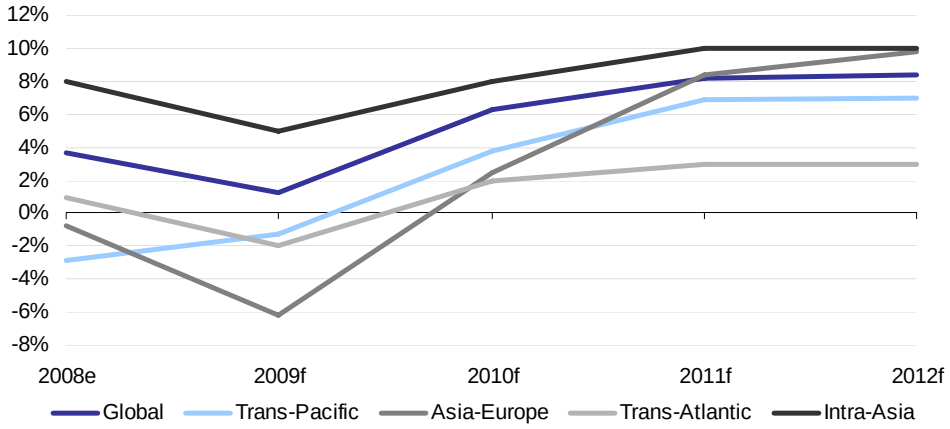
Exhibit 8
New Container Berths Required by 2015



Source: United Nations, Economic and Social Commission for Asia and the Pacific, "Regional Shipping and Port Development: Container Traffic Forecast, 2007 Update," p. 58

Between 1985 and 2007, global container shipping maintained an average growth rate of 10 percent annually (with the latter years being closer to 12 percent).[13] Similar to the UN research, UBS also expects growth in container trade will be led by the expansion of Intra-Asian activity (Exhibit 9).

Exhibit 9
Growth Forecast for Container Shipping Volumes by Major Trade Routes



Source: Investment Research, "UBS Global I/O: Container Shipping," 12 December 2008

While most forecasters paint a sobering near-term supply-demand balance for container trade, supply/demand buoyancy could return within the next two years. UBS, for example, forecasts TEU[14] volumes on some global trade routes to be nearing double-digit growth again by 2011.[15]

[13] Prof. Dr. Manfred Zachcial, ISL, presentation at the Maximising Port Capacity Conference, Barcelona, 24/25 September 2008.
[14] The International Standards Organisation (ISO) defines the unit of capacity measurement in the container industry as the twenty-foot equivalent unit, or TEU. This ISO standard of measurement is used throughout the industry and will be referenced repeatedly in this paper.
[15] UBS Investment Research, "UBS Global I/O: Container Shipping," 12 December 2008.

Evolution of Shipping

This paper so far has documented macro-economic conditions and strategic trade routes as factors influencing global port development. This has pointed us toward the relatively more favourable medium-to-long-term prospects for container growth as an investment focus rather than other types of trade such as bulk shipping and ro-ro.[16] This raises a question as to how container trade became so important so quickly. It is worth tracing the recent evolution of the shipping industry to understand exactly how this happened.

The concept of container shipping did not exist until the late 1950s, and then the industry spent years haggling over how to standardise the shape of the container itself. The standardisation issue had to be settled before investments in the supporting infrastructure – ships, cranes, muli-modal facilities, etc. – could occur.[17] It took nearly 25 years to reach global throughput of 38 million TEUs in 1980.[18] Since then, traffic growth has exploded. The world's top container port, Singapore, processed nearly 30 million TEUs alone in 2008.[19] Drewry calculates that the TEU volume of container traffic passing through the world's ports has increased 12 fold since 1980.[20]

As of year-end 2008, a global container fleet of 4,661 vessels held a capacity of 12.1 million TEUs.[21] The increasing scale of container ships has boosted efficiency. Nearly 300 ships are on order that can carry over 8,000 TEUs.[22] As 2009 began, total orders still exceeded 50 percent of the current global fleet size, and this will boost industry capacity by another six million TEUs by 2013.[23] Given current global economic conditions, however, it seems logical that some of the ship orders now on the books might ultimately be postponed. Shipping rates for bulk cargo have plunged since peaking in June 2008.[24] While container shipping may be somewhat less impacted than bulk shipping, near-term financial difficulties should, in theory, increase pressure to postpone container ship orders. So far, however, this does not appear to be happening, at least for the larger ships. In fact, there is growing speculation that many of the largest ship orders will proceed as planned and force a shakeout of smaller players in the shipping industry.[25]

Exhibit 10
Global Container Ship Fleets and Existing Orders, as of year-end 2008

Size range	In Service Today		Ordered (2009 - 2013)		Orders
	No. of ships	TEU 1,000s	No. of Ships	TEU 1,000s	% of Fleet (TEU)
000-499	384	124,184	12	1,920	1.5%
500-999	823	609,878	93	78,855	12.9%
1,000-1,999	1,261	1,779,576	209	311,763	17.5%
2,000-2,999	725	1,838,647	118	304,266	16.5%
3,000-3,999	332	1,141,898	74	253,997	22.2%
4,000-4,999	451	1,978,498	242	1,059,249	53.5%
5,000-5,999	286	1,574,918	39	206,734	13.1%
6,000-6,999	172	1,118,694	72	469,654	42.0%
7,000-7,999	29	213,091	27	196,740	92.3%
over 8,000	198	1,756,513	295	3,217,598	183.2%
Total	**4,661**	**12,135,897**	**1,181**	**6,100,776**	**50.3%**

Source: Containerisation International, February 2009

[16] See for example, Drewry Shipping Consultants, Ltd, "Key issues in the port and terminal sector", 5 March 2009.
[17] For a full discussion of this history, see Levinson, Marc, The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger, New Jersey: Princeton University Press, 2006.
[18] Drewry Shipping Consultants Ltd, February 2008.
[19] Containerisation International, online port statistics, accessed 27 February 2009.
[20] Drewry Shipping Consultants Ltd, February 2008.
[21] Containerisation International, February 2009.
[22] Containerisation International, February 2009.
[23] Containerisation International, February 2009.

At this time, it appears that market conditions, not technical barriers in shipbuilding, will be the primary limiting factor in growth. Designs for vessels as large as 18,000 TEUs have already been suggested.[26] According to the UN, there are two contrasting viewpoints with regard to economies of scale for container ships. The first viewpoint argues that there is no foreseeable barrier to increasing the scale of ships. This will in turn drive the radical reduction in number of port calls on major routes, and pushes for the development of global megaports served by fully integrated global networks.[27] Naysayers argue that these incremental efficiencies are increasingly marginal. With smaller ships, they argue, the shipping lines can avoid environmental and other externalities, maintain cost and marketing advantages, and support a wider range of port calls on the major trunk routes.[28] The issues roughly parallel closely those in the airline industry regarding the pros and cons of using the Airbus A380 for a limited number of passenger trunk routes.

Exhibit 11
The Growing Scale of Ships

Year	Ship Class	Capacity (TEU)	Length (m)	Width (m)	Water Dept. (m)
1968	Feeder	750	180	25	9.0
1972	Handy	1500	225	29	11.5
1980	Sup-Panamax	3000	275	32	12.5
1987	Panamax	4500	275	39	13.5
1997	Panamax/Post-Panamax	5500	325	41	14.1
1999	Post-Panamax	8000	345	43	14.5
2007	Post-Panamax	11000	360	43	16.0
2010+	Post-Panamax	15000	430	58	16.0
2010++	Malacca_Max	18000	470	60	21.0

Source: JWP GmbH, JLL European Seaports, September 2008

The similarities between shipping lines and the airline industry are worth considering. Transhipment ports work in much the same way as hub airports. They are nodes that divert traffic from major routes, re-routing it to and from secondary ports of call. As ships increase in size, growth in the container industry leads to the development of a hierarchy of transhipment ports. Consolidation in the industry can lead to changes in route structure, more often affecting lesser hubs rather than major ones like Singapore. In the airline industry, analysts stress the importance of origin and destination (O&D) markets as opposed to hub markets whose traffic is artificially inflated and whose status is much more vulnerable to corporate strategy or consolidation. Technological developments like the A380 in the airline industry create political (as well as market) pressure for second-tier airports to invest heavily in runways and terminals that can service these planes. Competition (and subsequent fallout) of airplane manufacturing, airline services, and airport hierarchy may provide a reasonable blueprint for how winners and losers in the container shipping industry could eventually emerge. The ingredients include rapid demand growth, demand volatility, high barriers to entry, intense competition and consolidation of key players, and significant investments in capacity and infrastructure without a guaranteed place in the hierarchy.

[24] Wright, Robert, "Falling rates leave challenges abroad," Financial Times, 19 November 2008.
[25] Miller, John W., "The Mega Containers Invade," Wall Street Journal, 26 January 2009.
[26] United Nations, Economic and Social Commission for Asia and the Pacific, "Regional Shipping and Port Development: Container Traffic Forecast, 2007 Update," p. i-ii.
[27] United Nations, Economic and Social Commission for Asia and the Pacific, "Regional Shipping and Port Development: Container Traffic Forecast, 2007 Update," p. i-ii.
[28] United Nations, Economic and Social Commission for Asia and the Pacific, "Regional Shipping and Port Development: Container Traffic Forecast, 2007 Update," p. i-ii.

Evolution of Global Ports

Three factors have converged to make global ports an attractive investment option. First, the growth of container trade since 1985 has far outpaced global GDP growth. Second, shipping company consolidations and economies of scale in ship construction have created the emergence of a group of truly global ports processing the world's container cargo. And third, the ports themselves have struggled to keep up with these changes. In developed countries, environmental and legal challenges have constrained the ports' ability to respond through greenfield or brownfield expansion.[29] Even amid the current economic downturn, UBS still estimates that TEU demand will surpass global shipping fleet capacity by 2011.[30]

Each port faces its own unique set of circumstances and constraints. Its competitiveness depends on a mix of factors including location, ownership and management, labour relations, customer base, and its hinterland network of transportation and logistics options. All of these factors contribute to a port's success and its investment attractiveness.[31] Ownership arrangements vary across countries. Exhibit 12 shows a comparison of selected countries' approaches to port privatisation. Exhibit 13 lays out the general policy framework for various levels of privatisation. The UK has perhaps taken the largest steps toward privatisation by selling off entire port operations. Malaysia has come close to this model, although its port deals are actually structured around a long-term lease rather than a freehold sale.[32] In most countries, the concession is granted at the terminal level, not for the entire port. In China, joint ventures are the norm with the state reserving a minority stake in the terminal.[33]

Exhibit 12
Terminal Privatisation Issues by Country
A Checklist of Government Objectives and Privatisation Approaches Used

	EMEA		Asia Pacific												Americas
Government Objectives	**FR**	**UK**	**AU**	**CN**	**HK**	**ID**	**IN**	**KR**	**MY**	**PH**	**SG**	**TH**	**TW**	**VN**	**US**
Downsize bureaucracy									●						
Finance deficit		●					●								
Finance facilities				●	●	●	●	●	●	●	●	●		●	●
Improve efficiency		●		●			●			●		●		●	●
Labour problems	●	●	●									●	●		●
Commercialise management			●	●	●									●	
Widen share ownership		●									●				
Approaches Used	**FR**	**UK**	**AU**	**CN**	**HK**	**ID**	**IN**	**KR**	**MY**	**PH**	**SG**	**TH**	**TW**	**VN**	**US**
Decentralise				●											
Corporatise			●	●				●	●		●				
Partial privatisation (services)	●	●				●		●		●			●	●	●
Partial privatisation (joint venture)				●		●			●						
Landlord ports (leases)	●		●					●				●	●		●
Landlord ports (concessions)					●	●	●		●	●		●			●
Capitalisation (share offering)		●							●		●				
Sell assets		●			●										

Source: Asian Development Bank, Development Best Practices for Promoting Private Sector Investment in Infrastructure: Ports, 2000, Appendex 4, pp. 2-3.

[29] Herrick, Thaddeus, "Ports in a Storm: Activists Choke Growth Of European Shipping," Wall Street Journal, 18 May 2007.
[30] UBS Investment Research, "UBS Global I/O: Container Shipping," 12 December 2008.
[31] Colonial First State Global Asset Management, "Infrastructure Market Review: European Port Sector," August 2008.
[32] United Nations, Economic and Social Commission for Asia and the Pacific, "Regional Shipping and Port Development: Container Traffic Forecast, 2007 Update," p. 23.
[33] Balbour, Frederik, "Why Ports are Hot Properties," Business Week, 29 March 2006.

Exhibit 13
Typical Ownership & Operating Structures for Container Terminals

Increasing Degree of Privatisation

Mode of Ownership	Land Area	Terminal Infrastructure	Terminal Superstructure	Quayside Operations	Landside Operations
100% state owned & operated	State owned	Owned & constructed by port authority	State owned	Port authority	Port authority
"Suitcase" stevedores	State owned	Owned & constructed by port authority	State owned	Private stevedores (on common-user berths)	Port authority
Leased terminal	State owned	Owned & constructed by port authority	Privately owned or rented from port authority	Terminal operator	Terminal operator
Concession agreement	State owned	Owned & constructed by port authority	Privately owned	Terminal operator	Terminal operator
BOT concession	State owned	Construction privately funded	Privately owned	Terminal operator	Terminal operator
100% privately owned	Privately owned	Privately owned	Privately owned	Terminal operator	Terminal operator

Source: Drewry; Deutsche Bank,, Global Markets Research, "DP World," 5 January 2009, p.47.

Barriers to entry for investors are prohibitive which limits the field to a relatively small number of major players with financial resources and technological expertise.[34] Exhibit 14 shows how the players in the industry are currently organised. According to fleet statistics monitored by Containerisation International, the 10 largest shipping companies control just over half of the world's current TEU capacity and 40 percent of the fleet capacity on order.[35] And the 10 largest port terminal operators control about 38 percent of container traffic.[36]

Exhibit 14
Competitive Landscape for Terminal Operators

Industry Group	Key Players	Key Characteristics
The Big Four	Hutchison Port Holdings	**strong growth driven by new developments and acquisitions*
	APM Terminals	**global breadth*
	PSA	**economies of scale*
	DP World	**global diversity combined with strong positioning in key growth markets*
Regional or niche players	Eurogate	**limited growth opportunities*
	SSA Marine	**established position protected by vertical integration*
	HHLA	
	Patrick	
	China Merchants Group	
Container shipping lines	Cosco	**terminals treated as cost centres rather than profit centres*
	Evergreen Marine	**facilities dedicated to in-house shipping line*
	MSC	**mostly minority equity position to ensure capacity in key locations*
	APL (including NOL)	
	OOCL	
	NYK Line	
	CMA CGM	
	K Line	
Infrastructure funds	Macquarie	**OECD focus*
	Borealis	**substantial financial capacity*
	Ontario Teachers' Pension Plan	**relatively low return requirements*
	AIG	**highly leveraged business model, cash flow focus*
	RREEF	
	Babcock & Brown *(see NOTE)*	

Note: Babcock & Brown was placed under administrative bankrutpcy protection as this paper was being prepared for publicaiton.
Source: Drewry; RREEF Research; Deutsche Bank,, Global Markets Research, "DP World," 5 January 2009, p.45.

[34] Colonial First State Global Asset Management, "Infrastructure Market Review: European Port Sector," August 2008.
[35] Containerisation International, online fleet rankings as of 26 February 2009.
[36] Journal of Commerce, 23 February 2009, p. 23.

