The Port Reform Toolkit could be elaborated thanks to the financing contributions of the following organizations:

- The Public-Private Infrastructure Advisory Facility (PPIAF)
  PPIAF is a multi-donor technical assistance facility aimed at helping developing countries improve the quality of their infrastructure through private sector involvement. For more information on the facility see the website www.ppiaf.org.
- The Netherlands Consultant Trust Fund
- The French Ministry of Foreign Affairs
- The World Bank

The Port Reform Toolkit Modules have been prepared with the contributions of the following organizations, under the management of the World Bank Transport Division:

- International Maritime Associates (USA)
- Mainport Holding Rotterdam Consultancy (formerly known as TEMPO), Rotterdam Municipal Port Management (The Netherlands)
- The Rotterdam Maritime Group (The Netherlands)
- Holland and Knight LLP (USA)
- ISTED (France)
- AXELCIUM – Ingenierie et Regulation Financiere (France)
- Nathan Associates (USA)
- United Nations Economic Commission for Latin America and the Caribbean (Chile)
- PA Consulting (USA)

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COMPETITIVE SCAN MODULE

The port sector has radically changed over the past two centuries. During the 19th century and first half of the 20th century ports tended to be instruments of state or colonial powers and port access and egress was regarded as a means to control markets. Competition between ports was minimal and port-related costs were relatively insignificant in comparison to the high cost of ocean transport and inland transport. As a result, there was little incentive to improve port efficiency.

How times have changed! Most ports today are competing with one another on a global scale and, with the tremendous gains in productivity in ocean transport achieved over the past several decades, ports are now perceived to be the remaining controllable component in improving the efficiency of ocean transport logistics. This has generated the drive today to improve port efficiency, lower cargo handling costs and integrate port services with other components of the global distribution network. Because of the capital intensity of such efficiency improvements, these have also generated the drive to unbind ports from bureaucratic control of public entities and encourage private sector operation of a wide range of port-related activities.

OVERVIEW OF THE COMPETITIVE LANDSCAPE

In the 21st century, five forces will interact to shape the competitive landscape
DETERMINANTS OF SERVICE PROVIDER BARGAINING POWER
- Experience and unique capabilities that the service provider brings to the port
- Extent to which service provider participates in financing the activity
- Existence of "choke points" in the port that facilitate slowdowns or stoppages in port operations
- Ability of service providers vs. port management to absorb downtime
- Inter-relationships among service providers and port users
- Legal rights conveyed in leases and other use agreements

BARGAINING POWER OF SERVICE PROVIDERS
- Contractors
- Concessions
- Labor

DETERMINANTS OF THE THREAT OF NEW PORT ENTRANTS
- Capital intensification in ports and terminals that creates barriers by raising cost of entry
- Changes in regional distribution patterns and ability of carriers to utilize load centers in place of direct service
- Provisions in leases and other agreements protecting service providers from new entrants in the port
- Natural barriers to expansion
- Magnitude of switching costs to utilize other ports or service providers within the port
- Cost advantages of existing service providers and customer loyalties

THREAT OF NEW ENTRANTS
- New port facilities in the region
- Start-up of regional load centers
- New service providers in the port
- Potential of new port or service providers

DETERMINANTS OF THE INTENSITY OF PORT RIVALRY
- Balance of demand and supply for port services and facilities in the region
- Ability to segment operations in the port to create competition among service providers
- Stakes at risk in preserving existing business
- Ability to absorb losses and/or cross-subsidize operations

RIVALRY AMONG EXISTING COMPETITORS
- Intensity of rivalry within and between ports

BARGAINING POWER OF PORT USERS
- Carriers
- Shippers
- Tenants

DETERMINANTS OF BARGAINING POWER OF PORT USERS
- Degree to which individual port users control a large percentage of traffic in the port
- Business realignments and alliances among port users that result in more powerful players
- Existence of large value adding tenants that the port wants to retain
- Importance of the port to the local economy
- The services provided by the port can be replicated elsewhere
- Cost of switching to other ports or service providers

POTENTIAL FOR GLOBAL SUBSTITUTE
- Other sources of supply
- Substitute products
- Other assembly sites

THE COMPETITIVE LANDSCAPE
facing port authorities and port service providers: 1) rivalry among existing competitors; 2) threat of new competitors; 3) potential for global substitutes; 4) bargaining power of port users; and 5) bargaining power of port service providers (see Box 1). These forces will impact ports of all sizes, driving requirements for port expansion, service improvement, pricing decisions and other management actions. Winners and losers will emerge in the global port sector, largely dependent on how port managers strategically position themselves in the evolving competitive landscape (see Box 2).

**Rivalry Among Existing Competitors**

The intensity of rivalry within the port and between ports is the first of five forces shaping the competitive landscape. In some ports there will be little, if any, rivalry, given the location of the port, type of service being provided, rules on number of companies able to operate within the port, etc. In other situations, rivalry among competitors will be intense and often result in pricing that strips the suppliers of profits. There are several factors that determine the intensity of port rivalry.

**Hinterland market access** — In some situations, only one port can logically provide access to hinterland markets. This may result from geographical features, lack of adequate transport infrastructure from all but one port, political issues or other factors. The port of Djibouti currently has a virtual monopoly on access to the Ethiopian market as a result of the conflict between Ethiopia and Eritrea and lack of transport infrastructure from neighboring Somalia. Dar es Salaam is the major entry point to Tanzania, as well as the neighboring landlocked countries of Zambia, Burundi, Rwanda and Malawi. Little general cargo enters Madagascar without passing through Toamasina. There is obviously little, if any, rivalry between ports in such circumstances. In other situations, many ports may be able to provide access to a common hinterland, creating intense rivalry for market share. Numerous ports on the U.S. East, Gulf and West Coasts compete for traffic to and from the Midwest. Likewise, a number of large ports in Northern Europe and the Mediterranean compete for the European hinterland. In Asia, Hong Kong, Shekou, Yantian, Fuzhou and other ports compete for access to the Southern China market and numerous ports in Northern Asia are available to service the Japanese and Korean markets.

**Ability to service transshipment trade** — While rivalry for hinterland market access can sometimes be limited, rivalry for transshipment business is intense, even for ports that have established leading positions as load centers. Singapore established its role as the world’s largest transshipment center as a result of an advantageous location on the Asia/Europe trade route and proximity to regional origin and destination centers in Southeast Asia. Malta Freeport and Gioia Tauro established their positions in the Mediterranean transshipment market as a result of their location on the Asia/Europe trade route and proximity to the Southern Europe and Northern Africa markets. Colombo
and Dubai have established themselves as regional hubs for traffic to and from the Arabian Sea market and the Indian Sub-Continent. However, the strategic location of these ports has not precluded rivalry for business. Singapore is in an increasing rivalry with Port Klang and more recently with Tanjung Pelapas.

BOX 2

Checklist of Key Questions for Positioning in the Global Port Market

Here are some key questions that port managers and port service providers should ask when developing long term strategy for market positioning.

**Rivalry Among Existing Competitors**
Which other ports have access to my hinterland market?
- Is future supply and demand for port services in the region expected to be in balance?
- Are competing ports able to absorb losses through cross-subsidizing services?
- Who has the greatest stakes at risk in maintaining and growing traffic volume?
- Where do we have a comparative advantage over our competitors?
- What actions can we take to attract and lock-in customers?

**Threat of New Competitors**
- Are new ports being planned in the region that potentially access my market?
- What is the status of these plans and likelihood the project will proceed?
- Will changes in distribution patterns create a new form of competitor?
- What actions can we take to minimize the impact on our existing market base?
- Which other companies are potential service competitors in the port?
- Can switching costs and other barriers be created to prevent market entry?

**Potential for Global Substitutes**
- Are there other sources for products being exported through our port?
- Have ultimate users of cargo through our port the ability to use substitute products?
- Can manufacturers and assemblers shipping through the port shift to other sites?
- Are there potential developments that could impact the ability to substitute globally?
- How significant is port cost in determining market competitiveness of port customers?
- What barriers or incentives can prevent port customers from switching products or sites?

**Bargaining Power of Port Users**
- To what degree do individual port users control traffic through the port?
- What is the potential for business realignments or alliances among customers in our port?
- How would these realignments or alliances change their bargaining power?
- To what extent can the services provided by our port be replicated elsewhere?
- What are the bargaining strengths and weaknesses of the port and port users?
- How can the port’s bargaining strength be improved?

**Bargaining Power of Service Providers**
- Which service providers are potential choke points in the port?
- What options are available to the port if negotiations with specific service providers fail?
- Has the service provider or port the greater capability to absorb port downtime?
- Does the service provider bring financing capability to negotiations with the port?
- Are there interrelationships between service providers and port users?
- What legal rights have been conveyed to the service provider by the port?
Other ports in the Mediterranean are increasingly competing with Malta Freeport and Gioia Tauro for the regional transshipment trade. Salalah and Aden are now serious rivals to Colombo and Dubai for the Arabian Sea and Indian Sub-Continent transshipment markets. These rivalries are often intense and create substantial pressure on transshipment pricing.