Private investment extends well beyond the major ports. Global operators often invest in second-tier regional ports which act as feeders to the global transhipment hubs along strategic trade routes.[37] Exhibit 15 shows the regional concentration of activities for the world's leading port terminal operators based on a sample of 104 major ports worldwide.

Exhibit 15
Major Terminal Operators by Region:
Presence of the 22 Largest Port Terminal Operators at 104 Major Ports Worldwide

Operator Rank	Asia	Europe	North America	Latin America	Mideast & Africa	Oceania
1 PSA International	|||||||||	||||			
2 Hutchison Port Holdings (HPH)	|||||||||	|||||	|||		
3 APM Terminals	||||||||||	|||||||||	|||||||	||	
4 DP World	||||||||	|||||			||		
5 COSCO Pacific	||||||||						
6 Evergreen Marine	||		||||||||||			
7 Eurogate		|||				
8 Mediterranean Shipping Company							
9 Hamburger Hafen und Logistik AG (HHLA)							
10 American Present Lines (APL)							
11 SSA Marine				|||||||	|||		
12 Dragados (ACS Group)							
13 NYK Line	|||||||||	|||||	|||				
14 Hanjin Shipping Co. Ltd	||||||||||||||||	||||||||||		|||		
15 CMA CGM							
16 ICTSI							
17 K Line	||||		|||				
18 MOL	|||		||					
19 Grup TCB							
20 Orient Overseas Container Line (OOCL)							
21 Hyundai Merchant Marine							
22 Yang Ming	||		||			
Number of Major Ports Sampled Per Region	**34**	**28**	**20**	**9**	**7**	**6**
Operations by Major Players in Port Sample	**92**	**54**	**49**	**8**	**8**	**2**

Note: Measures the presence of the 22 largest port terminal operators at 104 major ports worldwide; for some terminal operators shown above with blank rows, complete information was not available as to their presence in these six regions.
Source: Journal of Commerce; company and port websites; Heideloff, Christel, and Manfred Zachcial (editors), Shipping Statistics Yearbook 2007, Institute of Shipping Economics and Logistics (ISL),Bremen: December 2007

Thus far we have focused broadly on 104 major ports worldwide, but for this paper, we continue to narrow our investment focus toward those ports specialising in container cargo. Exhibit 16 shows 56 of the top container ports worldwide based on 2008 containers handled and it also shows how many of the top five terminal operators have a presence there.[38] Our sample indicates that the top five operators have a much greater foothold in Europe and in Asia than in the rest of the world.

[37] Balbour, Frederik, "Why Ports are Hot Properties," Business Week, 29 March 2006.
[38] Annual container estimates for ports sometimes vary marginally from one source to another. For the smaller individual ports, traffic can sometimes be up and down from one year to the next for various reasons. Rather than cut the list off at an even 50, we have expanded it to include a few more ports at the margins that may be in and out of the top 50 depending on the year or the source.

Exhibit 16
Ports Size (2008) & Terminal Operation Diversity by Region

	Port	2008 TEUs (millions)*	Number of Top 5** Terminal Operators	
Asia	Singapore SG	29.92	1	●
	Shanghai CN	27.98	4	●●●●
	Hong Kong HK	24.25	4	●●●●
	Shenzhen CN	21.41	4	●●●●
	Busan KR	13.43	3	●●●
	Ningbo-Zhoushan CN	11.23	2	●●
	Guangzhou Harbor CN	11.00	2	●●
	Qingdao CN	10.32	3	●●●
	Kaohsiung TW	9.68	0	
	Tianjin CN	8.50	4	●●●●
	Port Klang MY	7.97	1	●
	Tanjung Pelepas MY	5.60	1	●
	Xiamen CN	5.03	2	●●
	Laem Chabang TH*	4.64	4	●●●●
	Dalian CN	4.50	3	●●●
	Tokyo JP	4.27	0	
	Tanjung Priok ID*	4.14	1	●
	Colombo LK	3.69	1	●
	Yokohama JP*	3.43	1	●
	Ho Chi Minh VN*	3.14	3	●●●
	Nagoya JP*	2.90	0	
	Manila PH*	2.87	1	●
	Jawaharlal Nehru (Nhava Sheva) IN	2.48	1	●
	Kobe JP*	2.47	1	●
	Osaka JP*	2.31	0	
	Keelung TW	2.06	1	●
Oceania	Melbourne VIC AU	2.32	1	●
Europe	Rotterdam NL	10.80	1	●
	Hamburg DE	9.70	4	●●●●
	Antwerp BE	8.66	4	●●●●
	Bremen-Bremerhaven DE	5.50	4	●●●●
	Valencia ES	3.59	3	●●●
	Gioia Tauro IT	3.47	0	
	Algeciras Bay ES	3.32	3	●●●
	Felixstowe UK	3.20	1	●
	Barcelona ES	2.57	2	●●
	Le Havre FR	2.50	2	●●
	Zeebrugge BE	2.21	4	●●●●
Mideast & Africa	Dubai AE	11.83	1	●
	Port Said EG	3.20	1	●
	Salalah OM	3.07	1	●
	Jeddah SA	3.05	1	●
	Durban SA*	2.51	0	
	Khor Fakkan AE*	2.17	0	
North America	Los Angeles CA US	7.85	1	●
	Long Beach CA US	6.49	0	
	New York/New Jersey NY/NJ US*	5.30	1	●
	Savannah GA US	2.62	1	●
	Vancouver BC CA	2.49	1	●
	Oakland CA US	2.24	1	●
	Virginia (Hampton Roads) VA US	2.08	0	
	Tacoma WA US	1.86	1	●
	Seattle WA US	1.70	0	
Latin America	Santos BR	2.67	0	
	Manzanillo/Colon PA	2.22	0	
	Balboa PA	2.17	1	●

*Note 1: All date reflect 2008 TEU volumes except where noted [*]. As this report was prepared for publication in early March 2009, a few major ports had not yet released their year-end 2008 TEU volumes, thus 2007 volumes were included for these ports only. All data are from Containerisation International except Ho Chin Minh and Khor Fakkan (from ISL) and Manzanillo/Colon (from AAPA).

**Note 2: The five largest port terminal operators are Hutchison Port Holdings (HPH), APM Terminals, PSA International, DP World, and COSCO Pacific.

Source: RREEF Research based on Journal of Commerce; Containerisation International; AAPA: company and port websites; Heideloff, Christel, and Manfred Zachcial (editors), Shipping Statistics Yearbook 2007, Institute of Shipping Economics and Logistics (ISL), Bremen: December 2007.

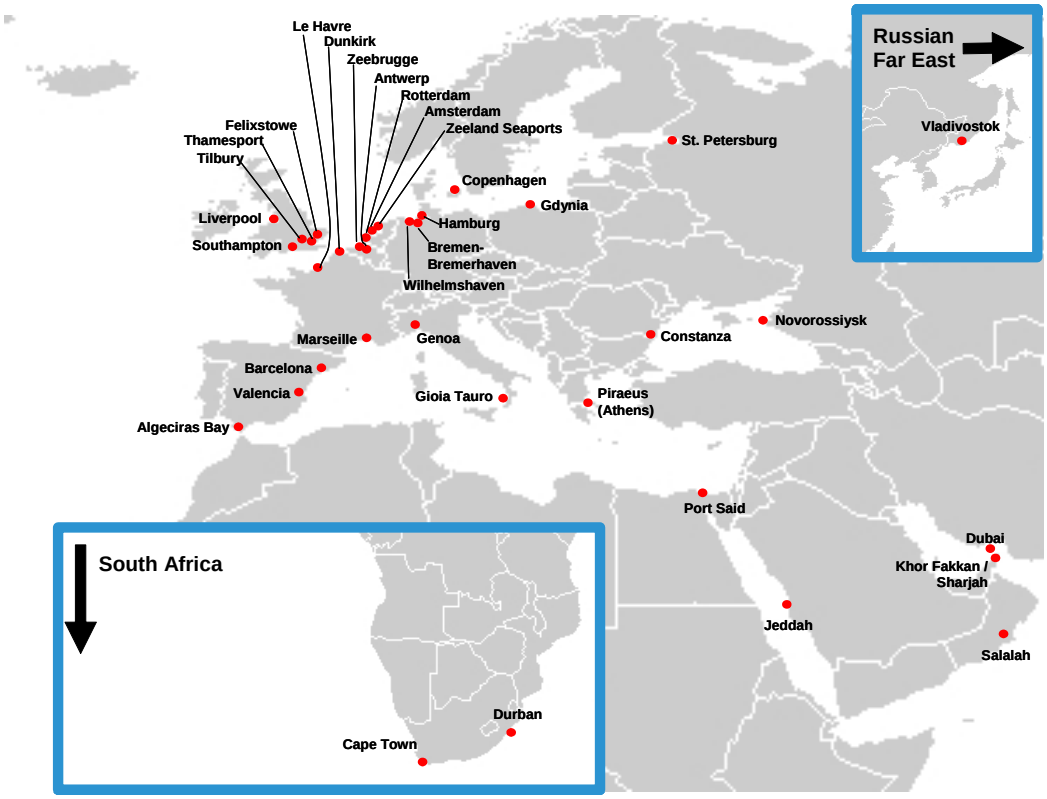
Evaluating Major Global Container Ports

While this paper concentrates largely on the medium and long-term outlook for container ports, the dismal near-term outlook for global trade cannot be ignored. The impact of the current economic downturn on ports is significant for two reasons. First, near-term demand pressures have diverged suddenly and sharply from the patterns of recent years. And second, the fallout from this near-term upheaval is likely to produce distinct winners and losers within each major trade region. Given the current economic environment, opportunities are likely to emerge. In this section, we identify the key regional trends and policies that shape the environment in which the major container ports operate. Our focus includes a review of hinterland connections, major development plans, and long-term trends that may impact strategies and opportunities.

Europe, Middle East, & Africa (EMEA)

The strategic trade route from Asia to Northwest Europe touches ports on three continents as it passes around the Arabian peninsula to the Red Sea, through the Suez Canal into the Mediterranean, and around Iberia to the North Sea ports where competition is intense. Rotterdam, Hamburg, and Antwerp – all in relatively close proximity to each other – rank among the 15 busiest container ports in the world. Hence, their connecting infrastructures to their hinterlands can be as important to competitiveness as the port's infrastructure itself.

Exhibit 17
Major Ports in the EMEA Region



Source: RREEF Research

Container ports across Europe have seen a massive increase in the number of TEUs handled in recent years with throughput in the continent's 10 largest ports 85 percent higher in 2007, at

51.9 million TEUs, than in 2000.[39] The highest level of growth within Europe's top 14 ports (by TEUs handled) has been at ports able to capitalise on their proximity to expanding markets like Constantza, Gdynia and St Petersburg. While the growth in these ports has been strong they remain relatively small on a continental scale; in 2007, St. Petersburg, the largest of the three, handled just 16 percent of the volume of TEUs processed by Europe's largest port, Rotterdam.[40]

Amongst the leading European ports the key trend since 2000 has been the increasing dominance of Europe's big three – Rotterdam, Hamburg, and Antwerp. In 2000 these three ports handled 52 percent of the total TEU throughput of Europe's 10 largest ports; by 2007 this had increased to 56 percent.[41] Total TEUs handled in the big three ports in 2007 was almost double the corresponding throughput in 2000, with growth led by Hamburg where TEU throughput was 131 percent higher across the period.[42] The gap between Europe's third largest port, Antwerp and the fourth largest, Bremen-Bremerhaven has also widened with Bremen handling 55 percent the number of TEUs of Antwerp in 2007 compared to 67 percent in 2000.[43]

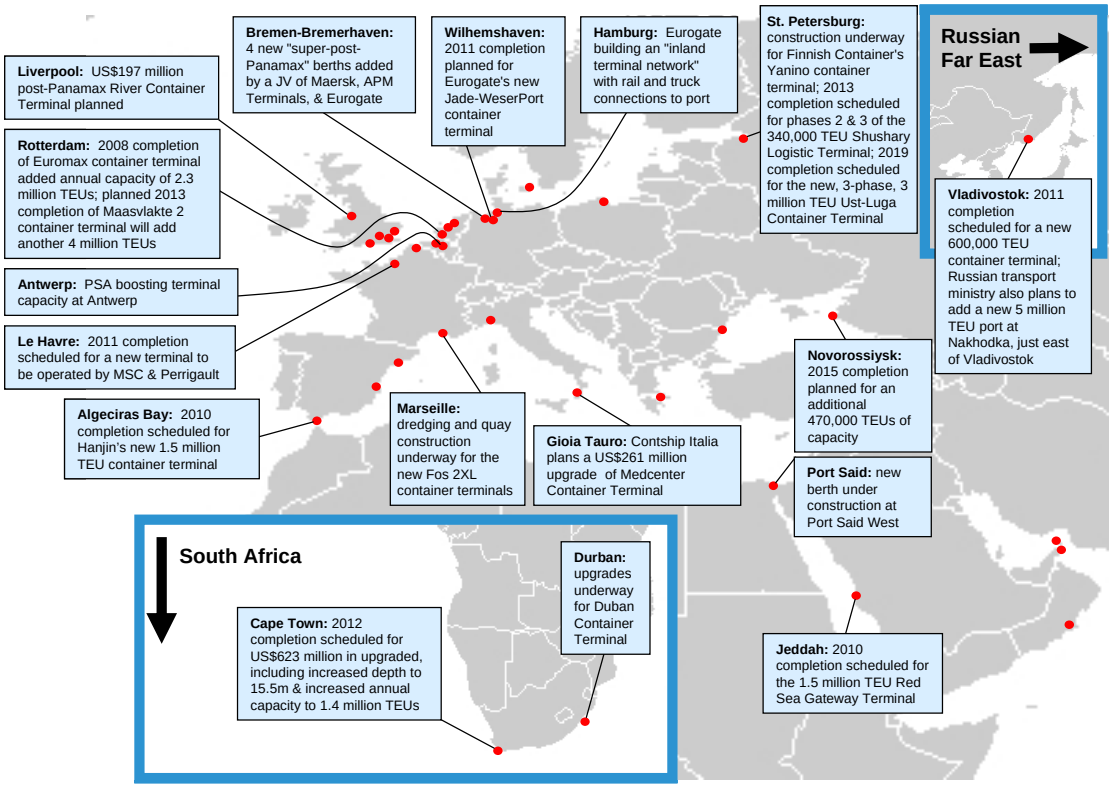
While the growth of the big three ports has been spectacular, all the major locations have benefited from the increase in global trade. The hierarchy, by TEUs handled, has however remained largely the same with only Valencia moving up from 10th in 2000 to 7th in 2007 with a growth rate matching that of Hamburg.[44]

The long-term outlook for EMEA's key ports appears positive, however, the current global recession will undoubtedly have a negative impact on near-term growth prospects. While it is unlikely to change the trend of the large, existing ports continuing to dominate, it may create more uneven growth going forward. Ports with greater exposure to the weaker European markets, either directly or through transhipment activity, are expected to suffer the most. Ongoing developments in shipping practices (the majority of European ports are unable to accommodate or have the capacity to handle the larger ships coming into service) will further differentiate the winners and losers.

Ports are just one link in what has become an increasingly globalised supply network. While development programs at specific sites remain crucial, individual locations will also be influenced by changing distribution methods and networks. The TEN-T projects for example have potential to modify the European transportation network, however this is a long-term trend and, in the more immediate future, local infrastructure projects focusing on current bottlenecks will have the most significant impact on trade routes. Ultimately, the TEN-T[45] network is expected to carry about half of all freight movements in Europe. Given the costs associated with expanding or adding new routes the focus is on optimising the transportation network currently in place through enhanced rail performance and less road congestion. (source: Jones Lang Lasalle European Logistics Report Trends & Prospects March 2008).

[39] Drewry Shipping Consultants, Ltd.
[40] Containerisation International, February 2009.
[41] Drewry Shipping Consultants, Ltd.
[42] Drewry Shipping Consultants, Ltd.
[43] Drewry Shipping Consultants, Ltd.
[44] Drewry Shipping Consultants, Ltd.
[45] The trans-European transport network, or TEN-T, is an initiative of the European Commission to prioritise 30 projects that focus on improving and expanding connections between Western Europe and the CEE region.

Exhibit 18
Notable Development Plans at Selected EMEA Ports



Source: RREEF Research

Nearly all major EMEA ports are facing capacity issues of one form or another and are investing to overcome these issues.

The major types of port investment/developments include but are not limited to:

- Expansion of container capacity (a high priority of recent years)
- Improvement of infrastructure, both site-specific and traffic flows, including:
  - Refinement of intermodal rail links, especially eastbound
  - Upgrades of road infrastructure into and approaching the port
  - Development of inland water networks, where applicable[46]
- Addition of complementary logistics space
- Enhancement of productivity through IT deployment

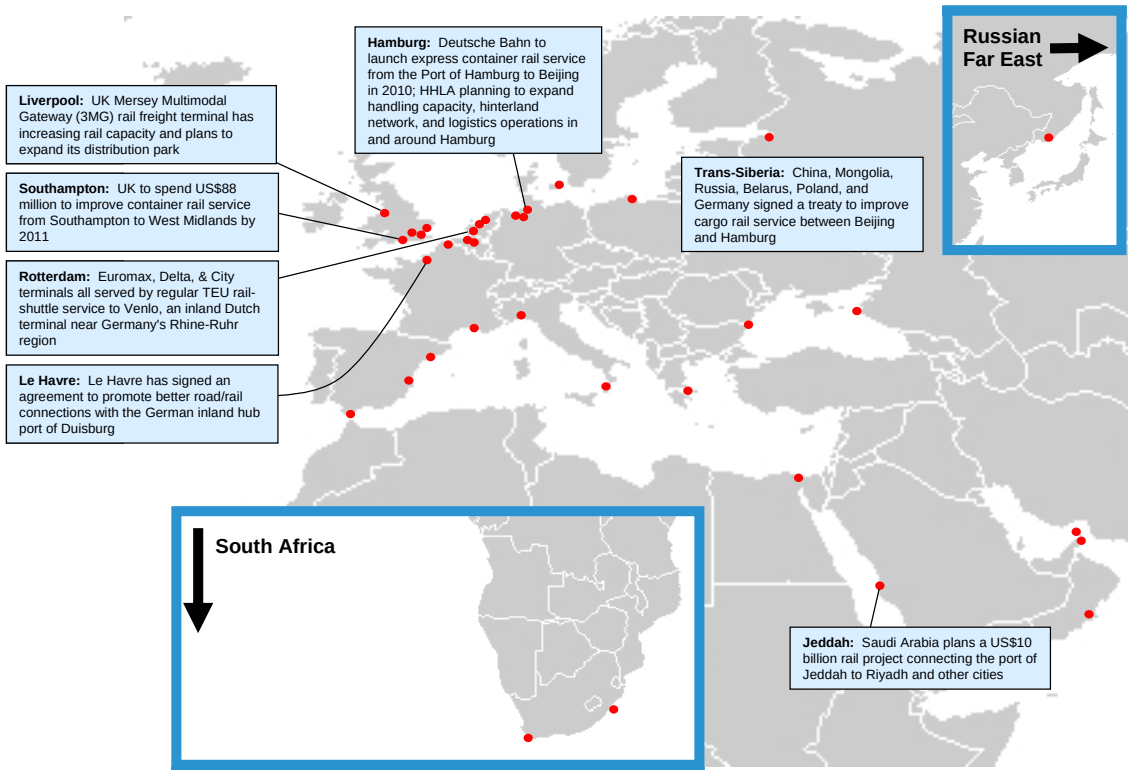
Within the ports themselves the ability to accommodate larger vessels with suitable handling facilities is a key requirement driving a number of development plans. Rotterdam has potentially the most significant program of any, as officials estimate the port and industrial area will run out of large sites between 2012 and 2014. As a result the Maasvlakte 2 expansion

[46] Free and Hanseatic City of Hamburg, "Focus of dynamic growth markets – Prospects and development potential for the Port of Hamburg" April 2007.

project which was first approved by the Dutch government in 1997 continues to progress. This project involves building an entire new port facility which will require 2,000 hectares of land reclamation, the construction of a new container terminal with depth of 20 metres and 1,000 hectares of land for new industrial space. With expansion of the existing port, the container capacity of Rotterdam is estimated to triple on completion in 2013, some 16 years after its inception.

Antwerp opened the Deurganck dock in 2005 but recent estimates by port officials suggest container handling at this dock would reach its seven million TEU capacity by 2013 if growth were to continue at its recent 8 percent annual pace. Given the recent economic slowdown, this is unlikely, but it does highlight the importance of ongoing port development. Development has not just been confined to the major ports, in Finland, the new Vuosaari Harbour complex opened in late 2008. At a cost of US$442.3 million, the facility provides two 750-metre container quays and 15 ro-ro berths on a 150-hectare site.[47]

Exhibit 19
Intermodal Connections to EMEA Hinterlands



Source: RREEF Research

The EMEA region's major ports, clustered along the North Sea, have experienced such extraordinary growth in throughput over the past decade that their hinterland connection infrastructure is approaching or exceeding capacity. This recent growth has spurred expansion plans for existing routes as well as investment in secondary/alternative locations. In addition to congestion stemming from the major ports reaching capacity, the more limited infrastructure in the CEE countries, which are poised for the strongest long-term economic growth going forward, poses a significant challenge for the region.

[47] http://www.vuosaarensatama.net/harbour/, accessed 11 November 2008.

The North Sea ports of Antwerp, Bremerhaven, Hamburg and Rotterdam currently dominate the region in terms of container volumes. Their hinterland links allow the majority of Europe's major industrial and economic hubs to be reached in one day by road. Within two days, goods from the Port of Rotterdam can reach Northern Spain, mid-Italy, Budapest or Warsaw. This attribute combined with the massive increase in trade flowing through the major ports has caused a number of bottlenecks on the transport system.

In the case of Rotterdam road congestion is a major issue, especially the A15 highway. This has caused a drop in the reliability of travel time from 94 percent in 2002 to 91 percent in 2006 with an estimated average annual increase in lost vehicle time on Dutch roads of 9 percent between 2004 and 2006.[48] It is estimated that 70 percent of traffic jams in the Netherlands are structural (i.e., they regularly re-occur on the same roads at the same times) as opposed to incidental (roadwork or accidents) which highlights the capacity issues on the Dutch network. The mixing of through-traffic and regional traffic as well as poor exchanges between roads are two of the key contributors. The recently completed Betwue freight railway project (part of the TEN-T plan, described below in more detail) will undoubtedly help alleviate this issue, however the extent of this relief is yet to be determined. The Dutch government recognises the importance of the port of Rotterdam to the national economy and consequently infrastructure improvements are ongoing.

Alternative transportation methods are also being explored. Waterways are a useful alternative as Rotterdam is located on the estuary of the Rhine and Meuse rivers. This allows inland shipping into the heart of Europe, Frankfurt is three days upstream (two down) while Budapest can be reached in 11.5 days. In the fourth quarter of 2008, the Delta Barge Feeder made its first discharge of containers at the new terminal dedicated to handling feeder and inland barges. The ability of the transport network to support trade flows to and from local markets will be a key component of the future growth of Europe's ports.

One of the major regional issues is the lack of modern hinterland infrastructure in the CEE countries, whose economies, despite near-term difficulties, are forecast to experience the strongest growth in the coming decades. The European Commission has taken note of the infrastructure issues facing the broad region and has responded with the TEN-T program. This program has identified 30 projects, which are crucial improvements for the region's infrastructure to be able to support the forecast growth and in light of the strong growth forecast for the CEE region a number of these focus on improving and expanding connections between Western Europe and the CEE region.

The majority of these projects focus on rail improvements which, in a number of instances, will take freight off the road network. These include the completed Betuwe line and the Sines/Algeciras-Madrid-Paris (SAMP) freight railway line currently in the planning stage. The Betuwe line provides an easier and more environmentally friendly transport option to the port of Rotterdam. This project consists of both newly built sections and the upgrading of existing sections to create a 160-kilomere freight railway linking the port to the German rail network at the Dutch/German border. This scheme is designed to move about 74 million tons of freight per year, however it is likely to attract only a fraction of this amount initially.

The SAMP project is a long-term project that will ultimately allow Iberia to become less dependant upon road transport by upgrading the rail line to European gauge. The Iberian peninsula's rail gauge is currently different from the rest of Europe which has caused more than half of the goods flowing to and from Iberia to be on by roadway, while only 4 percent is transported on the rail network (short sea shipping makes up the balance). With the completion of this freight railway upgrade, it is estimated that rail will achieve a 30 percent share of the land transport market in the Pyrenees. A critical component of this infrastructure improvement is the trans-Pyrenean rail link which the 2005 TEN-T update suggests will not be complete until 2020 at a total cost of €5 billion. This highlights the long-term nature of providing major

[48] Parliamentary document, "Policy framework for utilisation – A pillar of better accessibility", January 4, 2008.

competition to the current distribution routes and the importance of easing local log jams on key existing routes.

Asia Pacific

Despite the recent slowdown, the Asia Pacific region will still be at the epicentre of container trade growth in the decade ahead. Intra-Asia, Asia-Europe, and Trans-Pacific trade will be the primary growth areas for container traffic.[49] Within the region, opportunities vary as competition intensifies for primary slots along shipping trunk routes. For example, Singapore, Hong Kong, Port Klang and Tanjung Pelepas are the key transhipment nodes for the Asia-Europe route, but the Ports of Hong Kong, Kaohsiung, Shanghai, and Busan are the key transhipment nodes for the trans-Pacific route.

Exhibit 20
Major Ports in the Asia Pacific Region

Source: RREEF Research

According to the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), the share of the world's container ports in this region is expected to grow to 68 percent by 2015,[50] and East Asia has the strongest growth rate forecast. Within East Asia, the growth for China has been the strongest, with over 20 percent growth annually since the beginning of this decade.[51]

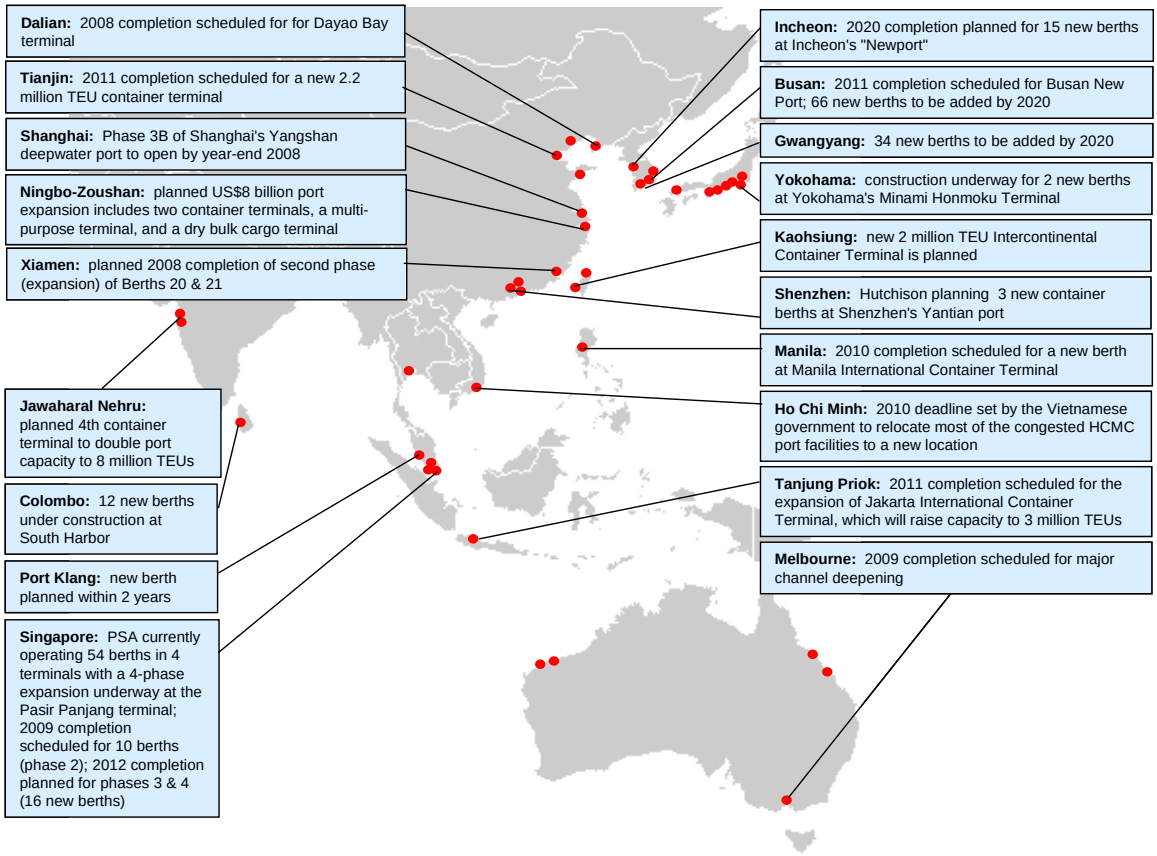
[49] Among the three major East-West trade routes: Asia-North America; Asia-Europe; and North America-Europe), the Asia-Europe route has the strongest growth forecast at 9.4 percent growth annually – stronger than the trans-Pacific route (7.2 percent annually).

[50] United Nation Economic and Social Commission for Asia and the Pacific (2007), Regional Shipping and Port Development – Container Traffic Forecast 2007 Update.

[51] United Nation Economic and Social Commission for Asia and the Pacific (2007), Regional Shipping and Port Development – Container Traffic Forecast 2007 Update.

In order to meet the demand for this growth, to improve the distribution efficiency of containers, and to expand hinterland ports, Asia will require substantial additional investments to connect the port terminals by road, rail, and inland waterways. According to the UN's estimates, more than US$51 billion will need to be invested in the Asia Pacific region's port-related infrastructure by 2015.[52]

Exhibit 21
Notable Development Plans at Selected Asia Pacific Ports



Source: RREEF Research

Many of the ports in this region have also suffered to various degrees due to the global economic slowdown. The two strongest economies in this region, China and India, have experienced a significant drop in terms of the shipping volumes. India's biggest container port, Jawaharlal Nehru Port (JNP) in Mumbai has downgraded its growth forecast for 2009, decreasing from 23 percent in 2008 to 12 percent in 2009.[53] In the port of Shanghai, the growth is also expected to decrease to 4 percent over the next three years, a 25 percent decline since 2000.[54] Despite this slowdown, many of the regional governments still have plans to expand or upgrade their major port facilities.