**Regional port capacity and demand**
An imbalance of port capacity within a region will influence the level of rivalry between ports. Excess capacity will cause rival ports to aggressively compete for market share. Sometimes this can lead to destructive pricing. For example, the rapid growth in load center capacity in the Eastern Mediterranean has produced intense competition between hubs, with the result that ports such as Limassol and Damietta have been forced to aggressively compete to retain customers through pricing of services that may not be covering costs. Likewise, inability within a region to generate sufficient traffic will increase rivalry for available business. The small hinterland of ports in the Caribbean constrains the market available to each port, creating the need to compete for all types of cargo rather than specialize in types of traffic for which the port might have comparative advantage.

**Ability to create competition within the port** — The ability to segment operations in the port to create competition among service providers will often determine whether rivalry can exist within the port itself. Sometimes it is difficult or impossible to divide facilities in a way that enables more than one contractor to provide certain types of services within the port, particularly container terminal handling services, giving the contractor monopoly status. Much depends on the geographical layout of the port, the available traffic and the minimum capacity additions (taking into account the lumpiness of port investments). In Beirut, a 20-year concession for handling containers in the port has been given to one contractor, as the layout of the port was considered to preclude more than one container terminal operator. In other situations, such as Jeddah, it was possible to segment container terminal facilities in a way that enabled the port to award long term container handling concessions to two contractors, each operating in a separate location within the port. Even more competition has been created among service providers in Hong Kong, where three container terminal operators compete with each other and a variety of other service providers compete for business within the port. In Buenos Aires, the geographical layout of the port and available traffic volumes ultimately enables not more than three terminal operators to compete.

**Stakes at risk** — Rivalry will be influenced by the stakes at risk in preserving market share of regional traffic. The greater the stakes at risk, the more intense the rivalry to preserve market share. This takes on particular significance in modern container ports, considering the investment required to establish a new container terminal can easily exceed $100 million. Whoever assumes the risk for this investment will clearly
have a big financial stake in ensuring that the new terminal captures and preserves market share. Maersk Sealand has invested heavily in a new container terminal in Salalah and clearly has a stake in ensuring that the facility is efficiently used as their regional transshipment hub (see Box 3). Stakes at risk also stem from the importance of the port to the local economy. The Port of Rotterdam, for example, is a major contributor to the local economy and preserving market share in regional traffic flows is of vital importance to the local and regional government. This has resulted in an intense rivalry with other

**Box 3**

**Load Centers Competing for the Arabian Peninsula Market**

Several major ports are positioning to be points of entry and exit for containers moving to and from the Arabian peninsula. It is producing a fierce competition for load center status. The outcome of this competition could significantly change the way ocean carriers service the Arabian Peninsula market.

**Dubai** — The port has established itself as a world-class transshipment hub serving as a load center for markets in the Gulf. Dubai now handles about 2.8 million TEU annually, about a quarter of which is transshipment traffic within the Gulf, with Saudi Arabia, Kuwait and Iran the major destinations. The port authority clearly plans to retain its role in current transshipment markets, as well as position as the load center for containers to and from Iraq once trade resumes. As part of its strategy to control market position, the port has been acquiring management contracts for other ports in the region, effectively gaining control over regional logistics networks.

**Salalah/Aden** — These two new transshipment hubs on the Arabian Sea clearly have designs on being load centers for the region. Their major advantage is proximity to the Europe/Asia trunk line route. Both require little diversion by line haul ships, allowing a quick pit stop to pick up and drop off containers for the Arabian peninsula and India/Pakistan markets. Already, the two new ports have drawn transshipment traffic that had previously been captive to Dubai and Colombo — and have drawn some Red Sea transshipment traffic from Jeddah. The terminal operators have made major investment in these facilities and obviously intend to promote their presence in the region.

**Jeddah** — This port now largely services the Saudi market and only 20 percent of the containers through the port are for transshipment. However, the proposed rail land bridge to Dammam could enable the port to function as a load center for the Arabian Gulf market. The investment in infrastructure is substantial and major hurdles are in the way, particularly establishing a process for allowing transit containers to move freely across the country without regard to contents. But if the rail investment is made and the hurdles resolved, Jeddah could be a major contender for traffic to and from the AG.