China's coastal ports have averaged container throughput growth of 30.4 percent annually over the past 27 years.[55] This substantially outpaces the 8.9 percent annual growth rate recorded at non-China container ports in the rest of the world.[56] China's ports now account for 21 percent of the container throughput market world-wide, compared with just 0.2 percent

[52] United Nation Economic and Social Commission for Asia and the Pacific (2007), Regional Shipping and Port Development – Container Traffic Forecast 2007 Update, p. 59.
[53] Deutsche Bank Research (2009), DP World – the world has changed, January.
[54] HSBC (2008), Equity Research: Hutchison Whampoa, December 2009.
[55] Nomura (2008), Ports: China Infrastructure, March.
[56] Nomura (2008), Ports: China Infrastructure, March; China Ministry of Communications.

market share in 1980.[57] According to China's Ministry of Communications, the container throughput at China's coastal ports reached 178 million TEUs in November 2008, up from 20 million at the beginning of decade. As a result, the need for container terminals as well as bulk and breakbulk terminals is likely to increase in the years ahead, and to accommodate this, the government permits foreign investors to take up to a 75 percent stake in port terminals. The National Plan for Coastal Port Layout, the master plan for Chinese coastal ports was passed by the government in 2006. The plan contains five principle areas – Bohai Sea Area, Changjiang River Delta, Southeast Costal Area, Pearl River Delta and Southwest Coastal Area, and focuses on the transportation systems for coal, oil, iron, container, food, cars and passengers, as well as upgrading facilities in major ports. For example, Tianjing is designed to be the primary port for Inner Mongolia and other inland Northern Provinces. As a consequence, a new terminal is scheduled to complete by 2011 which could potentially handle more than 2.2 million TEUs.[58] In order to handle increasing volumes of import and export activities, the third phase of Shanghai's deepwater port was opened at the end of 2008.[59]

The Port of Hong Kong is well-connected to the mainland manufacturing centres via road or rail links. It provides not only a high quality of infrastructure but also a high standard of services. The shortage of off-port land is the major constraint on the capacity of the Port of Hong Kong.[60] Hong Kong's major rival, Singapore, also plans to complete a second phase expansion of PSA's Pasir Panjang terminal by 2009 and the third and fourth phases by 2012. By doing this, the port of Singapore will be able to increase the number of berths from 54 currently to 80 when the project is completed.

In India, given the strong economic growth and import/export activity over the past decade, the need for a better quality of logistics chain – i.e. road, railways and landside infrastructure – is increasing. A number of major port projects are underway, including the new container facility at Krishnapatnam Port, and the construction of a rail line linking India and Myanmar. Jawaharlal Nehru Port (JNP) also plans to expand its fourth container terminal to double the capacity from 4 million to 8 million TEUs.[61]

The Philippines, Indonesia, and Vietnam will also need investments of about US$25 billion in the medium term to expand port capacity.[62] Southeast Asian ports are well-positioned along the shipping trunk route between China and India, putting them in good locations to benefit from these trade flows as well as the movement of resources and commodities between them. The trend towards larger container ships will drive these countries to deepen, modernise, and expand berths. Vietnam joined the World Trade Organisation on 11 January 2007. Since then, the government has set up the state-owned enterprise Vietnam National Shipping Lines (Vinalines) to be a leading player in the domestic marine transportation industry. Ports in Vietnam are too small to handle large vessels and the logistics facilities and storage are not able to cope with the large amount of trade flow. As a consequence, the government has decided to develop new ports as well as expanding/upgrading existing facilities. One of the current initiatives is to relocate the ports in Ho Chi Minh City to Cat Lai and Hiep Phuoc provinces by 2010.[63]

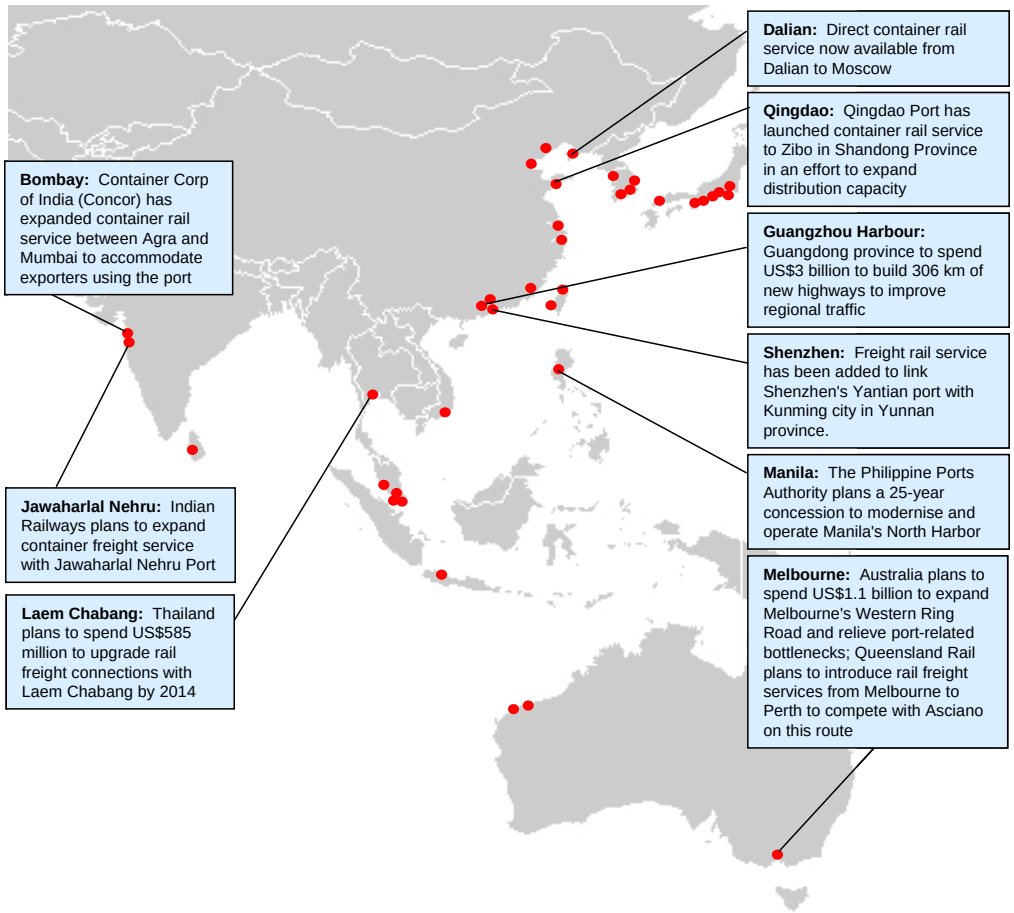
In Korea, the Busan Port Authority plans to invest 8.5 billion won (US$6.1 billion) to redevelop its North Port facility between now and 2020. The plan includes the conversion of four piers from bulk and containerised cargo into a complex of cruise terminal facilities for international, regional and coastal passengers.[64] Moreover, North Korea and South Korea have re-opened

[57] China Ministry of Communications.
[58] "The JOC's Top 50 World Container Ports," Journal of Commerce, 28 July 2008, pp.28-36.
[59] "The JOC's Top 50 World Container Ports," Journal of Commerce, 28 July 2008, pp.28-36.
[60] "HK needs more off-port land than a new terminal," Cargonews Asia, 10 March 2008.
[61] "JNPT board clears fourth container terminal project," Cargonews Asia, 31 March 2008.
[62] Asia Infrastructure, various issues.
[63] "The JOC's Top 50 World Container Ports," Journal of Commerce, 28 July 2008, pp.28-36; Project Finance (2007), Supplements 2007 – Global Infrastructure, June 2007.
[64] Asia Infrastructure, Issue 165, November 2008.

daily freight services, which could potentially expand South Korea's network to Russia's Trans-Siberian railway.[65]

Recent strong growth of the Australian economy and the surge of demand for commodities are the major drivers of demand for Australian sea transport. However, the global financial crisis has had a negative impact on the industry. The Port of Melbourne forecasts 1 percent to 2 percent of growth over the next two years, compared to 8.5 percent growth in 2008.[66] Despite the recent slowdown, various projects are being implemented. The Port of Melbourne is planning to spend over US$1 billion to deepen its shipping channel, in order to service deep-draught container vessels. The Australian government also plans to upgrade the capacity of the Newcastle Port and the Dalrymple Bay Coal Terminal in Queensland over the next few years as part of its economic stimulus package.[67]

Exhibit 22
Intermodal Connections to Asia Pacific Hinterlands



Source: RREEF Research

The development of the economy relies on the development of the maritime system. In many parts of this region, trade flows rely heavily on the development of hinterland ports, especially for those countries covering vast, populous interior regions, like China and India. In an era of economic globalisation, ports are evolving rapidly from being a traditional land/sea interface to providing a complete logistics network.[68] Port integration into road, rail and barge networks is

[65] "Daily cargo train run across two Koreas next month," Cargonews Asia, 23 November 2007.
[66] Deutsche Bank Research (2009), DP World – the world has changed, January.
[67] IBIS World (2009), International Sea Transport in Australia, February.
[68] Logistic networks include container terminals, hub-and-spoke networks of liner services, logistics centres, and other transportation services and facilities.

increasingly important. Rail and road links are vital where there is considerable distance between ports and end-users. As a result, upgrading surrounding transportation systems and port-related infrastructure around the existing ports are major tasks amongst the regional governments.

Many countries in Asia Pacific have also introduced free trade zones (FTZs) to develop their economies. A key feature of many FTZs is the presence of logistics services that provide connections between ports and hinterlands. Examples of this can be found in Thailand, Malaysia, China and India.[69]

China's current five-year plan calls for US$25.5 billion to be invested in ports expansions.[70] This plan will involve deepwater dredging, especially along the Yangtze River. Railway congestion and rising costs highlight the importance of connecting China's hinterland to the more developed coastal cities by way of the major rivers. Ports, especially China's interior ports, are likely to receive more attention in the coming years as the economy grows. In addition to the development plan for these inland ports, many of the surrounding infrastructure facilities are also set to be upgraded in order to expand the coverage and reduce the cost. According to China's National Plan for Coastal Port Layout, the country prioritises the development of a network of coastal seaports as gateways to the inland provinces.[71] Those infrastructure facilities would include large-scale and professional transfer, warehousing and transportation facilities for large-scale bulk cargos.[72]

In India, the federal government has outlined a plan to spend US$20 billion to modernise the infrastructure facilities in 12 major ports as well as 187 smaller ports across India by 2010.[73] So far, Container Port of India (Concor) and Sical Logistics both plan to expand container rail and freight services in India in order to improve integration of logistics services.[74] One of the top priorities is for the Indian Railways to expand container freight services to inland cities in order to connect with the country's major port, Jawaharlal Nehru.[75]

When Korea's new government took power in December 2007 it proposed the ambitious public-private construction of a 3,000 kilometre cross-country "Grand Canal" that would link the Han and Naktong Rivers and revolutionise the country's inland freight transport.[76] The plan now appears to be dead as a result of strong public opposition.[77] For now, it appears that Korea's major container port in Busan is left as the primary focus of shipping expansion and construction projects.

In Australia, the government's involvement in expansion of network coverage and surrounding transportation has become one of the top priorities for the hinterlands. The government is planning to spend US$1.1 billion to expand Melbourne's Western Ring Road in order to reduce port-related bottlenecks.[78] In addition, Queensland Rail plans to introduce rail freight services from Melbourne to Perth.[79]

[69] United Nation Economic and Social Commission for Asia and the Pacific (2005), Free Trade Zone and Port Hinterland Development, 2005.
[70] Business Monitor International (2007), China Infrastructure Report Q3.
[71] In order to serve inland provinces, the plan focuses on development of ports like Yingkou Port, Jinzhou Port, and Tianjing Port.
[72] Nomura (2008), Ports: China Infrastructure, March.
[73] "Red Tape May Force Investors to Shun India Ports", Wall Street Journal, 25 February 2009.
[74] "An extra train between Agra, Mumbai," Cargonews Asia, 5 November 2007.
[75] "More trains to connect with Indian port," 23 May 2008.
[76] CLSA, "Ramping Up: Asia's Infrastructure Stimulus", Cargonews Asia, March 2008.
[77] Asia Infrastructure, Issue 162, August 2008.
[78] "Melbourne invests $1.07b to reduce traffic gridlock," Cargonews Asia, 25 October 2007.
[79] "Queensland Rail to launch Melbourne–Perth route," Cargonews Asia, 22 October 2007.

Americas

Two main issues loom over container trade in the Americas. The first is the persistent bottleneck of transpacific trade at Southern California's twin gateway ports, Los Angeles and Long Beach. Congestion, high costs and environmental externalities hamper the ports' competitiveness, yet the retailers, wholesalers and logistics providers who move Asian imports into the rest of the continent are so invested in this location it makes it difficult for other regions to gain a significant foothold. Still, competition with Los Angeles and Long Beach stretches up and down the West Coast, not just in Puget Sound and San Francisco Bay, but as far north as Prince Rupert, Canada, and as far south as Lázaro Cárdenas, Mexico.

The second issue impacting container trade is the upgrading of the Panama Canal, now in process to accommodate today's larger container ships. Where West Coast ports now form the field of competition with Los Angeles and Long Beach for the Trans-Pacific trade, the expansion of the Panama Canal will broaden this competitive circle to include East Coast ports as well.

Exhibit 23
Major Ports in the Americas Region

Source: RREEF Research

Most forecasters are predicting a second consecutive year of decline in Asia-to-US shipments, and ports across the Americas are preparing themselves for a difficult year. A rebound in overall demand is expected in the second half of 2010, likely coinciding with the traditional peak shipping season in the third quarter.[80] Despite the sour economy requiring port

[80] See for example: Chang, Alex, UBS Global I/O: Container Shipping, UBS, 12 December 2008.

authorities and terminal operators to cut operating and capital costs, the majority of them continue to move forward with long-term capital projects focused on port and hinterland expansion. In addition, shipping companies are not expected to cancel any orders for new ships, allowing the global fleet to increase by over 12 percent, way ahead of the expected demand.[81]

Despite the current downturn, there are a number of reasons why ports across the Americas are committed to development. While congestion is no longer a short-term problem, it is clear that international trade volumes will continue to increase in the mid-to-long term. Increase in Asian imports, primarily from China, is forecasted to exceed the capacity of the ports within the next few years.[82] Secondly, larger ships under construction will lead to a need for massive investment in ports worldwide. The ports along the East Coast and Gulf Coast, in particular, are looking beyond the current downturn in forging ahead with development plans to meet the completion of the Panama Canal expansion in 2014. The new canal will be able to accommodate 12,500 TEUs container ships that can carry nearly three times their current load under existing conditions. Inevitably, these ports will also become increasingly congested in the long term. Raising intermodal cost is another factor leading to the deployment of all-water service routes to the East Coast. In an analysis of the end-to-end transport costs of containers shipped to and from US interior points via the West Coast and East or Gulf Coast, Drewry found that for many destinations in the eastern US, the route via the West Coast ports is now much more expensive than the route via East Coast and Gulf Coast ports.[83] However, other determining factors, such as the toll structure at the Panama Canal, may impact the change in seaport routes in the future.[84] Finally, while lower prices may be one of the key selling points for East Coast ports in the long term, the real inducement for most shippers to expand to the East Coast is the goal of a balanced transportation network leading to greater reliability. A recent Supply Chain Consortium survey of more than 200 leading companies, representing more than US$1 trillion in total annual revenue, indicated that corporate logistics professionals are looking to make changes in port routings from Southern California.[85] Drewry confirmed that the shift away from the West Coast is likely to intensify in the decade to come.

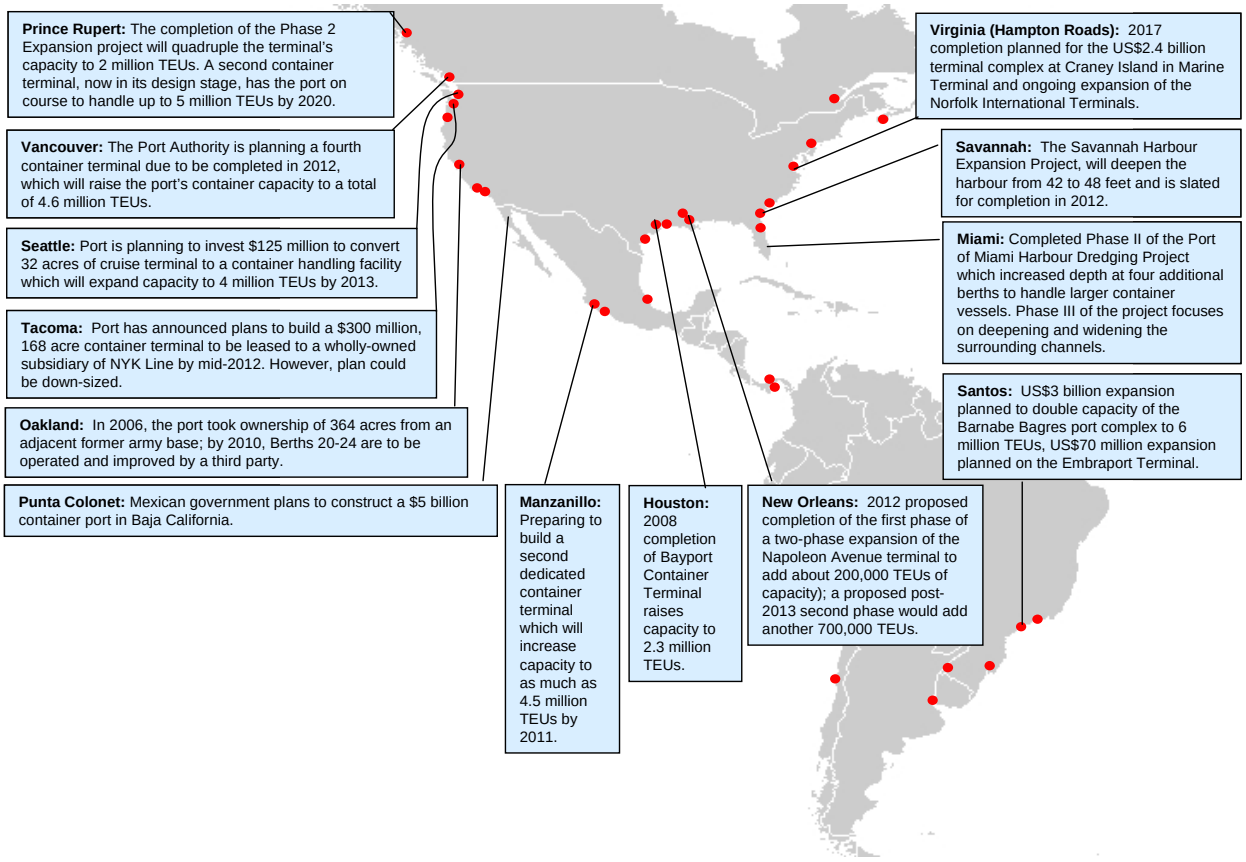
New shipping patterns will emerge in the Americas as a result of changes in trade routes. Some shipping experts believe that most cargo originating in Northern China will move through the Panama Canal to the East Coast. However, cargo from Southeast Asia, India and perhaps Southern China will move predominately through the Suez Canal because the distance for cargo to ship from South and East of Vietnam is shorter.[86] Secondly, according to the American Association of Port Authorities (AAPA), a “cascade” effect may take place after the completion of the Panama Canal, as the Panamax ships of today may become the feeder vessels for Post-Panamax ships of tomorrow.[87] The transhipment activity in the Caribbean and Latin American regions may change as larger vessels concentrate on a fewer number of ports. Additionally, we may also see a proliferation of feeder services that will shuttle cargo from deep to shallower East Coast ports that have not developed in time. Global Insight has indicated that if the US ports are not ready to handle Post-Panamax ships, the Caribbean Basin ports may be among the biggest beneficiaries of the canal expansion.[88] Finally, when considering the trade-off between cost and time, high-value and time-sensitive goods will most likely continue to use West Coast ports.[89] Navigating cargo through the Panama Canal and up

[81] Miller, John W., ”The Mega Containers Invade”, Wall Street Journal, 26 January 2009.
[82] Dutton, Gail, “Trade in the Americas: Expanding the Panama Canal for the 21st Century”, World Trade Magazine, 2 November 2007.
[83] Port Strategy, “No end in sight for US West Coast ports malaise”, 24 October 2008.
[84] Dutton, Gail, “Trade in the Americas: Expanding the Panama Canal for the 21st Century”, World Trade Magazine, 2 November 2007.
[85] The Changing Dynamics of Global Trade, AAPA Seaports Magazine, summer 2008.
[86] Dutton, Gail, “Trade in the Americas: Expanding the Panama Canal for the 21st Century”, World Trade Magazine, 2 November 2007.
[87] The Changing Dynamics of Global Trade, AAPA Seaports Magazine, Summer 2008.
[88] The Changing Dynamics of Global Trade, AAPA Seaports Magazine, Summer 2008.
[89] Dutton, Gail, “Trade in the Americas: Expanding the Panama Canal for the 21st Century”, World Trade Magazine, 2 November 2007.

the East Coast will take more time than transporting containers via rail from the San Pedro Port complex. Therefore, commodities and goods that are not time-sensitive will most likely choose the retrofitted Panama route.

In the long run, changes in the Asia-to-US trade routes will lead to a more competitive balance among ports in this region. The ongoing credit crunch will continue to make capital scarce which may pressure operating ports to turn to public-private partnerships to fund development projects. While navigating through the current economic downturn, it is critical for the ports in this region to remain focused and continue to develop their port infrastructure system in preparation for a return to robust growth in the coming years.

Exhibit 24
Notable Development Plans at Selected Americas Ports

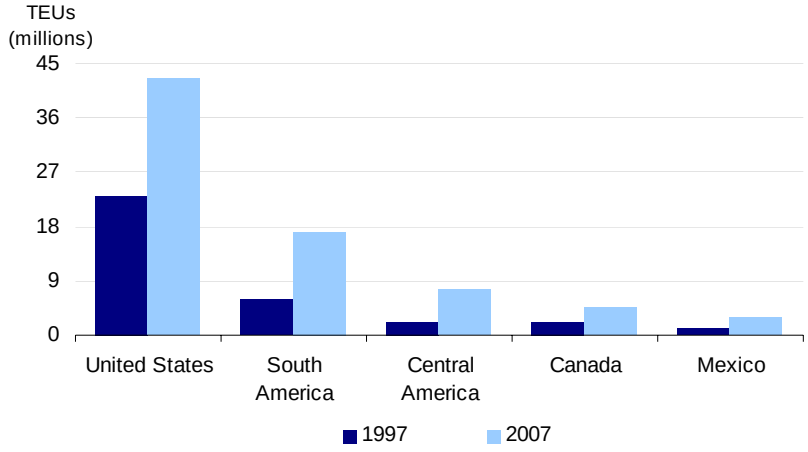


Source: RREEF Research

In recent years, ports in the Americas have been struggling to expand capacity to keep pace with increasing trade volume. At peak levels, ports are nearing the limits of capacity, with inefficiencies and congestion becoming critical issues. Despite the decline in container traffic due to the current recession, industry projections indicate strong growth on the transpacific routes and West Coast US container shipments are projected to triple over the next 20 years.[90] On February 18, 2009, President Obama signed into law an economic recovery bill that allocates US$150 million in the form of Port Security Grants, focusing on construction projects and those that create jobs in the port sector. However, there is still a significant gap in need for port infrastructure development in the US. From 1997 to 2007, the share of total container traffic increased by nearly 75 percent in the US, and more than doubled in South America. (See Exhibit 25).

[90] Port Metro Vancouver, http://www.portmetrovancouver.com/, accessed 2 February 2009.

Exhibit 25
Share of Total Container Traffic in the Americas by Region



Source: American Association of Port Authorities

As container traffic increased, shipping companies strove for further economies of scale. Over the past decade, global maritime shipping has witnessed a progressive increase in maximum vessel size, which has lowered transportation costs per unit shipped. The containership order book is currently dominated by vessels over 7,000 TEUs, accounting for 56 percent of the capacity currently on order.[91] Most of the old container ships were built to "Panamax" specifications, or the exact maximum size allowed to fit through the locks of the Panama Canal. With the expansion of the canal scheduled to be completed in 2014, a new generation of large "Post-Panamax" or "PPX" vessels are in development according to retrofit standards. Consequently, port operators across the Americas are focused on upgrading port facilities to prepare for PPX vessels and anticipated future demand.

There are more than 300 ports in the US, however, approximately 40 percent of the US container cargo arrives at the Ports of Los Angeles and Long Beach.[92] Known as the San Pedro Port Complex, it is the world's fifth-busiest port complex, having handled 15.7 million total TEUs in 2007.[93] When container volumes were growing at 10 percent a year, terminal operators had projected that the ports would reach capacity around 2012.[94] In order to accommodate the increasing trade volume over the mid-to-long run, the ports must rapidly expand both capacity and productivity in order to maintain market share. However, challenges such as antiquated facilities, lengthy environmental deliberations and road congestion often delay expansion plans. Inevitably, many importers and exporters will diversify their supply chains to take advantage of other ports along the West Coast and East Coast.

The Port of Prince Rupert in British Columbia, Canada is well-positioned as a northern alternative to the congested ports of Southern California. The port is strategically located on the Great Circle sailing route, which makes it the closest deep-harbour North American West Coast port from Asia by up to three days. While the port has a current capacity of 500,000 TEUs, the completion of the Phase 2 Expansion Project will quadruple the terminal's capacity to 2 million TEUs. A second container terminal, now in its design stage, has the port on course to handle up to 5 million TEUs by 2020.[95] At the Port of Vancouver, plans are also underway to increase container-handling capacity. The Port Authority is planning a fourth container terminal due to be completed in 2012, which will raise the port's container capacity to a total of

[91] UNESCAP and Korea Maritime Institute, "Regional Shipping and Port Development – Container Traffic Forecast 2007 Update", 2007.
[92] Containerization International, February 2009.
[93] "Studying Seaports: Industrial investment opportunities exist near ports", Global Real Estate Monitor, December 2008.
[94] Mongelluzzo, Bill, "Mexico port plan on track", Journal of Commerce, 14 January 2009.
[95] Prince Rupert Port Authority, http://www.rupertport.com/development.htm, accessed 19 January 2009.

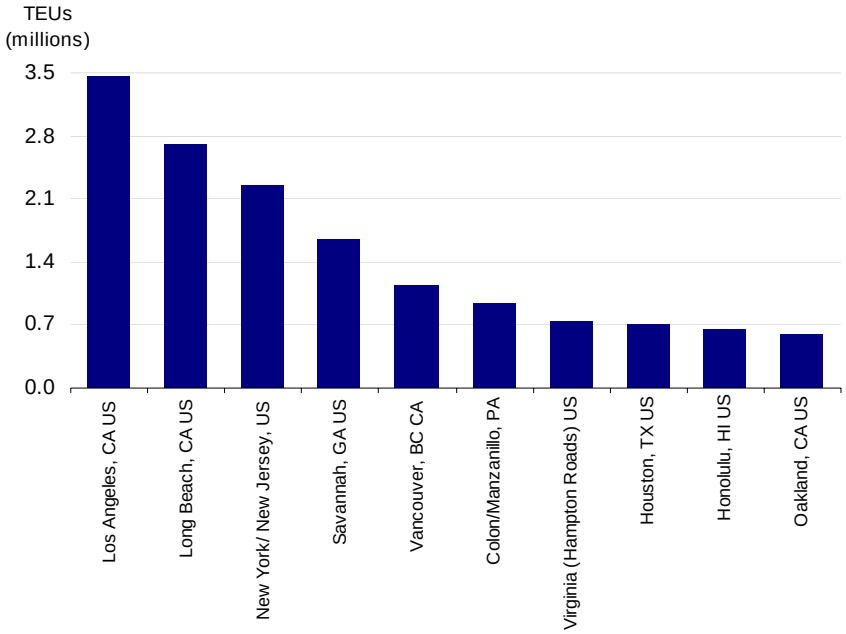
4.6 million TEUs.[96] The Port of Seattle is planning to invest US$125 million to convert 32 acres of cruise terminal to a container handling facility which will expand capacity to 4 million TEUs by 2013.[97] As part of the Port of Tacoma's Five-Year Capital Improvement Program, which calls for more than US$953 million to be invested in terminal development, the port has announced plans to build a US$300 million, 168 acre container terminal to be leased to a wholly-owned subsidiary of NYK Line by mid-2012. However, the sour economy and declining transpacific trade could cause the plan to be downsized. Despite cost-cutting initiatives, the port is committed to other long-term projects such as the redevelopment of the port's Totem Ocean Trailer Express Terminal and expanding the Washington United Terminal.[98] In recent years, the Port of Oakland took ownership of 364 acres from the former Oakland Army Base. A third of the port's US$341 million, five-year development plan will be used for container terminal development such as deepening its channels and berths. The Port of Houston, which handles two-thirds of the containerised cargo in the Gulf of Mexico, is moving ahead with US$30 million in development plans to expand its new Bayport Container Terminal.[99]

Mexican and international maritime interests are convinced that the existing North American gateways will become congested sometime in the coming decade and are eager to provide a feasible alternative.[100] However, Mexico's 107 ports, which handle 80 percent of its international trade, are among the most expensive in the world with lengthy processing times. In recent years, Mexican port sector leaders have urged the federal government to increase investment in ports and adopt new financing schemes to strengthen the industry and reduce costs. The Port of Manzanillo, located in Colima, Mexico, is preparing to build a second dedicated container terminal which will increase capacity to as much as 4.5 million TEUs by 2011. Mexico's plans to construct a US$5 billion container port at Punta Colonet in Baja California are still on track, contrary to reports in the US and Mexican media that the government is considering delaying the project. Lázaro Cárdenas, a deep-water port about 1,000 miles from the US border has development potential - yet the facility is understaffed and lacks the necessary personnel to operate post-Panamax cranes.

Traditionally, vessels arriving from Asia stop at the San Pedro Port Complex to transport cargo via rail to markets in the Midwest and East Coast. However, a number of shipping lines over the past few years have already chosen to bypass the congested West Coast for all-water services to the East Coast. With a potential influx of trade volume after the expansion of the Panama Canal, ports along the East Coast and Gulf Coast are racing to position themselves as the new America's port (See Exhibit 26).

[96] Padova, Allison, "Trends in Containerization and Capacity at Canadian Ports", 30 January 2006.
[97] Bernstein, Mark, "America's Ports Take on the Challenge of Trade Growth", World Trade Magazine, 2 February 2008.
[98] Mongelluzzo, Bill, "Ports in a storm", Journal of Commerce, 14 January 2009.
[99] Leach, Peter T., "US Ports", Journal of Commerce, 12 January 2009.
[100] Mongelluzzo, Bill, "Mexico port plan on track", Journal of Commerce, 14 January 2009.

Exhibit 26
Net Change in TEUs Processed at Selected Ports, 2000-2007



Source: American Association of Port Authorities

Fortunately for port developers on the Southeast Coast, building permits are relatively easy to secure. Despite the current downturn, many port development projects on the East Coast and Gulf Coast continue.