**Beirut** — Then there’s the new container terminal in Beirut that will begin operating in late 2000. This terminal has the potential to become the major load center for containers moving between the Arabian peninsula and Europe/North America. Cross-border issues are hurdles that must be resolved. But use of Beirut as a load center will avoid passage through the Suez Canal and save 3,400 miles sea voyage to the western Arabian Gulf. The line haul route could be served using two fewer ships in the weekly
Northern European ports and underpins the plan to invest US$ 2 billion in a new deepwater container terminal and a new railway connection to Germany to maintain position in the future market.

**Ability to absorb losses** — The ability to absorb losses and/or cross-subsidize operations within the port impacts the balance and intensity of rivalry. Global terminal operators with strong financial balance sheets and multiple operations worldwide may be willing to absorb losses in a particular region, at least for a limited period of time, in order to eliminate competition. Ports with multifaceted operations may be able and willing to cross-subsidize services in order to lower charges on port activities where there is greater rivalry for business. In Djibouti, the port authority has been cross-subsidizing transit traffic to Ethiopia through higher charges on export/import traffic and has also been cross-subsidizing general cargo activities in the port through high charges on handling containers. Likewise, port authorities involved in non-seaport related activities, such as the Port of New York and New Jersey, may be able and willing to cross-subsidize port related services through higher charges on non-port related services.

**Ability to control operations** — Rivalry is also impacted by the ability of port authorities and port service providers to control the efficiency of port services. There are situations where entities operating in the port are outside the control of the port manager or service provider, effectively limiting the ability of the port to compete with other ports for market share. In particular, procedures and requirements imposed by Customs in a port frequently impose constraints on the port’s ability to compete with rival ports for market share. In Jeddah, for example, clearance procedures have been the primary culprit limiting the port’s ability to grow as a load center for the Red Sea and Middle East markets. In the West African port of Cotonou, Customs processes have become such a hindrance that container long dwell times are suffocating the port.

**Limits on rivalry within ports** — Limits that ports set on the number of eligible service providers impact the degree of rivalry. Many port authorities have policies limiting the number of stevedores, tug companies, etc. that can operate in the port. Sometimes these limits are set by entry criteria that effectively limit the number of competitors. In some situations these limits are not the result of port policy, but result from historical precedent limiting competition. Such a situation is difficult to change. Japanese ports, for example, are largely controlled by a number of small and medium sized stevedoring companies that have existed for many decades. Entry of new stevedores has been difficult, if not impossible, and the Japanese MOT attributes Japan’s ports being non-competitive with Asian rivals to this lack of competition.

**Government willingness to subsidize operations** — Rivalry between ports is sometimes influenced by the availability of public funds to offset losses, blurring the role of commercial forces. Governments sometimes subsidize ports on the basis that they are vehicles for
economic growth. European ports have for many years been willing to subsidize port access and quays to achieve larger economic goals. The effect of these subsidies is to create artificial forces that influence the chance of rivals’ success. There are indications that government subsidies in the Mediterranean may be impacting the ability of transshipment centers to compete for business.

**Threat of New Competitors**

The second of five forces is the potential entrance of new port facilities or service providers within the port. This would include creation of new regional load centers that change the way cargo to and from a country’s hinterland is distributed. The significance of this threat will vary from port to port depending on a number of factors.

**Capital expenditure for new port facilities** — The capital cost required to build a new port facility frequently provides a barrier to new competitors. Large up-front expenditures are often required for dredging, quay construction, access roads and port superstructure. These start-up costs provide an entrance barrier that can often deter all but the most aggressive players. But there are instances where new entrants will take the risk of major investments in new ports where they see opportunity for market positioning. A good example is Pelabuhan Tanjung Pelapas, on the southwest tip of peninsula Malaysia, where almost $750 million is being earmarked to build a dedicated container port. The developers see the opportunity to tap into the large and lucrative container market, which until now has been largely dominated by Singapore and to a smaller extent by Port Klang. Another example is the new container terminal in Port Qasim in Pakistan, which came into being to provide competition to container terminal facilities in the port of Karachi, which users believed were costly and inefficient.