All-water services from Asia are already present at the Port of New York and New Jersey, the largest port complex on the East Coast of North America. The port is the closest point of entry via water to major East Coast consumer markets and a viable gateway to a portion of the mid-Atlantic and Midwest markets. In addition, cargo transiting its wharves can reach almost one-third of the population within 24 hours.[101] The port anticipates a doubling of cargo volume to 10 million TEUs by 2020,[102] yet it faces severe restrictions on its physical growth, despite a US$1.7 billion investment to reconfigure existing terminals, deepen harbors and berths, and improve inland rail access.[103] Even though its channel will be dredged to 50 feet by 2014, the port authority has yet to figure out how to finance the estimated US$2 billion cost of raising or rebuilding the Bayonne Bridge to accommodate PPX ships.[104] Competing with New York for these new shipments destined for the mid-Atlantic and Midwest states, the Port of Virginia has the best natural deepwater harbor and the largest intermodal facility on the East Coast. In April 2008, the Virginia Port Authority (VPA) signed an agreement with the Panama Canal Authority to strengthen an alliance first formed in 2003.[105] The VPA is focused on the ongoing expansion of the Norfolk International Terminals and planning a massive expansion at Craney Island Marine Terminal, which will be built on 600 acres of open water with an anticipated cost of US$2.4 billion. However, due to the economic slowdown, construction has been postponed.[106] The ongoing credit crunch will continue to make capital scarce, so many operating ports may have to turn to public-private partnerships to fund expansion plans. The

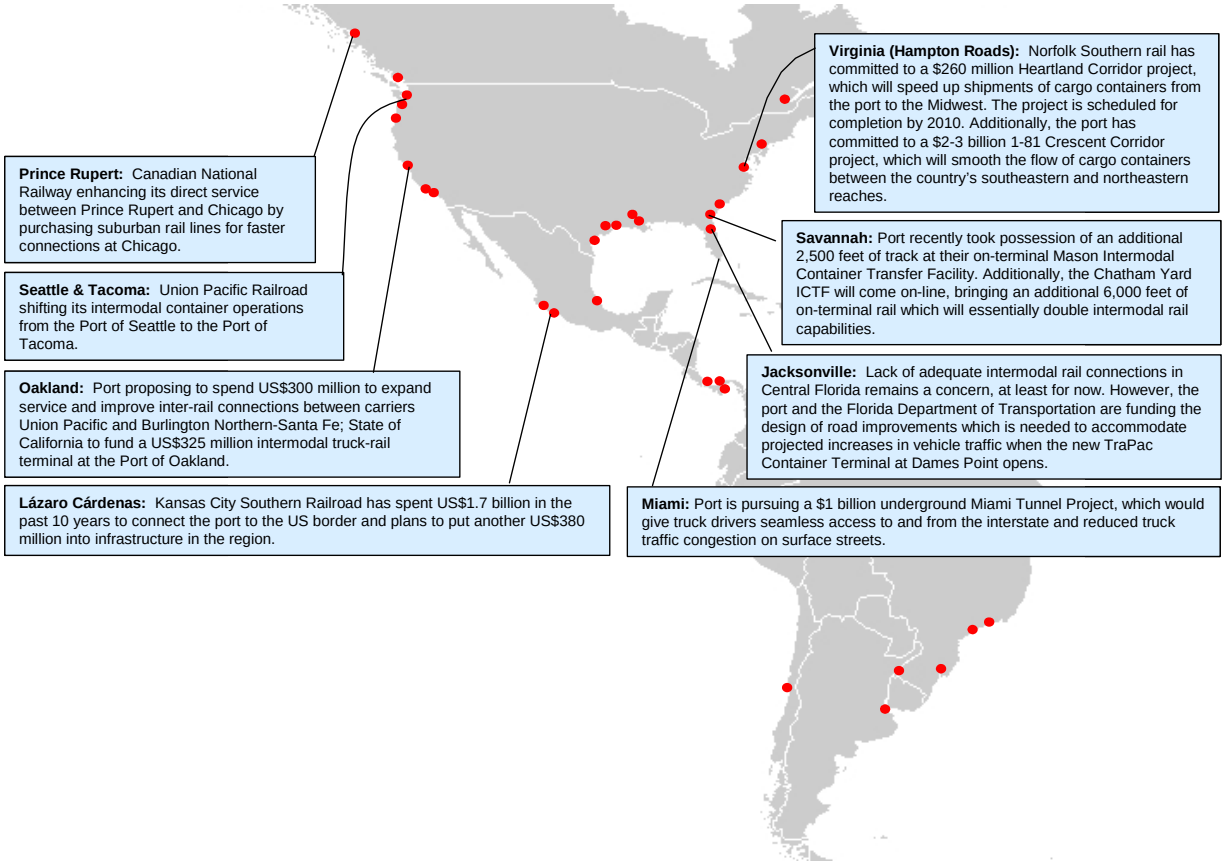
[101] Breskin, Ira, "The East Coast Port Alternatives", World Trade Magazine, 1 June 2005.
[102] "Harnessing the Hinterland", Port Strategy, 24 June 2008.
[103] Bernstein, Mark, "America's Ports Take on the Challenge of Trade Growth", World Trade Magazine, 2 February 2008.
[104] Dutton, Gail, "Trade in the Americas: Expanding the Panama Canal for the 21st Century", World Trade Magazine, 2 November 2007.
[105] Johnson, Ben, "U.S. Ports Battle for Trade", National Real Estate Investor, 1 June 2008.
[106] Johnson, Ben, "U.S. Ports Battle for Trade", National Real Estate Investor, 1 June 2008.

ports in the Southeast have generally been supported by a strong and growing regional economy and escalating container volumes.[107] The Port of Savannah is one of the nation's fastest growing container ports and has the potential to reach a capacity of 6.5 million TEUs by 2018. The Georgia Ports Authority has been focused on the Savannah Harbor Expansion Project, which will deepen the harbor from 42 to 48 feet and is slated for completion in 2012, two years before the anticipated completion of the Panama Canal expansion. Savannah also plans to increase routings through the Suez Canal. Further down the coast, the Port of Miami has completed Phase II of the Port of Miami Harbor Dredging Project, which provides increased depth at four additional berths to handle larger container vessels. Phase III of the project focuses on deepening and widening the surrounding channels. Financing for this large-scale dredging project, expected to be completed within six years, is awaiting Congressional authorisation.[108]

According to Global Insight, it might not be cost effective for PPX ships to make multiple ports of call. The result may be increased transhipping in the Caribbean, with a PPX ship traversing the canal for a major hub port and reloading there for the trip back through the canal. As a result, Panama has raised the possibility of creating a megaport at the western entrance of the canal.[109] Many of the ports in the Latin American region are severely capacity-constrained and underdeveloped. Ports from Santos on the Atlantic Coast, to Callao on the Pacific Coast and Puerto Cabello in the Caribbean are all struggling to cope with congestion as a result of the commodity boom. Some estimate that the region pays up to three times more for its logistics than developed countries.[110] Lima's Chamber of Commerce has warned that the Port of Callao will reach full capacity by 2010 and that investment in alternative outlets such as Paita and Pisco must be developed quickly to help manage traffic. Peru is undergoing a flurry of new ports construction as its trade with the rest of the world flourishes.[111] Neptunia, a logistics and warehousing company is building a new port north of Callao, scheduled to be completed during the first quarter of 2010. Even a new development funded by DP World is still seen as insufficient in catering for predicted demand. The ports in the South and Southeast of Brazil have suffered greatly from congestion. The causes have been an acute lack of investment in port terminals, good rail and road links into the major ports of the South American country and terrible coordination of dredging operations.[112] The Port of Santos in Brazil is the busiest container port in Latin America. The port authority plans to spend US$680 million to construct the Bernabé Bagres Complex which will double the capacity of the port and US$70 million on the Embraport Terminal initiative to build a 1 million square meter (10.8 million square feet) terminal that is scheduled for completion in 2010. A report issued by the Economic Commission for Latin America and the Caribbean has warned that the port will have to double its capacity every four years in order to keep up with demand, while port capacity in the rest of Latin America will have to double every five years to simply accommodate increasing cargo traffic.[113]

[107] Sowinski, Lara L., "The Southeast Sets the Pace", World Trade Magazine, 31 March 2008.
[108] Port of Miami, http://www.miamidade.gov/portofmiami/development_warf.asp, accessed 19 January 2009.
[109] Dutton, Gail, "Trade in the Americas: Expanding the Panama Canal for the 21st Century", World Trade Magazine, 2 November 2007.
[110] Lloyd's List, "Ports struggle to cope with rising congestion", 27 October 2008.
[111] Port Strategy, "Callao will reach capacity limit in 2010", 25 September 2008.
[112] Port Strategy, "Sting of success", 1 April 2007.
[113] Port Strategy, "Stark capacity warning for Latin America", 2 December 2007.

Exhibit 27
Intermodal Connections to Americas Hinterlands



Source: RREEF Research

Increasing volume of containers moving through ports across the Americas in the mid-to-long run will generate a need for faster and more efficient intermodal connection and hinterland infrastructure. In fact, when it comes to assessing the development potential of ports, one of the key factors for consideration is the potential for hinterland development. Ports along the West Coast of North America are preparing for the growth in manufacturing capacity from Asia by supporting rail network expansion, road construction and development of new information technologies to improve the management of traffic flow. Another element driving improvements in intermodal infrastructure is the need for accommodating PPX container ships with increasing volumes of trade. While many ports in the region have improved their hinterland infrastructure over time, the pace of development has not matched the pace of growth in ship size. For many ports, urban development, in which container terminals are located, have also contributed to the land accessibility issue, resulting in container trucks competing with cars and buses and container trains competing with passenger and commuter trains.[114]

Despite best efforts such as plans to move forward with terminal and no-dock rail expansion projects that will increase capacity at the Port of Los Angeles, intermodal congestion will still remain a critical issue for Southern California ports. Meanwhile, other ports along the West Coast are making strong efforts to increase their intermodal capacity. At the Port of Prince Rupert in Canada, the nearby Canadian National Railway has enhanced its direct service between the port and Chicago by seeking to purchase suburban rail lines for faster connections at Chicago. The Port of Tacoma recently signed a deal with Union Pacific Railroad

[114] McCalla, Robert J., "Factors influencing the landward movement of containers: the cases of Halifax and Vancouver", Ports, Cities, and Global Supply Chains, 1 August 2007.

to obtain Union Pacific's domestic intermodal container business from the Port of Seattle's Argo Rail Yard. In return, this shift will allow the Port of Seattle to handle more international container traffic via Union Pacific and increase rail transport to the Midwest and the East Coast. The Port of Oakland has proposed a plan to spend US$300 million to establish an expanded intermodal rail facility between existing carriers, Union Pacific and Burlington Northern-Santa Fe, and US$325 million for an intermodal truck-train terminal. In recent years, Lázaro Cárdenas has upgraded railway and highway infrastructure in anticipation of an increase in volume of goods bound for the US. Kansas City Southern de Mexico has already invested more than US$1.7 billion over the past 10 years and announced plans to invest over US$380 million in 2009 to finance several infrastructure projects in spite of the global economic crisis. Projects include the construction of an US$80 million intermodal terminal at the port.

Ports along the East Coast of North America have also been strategically developing their hinterland transportation in anticipation of more trade volume due to the completion of the Suez and Panama Canal expansion projects. The Port of New York and New Jersey moved 358,000 intermodal containers in 2007, more than double its 2000 volume.[115] With the expansion of the ExpressRail system, the port hopes to continue to be the gateway choice for all-water services to the East Coast. At the Port of Virginia, Norfolk Southern rail has committed to a US$260 million Heartland Corridor project, which will speed up shipments of cargo containers from the port to the Midwest. The project is scheduled for completion by 2010. Additionally, the port has committed to a US$2-3 billion I-81 Crescent Corridor project, which will ease the flow of cargo containers between the country's Southeastern and Northeastern reaches. The Port of Savannah recently took possession of an additional 2,500 feet of track at their on-terminal Mason Intermodal Container Transfer Facility, increasing capacity at that facility by 25 percent. By the end of this year, the Chatham Yard ICTF will come online, bringing an additional 6,000 feet of on-terminal rail which will essentially double intermodal rail capabilities. The Port of Jacksonville and the Florida Department of Transportation are funding the design of road improvements which is needed to accommodate projected increases in vehicle traffic when the new TraPac Container Terminal at Dames Point opens in 2009. The Port of Miami is pursuing a US$1 billion underground Miami Tunnel Project, which will give truck drivers seamless access to and from the interstate and reduce truck traffic congestion on surface streets. However, the Florida Department of Transportation recently announced that it will re-evaluate the project in light of current economic difficulties.

The Latin American region lacks a well-developed transport infrastructure and should focus on improving their internal connectivity. Additionally, the majority of Central American ports are purely state-owned and inefficient. The AAPA recommends that the region focus more on port decentralisation and privatisation to increase efficiency via private management.[116] The Port of Santos is Brazil's largest port and serves as an industrial and agricultural export hub for the entire southern cone of South America. However, the port is heavily congested, exacerbated by intermodal challenges, such as lack of development of the rail system to focus on the containerised market rather than the bulk agricultural commodities market. Less than 10 percent of cargo is transported by rail to the port, compounding problems during the peak season. Intermodal operators in Brazil are currently investing to increase the participation of the rail sector by approximately 10 percent to reduce truck waiting times at the port. Ports across the Americas are enthusiastically pursuing big-scale intermodal improvements, eager to act as an alternative for shippers seeking to avoid the persistent congestion in Southern California. The expectation is that this is not a mere short-term opportunistic change but rather a substantive 'sea change' in America-bound shipping routes.[117]

[115] Port of New York and New Jersey, http://www.seaportsinfo.com/panynj/expressrail/?page=home, accessed 19 January 2009.
[116] Dasso, Renzo, "AAPA: Latin American countries need to invest in internal connectivity", BN Americas, 7 August 2008.
[117] Breskin, Ira, "The East Coast Port Alternatives", World Trade Magazine, 1 June 2005.

Global Investment Market

In this section, we review recent investment trends, and we conclude our analysis by rating the long-term outlook for the 56 largest container ports based on a range of factors.

The wide variety of national models for private participation in ports and terminals has created many options for investors. Investor interest has sparked record prices for port assets. Between 2005 and 2007, deals involving DP World, CSX Terminals, P&O Ports, Teachers, OOIL Terminals, AIG, RREEF, and Maher Terminals carried prices ranging from 14 to 24 times EBITDA.[118] The relationships between the terminal operators and the shipping lines are the key to understanding the stability of the port itself. As Exhibit 14 showed, there are contrasting types of global terminal operators, ranging from those whose primary business is the operation of container terminals to those whose terminal operations are ancillary to shipping activities.[119] The shipping lines operate through networks and alliances, which include terminal operations. Consolidation or change in strategy can dramatically affect a port's competitive position. When Maersk Lines, for example, shifted its operations a few years ago across the Singapore Strait to Tanjung Pelepas, the Port of Singapore lost 15 percent of its business.[120] Similar competition between the Port of Vancouver and Fraser River Port in 2006 eventually resulted in a port merger.

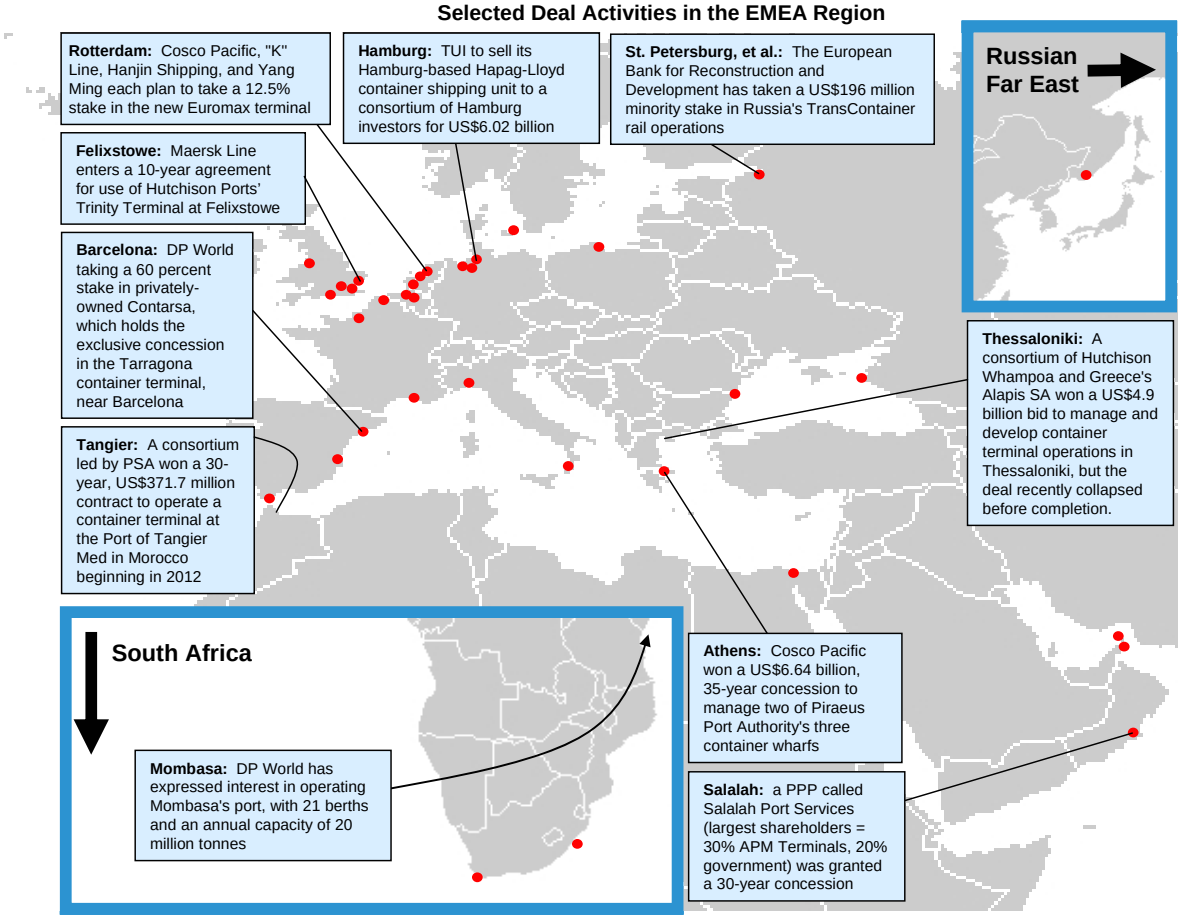
Investment Trends – Europe, Middle East, & Africa (EMEA)

The fourth quarter of 2008 saw a fall-off in port transaction volume in the European infrastructure market. According to Dealogic data, only one deal was signed — totalling US$247.5 million in the fourth quarter of 2008. Located in Lisbon, Portugal this deal is a PPP project at the Alcantara port container terminal.[121]

While privatisation deal activity has slowed, terminal investment plans continue to move forward as long-term prospects remain strong that trade volumes will increase. This outlook is due in part to the surge in container traffic flows in recent years and the ensuing bottlenecks and capacity issues at the major ports in the region. Recently announced port terminal investment activity in the EMEA region has been focused on the major ports of Rotterdam, Hamburg and many of the second tier ports which are trying to attract spill-over demand (see Exhibit 28). As of early March 2009, Greece had approved a three-decade concession for Cosco Pacific to operate container terminals at the Piraeus port near Athens, but the deal had not yet closed.[122]

[118] Drewry Shipping Consultants Ltd.
[119] United Nations, Economic and Social Commission for Asia and the Pacific, "Regional Shipping and Port Development: Container Traffic Forecast, 2007 Update," p. 26.
[120] United Nations, Economic and Social Commission for Asia and the Pacific, "Regional Shipping and Port Development: Container Traffic Forecast, 2007 Update," p. 25.
[121] Dealogic, accessed 30 January 2009.
[122] "Greek Parliament OKs Cosco Piraeus Deal," Journal of Commerce, 6 March 2009.

Exhibit 28
Selected Deal Activities in the EMEA Region



Source: RREEF Research

Cosco Pacific along with three other shipping lines – "K" Line, Hanjin Shipping and Yang Ming – will invest in 12.5 percent each in the new Euromax terminal at the Port of Rotterdam. Euromax will have four berths and an annual capacity of 2.3 million TEUs with the potential to expand up to six million TEUs.[123] With shipping companies increasingly taking stakes in terminal operations, the interests of these parties are becoming ever more aligned. This will limit the ability of competing ports which lack the presence of a major shipping line to compete for global rather than local container traffic.

At the same time, the alignment of shipping lines and ports raises potential conflicts of interest and transfer pricing issues arising from the fact that it is often in a shipping line's interests to lower port fees for its own ships and to secure other preferential treatment such as guaranteed berthing slots. Other shipping lines may feel less comfortable to use ports over which a competitor has a significant control and/or influence for fear of confidential trade information falling into the hands of that competitor.

Container traffic growth over the last seven years highlights the ability of the major ports to capitalise on their dominant positions. Investment opportunities outside of these locations do however exist, as evidenced by DP World purchasing a 60 percent stake in Contarsa Sociedad de Estiba (Contarsa) which holds exclusive rights for the Tarragona container terminal in northern Spain. While Tarragona is located only 70 miles southwest of Barcelona and 160 miles north of Valencia (both of which saw container throughput in excess of 2.5 million TEUs in 2008) it provides ample land for expansion, deep-water draft and good hinterland links.

[123] "Cosco Pacific to invest in Rotterdam terminal," Cargonews Asia, 26 August 2008.

Investment Trends – Asia Pacific

The recent credit crisis negatively impacts regional trade flows as well as port-related infrastructure investments. According to Dealogic, more than US$8 billion has flowed into port-related transactions in the Asia Pacific region since 2000. In spite of year-to-year variations in transaction volumes, the overall trend of port-related investments in the Asia Pacific region shows an almost three-fold increase since the beginning of this decade, from US$758 million in 2000 to US$2 billion in 2008. In 2008, port-related transactions accounted for 4.4 percent of the regional infrastructure investment total. Since 2000, Hong Kong, South Korea, and Vietnam appear to be the most active markets in this region.

The Chinese port authority is seeking joint venture opportunities with various port operators to improve port-related infrastructure, so it follows that inward investment in this sector has recently been focused in China. These deals cover more than primary ports like Shanghai or Shenzhen; they also cover ports like Tianjin or Ningbo which may be secondary locations within China, but are still among the largest container ports in the world hierarchy.[124] On the other hand, the investment flow in Indian's ports sector is relatively limited, partly due to its "blanket ban" on investment from certain sources.[125] Despite this archaic law, 3i has disclosed their plan to invest US$161 million in a deep-water port along the eastern coast of India.[126] Apart from this deal, the only notable recent deal is the transaction of DP World at the Port of Chennai. In Australia, there were a number of investment transactions during 2008. DP World, the world's fourth largest terminal operator, is the most active player in Australia.[127]

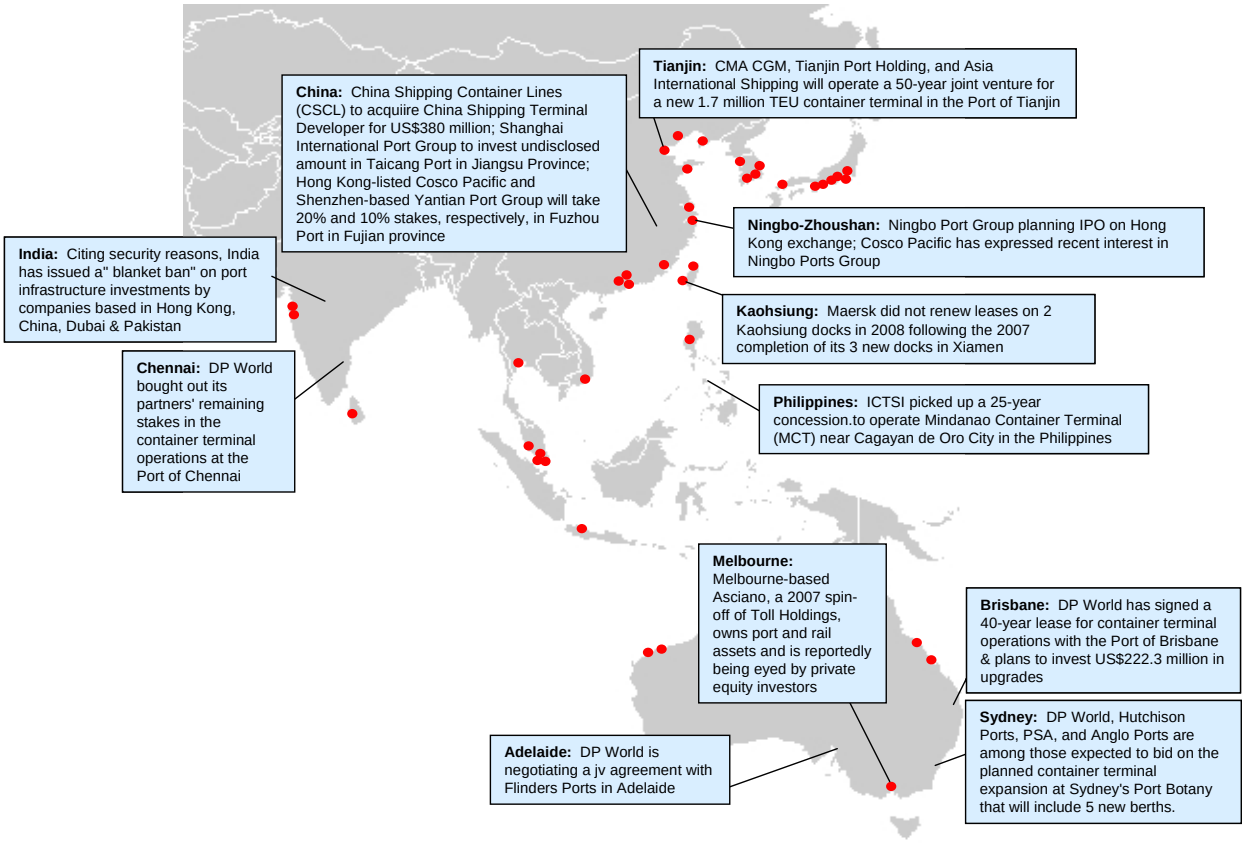
[124] "Shanghai port plans to invest in Taicang," Cargonews Asia, 30 July 2008; and 2008-07-28,"Cosco and Yantian to buy into Fuzhou port," Cargonews Asia, 28 July 2008.

[125] Due to security reasons, India has issued a" blanket ban" on port infrastructure investments by companies based in Hong Kong, China, Dubai and Pakistan. (See "India bans HK from port investment," Cargonews Asia, 22 July 2008.

[126] 25 February 2009, "3i unveils $161 million in Indian deep-water port", Financial News, http://www.efinancialnews.com/archive/keyword/infrastructure/2/content/1053448536/restricted, accessed 12 March 2009.

[127] Deutsche Bank Research (2009), DP World – the world has changed, January.

Exhibit 29
Selected Deal Activities in the Asia Pacific Region



Source: RREEF Research

Investment Trends – Americas

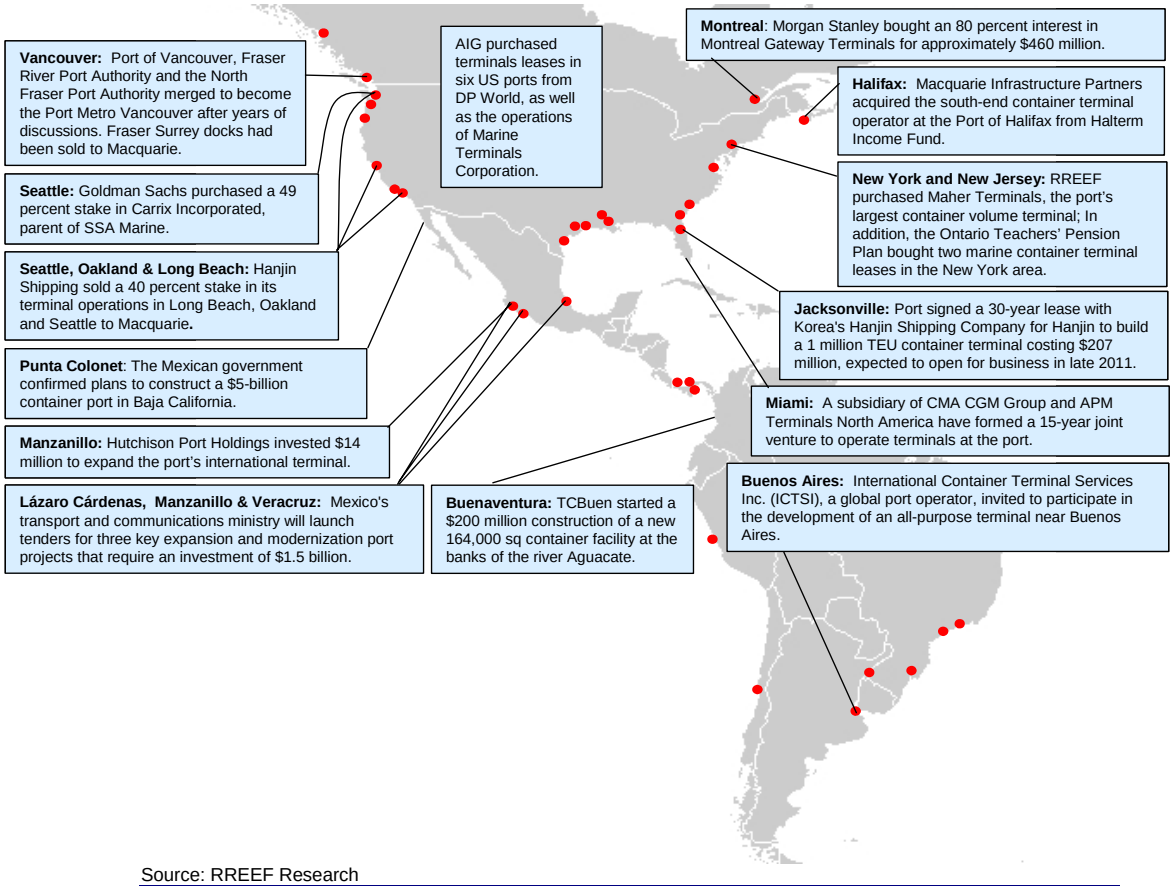
The credit crisis and the decline in global consumer confidence have impacted the volume of goods and materials entering and exiting US ports. Container volumes at US West Coast ports have dropped by nearly 10 percent from 2007.[128] According to Dealogic, there was a US$2.8 billion decline in port transactions for the Americas region, from US$8.7 billion in 2007 to US$5.9 billion in 2008. However, historical Dealogic data reveal significant growth in port investments for the Americas region over the past few years. In 2003, port transactions totalled US$580 million, far below 2008 total transaction volume.

In anticipation of an increase in container traffic in the mid-to- long run, CenterPoint Properties, a real estate development company, recently announced plans to submit a multi-billion dollar offer for the operating rights to the cargo terminals of the Virginia Port Authority. Privatisation of the terminals would represent the largest such transaction in the US port industry since 2006/2007.[129] In 2008, the Jacksonville Port Authority has signed a 30-year lease with Korea's Hanjin Shipping Company for Hanjin to build a 1 million TEU container terminal at Dames Point Marine Terminal, scheduled for completion in 2011. The 90-acre facility, at a cost of US$207 million, will be Hanjin's first dedicated US operation outside the West Coast, a strategic move meant to capitalise on the expansion of the Panama Canal. The agreement Hanjin has with Port of Jacksonville also allows for further expansion of the facility.[130] At the Port of Miami, the CMA CGM Group, through its subsidiary Terminal Link, and APM Terminals

[128] Mongelluzzo, Bill, "Mexico port plan on track", Journal of Commerce, 14 January 2009.
[129] Bonney, Joseph, "Bidder Seeks Virginia Terminals", Journal of Commerce, 11 March 2009.
[130] Jacksonville Port Authority, "Hanjin Container Terminal at Dames Point" December 2008.

North America have formed a 15-year joint venture to operate terminals at the port. The agreement, signed in 2008, represents a minimum total investment of US$25 million toward terminal infrastructure upgrades and improvements.[131] Also in 2008, the Port of Vancouver, Fraser River Port Authority and the North Fraser Port Authority merged to become the Port Metro Vancouver after years of discussions. The merger aligns with the government's Asia-Pacific Gateway and Corridor Initiative to boost trade with Asia and increase the Vancouver Gateway's share of container imports. The port is now the fourth-largest tonnage port in North America and better positioned to optimise the region for customers.

Exhibit 30
Selected Deal Activities in the Americas Region



Source: RREEF Research

In recent years, a number of private entities have invested in terminals at public ports in the US. Macquarie Infrastructure Partners acquired the south-end container terminal operator at the Port of Halifax from Halterm Income Fund and the Fraser Surrey Docks from the privately-held APTL Terminals Ltd. AIG purchased terminal leases in six US ports from DP World, as well as the operations of Marine Terminals Corporation. RREEF purchased Maher Terminals, the Port of New York and New Jersey's largest container volume terminal. Goldman Sachs purchased a 49 percent stake in Carrix Incorporated, parent company of SSA Marine. The Ontario Teachers' Pension Plan purchased two marine container terminal leases in the New York area.[132] Morgan Stanley purchased an 80 percent interest in Montreal Gateway Terminals for approximately US$460 million. Hanjin Shipping sold a 40 percent stake in its terminal operations in Long Beach, Oakland and Seattle to Macquarie.[133]

[131] "CMA CGM Group to Operate Miami Terminal in Joint Venture with APM Terminals", CMA CGM Press Release, 9 July 2008.
[132] Maritime Administration, http://www.marad.dot.gov/ports_landing_page/ports_landing_page.htm, accessed 9 February 2009.
[133] Leach, Peter T., "Hanjin Sells Stake in West Coast Terminals", Pacific Shipper, 21 September 2006.

Announced in early 2009, Mexico's transport and communications ministry will launch tenders for three key port projects that require an investment of US$1.5 billion. The expansion and modernisation projects will be carried out at the ports of Manzanillo, Veracruz and Lázaro Cárdenas, in the states of Colima, Veracruz and Michoacán respectively. Mexico's federal government has prioritised investments to modernise the port system as part of a plan to position the country as the sector's leader in Latin America.[134] Last year, Hutchison Port Holdings invested US$14 million to expand its Manzanillo international terminal in Mexico. The new terminal will be able to handle 340,000 containers annually and generate US$30 million in annual profits.[135] Also earlier this year, the Mexican government confirmed plans to construct a US$5 billion container port at Punta Colonet in Baja California, which the government views as an alternative Pacific Coast gateway to the US market for the Asia container trade, about 150 miles south of the US border.

In 2008, port operator International Container Terminal Services (ICTSI) was invited by Argentine firm Loginter to act as its partner for an all-purpose terminal at the Port of La Plata, located south of Buenos Aires along the River Plate. The Loginter-ICTSI team will invest US$250 million during the 30-year concession. The new container terminal will initially handle 400,000 TEUs, equivalent to 25 percent of the container traffic currently handled in the country.[136] In Colombia, construction started last year in the Port of Buenaventura, a development some would consider the most important new port investment on the Pacific Coast of Colombia for more than a decade. TCBuen, the group controlled by local investor Grupo Empresario del Pacifico and Terminales de Contenedores de Barcelona, kick-started the US$200 million construction of a new 164,000 sq container facility on the banks of the river Aguacate.[137] Despite the current global financial crisis and decreased container volumes, international maritime interests are convinced that numerous ports in the America region will become congested in the coming decade.

Evaluating the Outlook for Container Ports

This paper evolved over a long period of time, allowing the research team to think through issues and questions and consult with various experts in the field, both internal and external. In this last section, our goal is to tie the analysis together by developing a useful scoring system for evaluating port-related opportunities. We began with an initial list of potential variables that might be useful. As the paper progressed, some of these variables were deemed less helpful and were dropped. Meanwhile, other discoveries made along the way were added to the list even though they were not initially planned.

The final scoring model includes 21 variables, nine of which evaluate national or macroeconomic influences. These nine country-level variables focus heavily on measurable aspects of trade flows, GDP, and competitiveness. Together, these national factors comprise 40 percent of the overall scoring mechanism.

Port-level variables are more geographically focused and reflect a broader group of inputs, thus in aggregate, these 13 variables contribute 60 percent to the scoring mechanism. Within this group of 13, two variables consider investment and ownership characteristics. Three variables focus on crucial supply-side constraints, including maximum port depth, existing operational capacity, and the known development pipeline. Four demand-related variables include TEUs processed, TEU growth in both demand and percentage terms, and estimated future absorption pressure. Together, these add up to nine quantifiable port-level variables, but four other crucial factors in our investigation remained. While these remaining port-level factors could not be ignored, neither were they traditionally quantifiable, especially not when comparing across diverse regions of the world. In the end, these last variables could only be

[134] BN Americas, ”SCT: Key port projects to total US$1.5bn in 2009”, 14 January 2009.
[135] BN Americas, ”HPH invests US$14mn to expand Manzanillo international terminals”, 27 June 2008.
[136] Infrastructure Journal, ”New container terminal to be built for Argentine port”, 1 September 2008.
[137] Port Strategy, “Buenaventura terminal”, 5 September 2008.

arrived at through a qualitative approach. In this case, the research team relied on a mix of interviews, discussions, and literature review to evaluate these last four variables:

- ***Development plans.*** Are realistic plans in place to expand the port's capacity over the next 10 years? Feasible, realistic plans for anticipating needs and managing expansion with full political and financial support were evaluated most positively. More critical evaluations were given to those ports deemed to have no realistic plans in place as well as those where severe environmental, political, financial, physical, or other constraints prohibited necessary expansion.

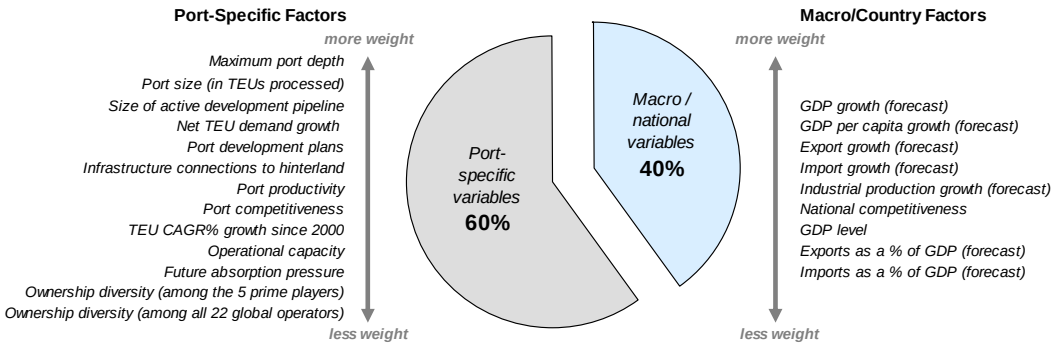
- ***Hinterland infrastructure.*** Is a significant multi-modal infrastructure in place to efficiently connect the port to the region? Ports with a state-of-the-art infrastructure in place or at least with significant infrastructure investments planned over next 10 years were evaluated positively. Critical evaluations were given for those ports with dismal hinterland infrastructures in place and little improvement expected.

- ***Port competitiveness.*** How secure is the port's competitive position over the next 10 years? The highest evaluations were reserved for gateway ports which hold near-monopoly status to and from their major hinterlands. Major hubs with defensive competitive positions along strategic global trade routes were also evaluated positively. The least competitive ports were deemed to be the minor transhipment ports believed to have multiple competitors.

- ***Port Productivity.*** How fertile is the managerial environment for productivity gains over the next 10 years? Ports receiving the most positive evaluations were those with helpful regulatory tools like special economic zones (SEZs) in place or the ability to automate activities and processes as needed. Ports received lower evaluations if they experienced significant regulatory burdens or strong resistance to automation.

In total, 21 variables form the overall scoring mechanism. Exhibit 31 shows how these variables were grouped and weighted. From the raw data, we calculated Z-scores for each variable and then normalised the scores on a 1-10 scale. Higher weights were applied to those factors deemed most important, and final scores were calculated.

Exhibit 31
Methodology for Ranking the Ports



Source: RREEF Research

Exhibit 32 shows the final scores grouped by major region. Results should be viewed as relative opportunity scores rather than absolute rankings. As the previous sections of this paper have indicated, the bulk of future container port growth will be in the Asia Pacific region. Our scoring system corroborates this finding as well since many of the Asian ports accrue more points than their EMEA or Western Hemisphere counterparts. In this context, the scores can be a helpful way to sort out the relative opportunities within each region.

There are some notable patterns across and within regions. In the EMEA region, for example, we have already noted that the "Big Three" ports of northwestern Europe have been strengthening their roles as gateways, and our scoring process indicates this dominance is likely continue. Not so in the other two regions. The West Coast gateway ports of the Americas – Los Angeles and Long Beach – do not score highest within their region. Instead the scores reflect the expectation of intense competition in the years ahead. This is true also in Asia, where the world's top ports of the past several years – Singapore and Hong Kong – score slightly lower within the region than many of the emerging Chinese ports. Emerging ports in Malaysia and India also score a bit higher than older stalwarts in Japan, Taiwan, and Australia.

Exhibit 32
Summary of Container Port Services

	Port	Country	Weighted Score
Asia Pacific	Shanghai	China	9.28 ●●●●●●●●●
	Shenzhen	China	9.21 ●●●●●●●●●
	Qingdao	China	8.92 ●●●●●●●●
	Tianjin	China	8.90 ●●●●●●●●
	Ningbo-Zhoushan	China	8.56 ●●●●●●●●
	Guangzhou Harbor	China	8.50 ●●●●●●●●
	Dalian	China	7.99 ●●●●●●●
	Xiamen	China	7.79 ●●●●●●●
	Hong Kong	China	7.73 ●●●●●●●
	Busan	South Korea	7.52 ●●●●●●●
	Singapore	Singapore	7.47 ●●●●●●●
	Port Klang	Malaysia	6.98 ●●●●●●
	Tanjung Pelepas	Malaysia	6.79 ●●●●●●
	Jawaharlal Nehru	India	6.74 ●●●●●●
	Kaohsiung	Taiwan	6.55 ●●●●●●
	Ho Chi Minh	Vietnam	6.46 ●●●●●●
	Laem Chabang	Thailand	6.18 ●●●●●●
	Yokohama	Japan	5.90 ●●●●●
	Tokyo	Japan	5.59 ●●●●●
	Colombo	Sri Lanka	5.37 ●●●●●
	Nagoya	Japan	5.33 ●●●●●
	Tanjung Priok	Indonesia	5.30 ●●●●●
	Osaka	Japan	5.04 ●●●●●
	Melbourne, VIC	Australia	4.98 ●●●●
	Kobe	Japan	4.96 ●●●●
	Keelung	Taiwan	4.64 ●●●●
	Manila	Philippines	4.22 ●●●●
EMEA	Rotterdam	Netherlands	6.94 ●●●●●●
	Hamburg	Germany	6.32 ●●●●●●
	Antwerp	Belgium	6.16 ●●●●●●
	Dubai	UAE	5.45 ●●●●●
	Durban	South Africa	5.36 ●●●●●
	Jeddah	Saudi Arabia	5.20 ●●●●●
	Salalah	Oman	5.18 ●●●●●
	Port Said	Egypt	5.09 ●●●●●
	Bremen-Bremerhaven	Germany	4.97 ●●●●
	Algeciras Bay	Spain	4.34 ●●●●
	Le Havre	France	4.22 ●●●●
	Khor Fakkan / Sharjah	UAE	4.11 ●●●●
	Barcelona	Spain	3.95 ●●●
	Zeebrugge	Belgium	3.95 ●●●
	Felixstowe	UK	3.80 ●●●
	Valencia	Spain	3.79 ●●●
	Gioia Tauro	Italy	3.00 ●●●
Americas	Balboa	Panama	6.37 ●●●●●●
	Savannah, GA	USA	6.37 ●●●●●●
	New York/New Jersey, NY/NJ	USA	6.15 ●●●●●●
	Hampton Roads (Virginia), VA	USA	6.04 ●●●●●●
	Los Angeles, CA	USA	5.91 ●●●●●
	Vancouver, BC	Canada	5.89 ●●●●●
	Long Beach, CA	USA	5.76 ●●●●●
	Tacoma, WA	USA	5.69 ●●●●●
	Manzanillo/Colon	Panama	4.94 ●●●●
	Santos	Brazil	4.88 ●●●●
	Seattle, WA	USA	4.74 ●●●●
	Oakland, CA	USA	4.58 ●●●●

Source: RREEF Research

Conclusion

This paper covers a considerable amount of ground. In each of the three sections we posed a basic question: (1) How did we get to this point? (2) What's happening on the ground right now? And (3) what is the opportunity landscape? As we worked through these questions, we made several discoveries. Ports and trade routes are distinguishable by their activities and cargoes. As property markets are evaluated by sectors like office and retail, so too does it make sense to evaluate container ports separately from ports specialising in other types of activities where the infrastructures, supply chains, and major players differ. This finding helped us to narrow an initial list of 104 major ports down to just 56. We also observed that competitive factors in the airline and airport sector provide a comparable framework for thinking about port competition and risk. Perhaps most importantly, though, we found that despite the current downturn, most analysts and experts anticipate that future growth in container traffic will be led by intra-Asian trade. This does not discount opportunities elsewhere, although they may need to be more targeted and selective. The upgrading of the Panama Canal may reshape the competitive landscape to some extent in the Americas, while in EMEA, the evolution of the EU's TEN-T plan may influence the future relationship of ports to their hinterlands.

Our scoring process confirms that opportunities are likely to be greatest in the Asia Pacific region. We also differentiated ports within regions. Of the gateway ports in each region, our scores show that Europe's "Big Three" are probably the most secure, while the leading gateway ports in Asia (Singapore and Hong Kong) and the Americas (Los Angeles and Long Beach) face much stiffer competition for regional market share.

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