**New distribution patterns** — Changes in distribution patterns can create new port competitors. This is particularly the case in containerized trades, where a newly created regional load center can siphon traffic from traditional ports in the region. In the Red Sea, for example, the newly created load centers in Aden and Salalah threaten to siphon a substantial portion of the transshipment business to Africa now moving through the port of Jeddah. These new load centers are also siphoning business from the port of Colombo, as well as taking business from Dubai and other ports in the UAE. Another example is the $240 million load center being built by PSA Corporation in Sines, which will draw traffic from Lisbon, Leixoes and other ports in the region. There are also instances where a new port can provide access to a hinterland via overland transit, providing competition to a port more locally sited. The new container terminal in Beirut, for example, provides access to markets via overland transport that are now serviced through the port of Aqaba (see Box 3). The new port of El Sukhna at the western end of the Red Sea will be a strong competitor to Egyptian ports in the Mediterranean for the Egyptian market.

**Provisions in operating agreements** — Provisions in leases, concessions and
other agreements, particularly those involving investment by the operator, will often provide some degree of protection from new competitors starting up business in the port. For example, the terminal operator who has been given the 20-year concession to operate the container handling facility in the port of Beirut has exclusive rights to handle containers in the port during the period of the concession. In other situations, however, the port service provider can be threatened with new entrants. Nowhere is this better evidenced than in Northern Europe with the recent success of the Dutch tug company Kotug in expanding its tug assist business in this region’s ports, which have traditionally been the realm of long established players. In Bremerhaven, Kotug’s entry has resulted in layoffs and cutbacks in the three tug companies that had been operating in a pool arrangement.

**Natural barriers** — Natural barriers that constrain port capacity can limit the threat of new port entrants, particularly those requiring land or fixed facilities to operate within the port. In many ports there simply isn’t space for additional berthing, storage and other fixed facilities, providing some insulation from entry of new competitors. However, these barriers can easily be overstated. In the long term many of these barriers can be overcome by building in adjacent locations, extending out into the sea, etc. There can also be new methods of operation introduced that do not require presence in the port. For example, an inland container depot could substitute for storage and other operations now performed in the port. The Italian port of La Spezia has a chronic lack of space and has constructed the Intermodal Center of S. Stefano Magra for this purpose.

**Magnitude of switching costs** — Existence of switching costs will often determine the ability of new entrants to start up competing operations, either within a port or between ports. Switching costs can come in several forms. They could be the capital expenditure required to switch from one port facility to another. In some cases this can be a very small cost, especially for carriers that have little fixed investment in a facility. A pure transshipment facility for containers, such as Kingston Jamaica, can be particularly vulnerable to switching as the carriers using the facility may incur little switching cost in shifting to a competing facility. In other cases this cost can be substantial. Carriers can have a considerable amount of equipment positioned in a port that would need to be shifted to another port if they were to switch operations. Also, some carriers have heavily invested in port and terminal infrastructure. In instances where major bulk handling facilities have been created, switching is almost impossible. Another form of switching cost is the need to establish a service network in the new port, which could entail a considerable amount of learning and experience costs. Then there’s a form of switching cost resulting from disruption in service during the transition period. Ports, and service providers within a port, can often protect their market position by ensuring that these switching costs are maximized.
**Cost advantages and customer loyalties** — Cost advantages of existing service providers and customer loyalties will impact the threat of new entrants. There may be economies of scale and/or experience that enable established players to retain the position of cost leaders if new entrants were to start up business in the port. This could result from a variety of factors, including having the better location in the port, having sunk investment in facilities and equipment, employing experienced personnel, etc. While customer loyalties can be ephemeral, quality of service (e.g., responsiveness to customer needs, handling rates, clearance time, etc.) can differentiate the service provider and limit the threat of new entrants. Sometimes these customer loyalties can result from the threat of reprisal should the customer shift to another service provider or another port.

**Potential for Global Substitutes**

The third force shaping the competitive landscape is the potential of port users to shift to other global sources, impacting the level of activity in the port. This force takes on greater importance as world trade is opened to competition, sourcing of supply becomes increasingly global and vertical specialization becomes an increasingly important factor in global logistics chains. Several factors will determine the importance of this force on specific ports.

**Other global sources for products moving through the port** — The extent to which there are other global sources available to customers now shipping through the port will determine the ability to source elsewhere. Various types of fruits and vegetables provide good examples of substitute global sources. Bananas, for example, can be sourced from West Africa, Latin and South America, the Caribbean or Asia. Manufacture of clothing is also globally footloose, with many potential locations to source product. The efficiency of port facilities in each of the export locations will impact the success of the product in the export market, which ultimately impacts the level of activity moving through the port.

**Substitute products for exports and imports** — Foreign buyers may be able to substitute other products for the product they are now shipping through the port. For example, a power plant utilizing imported coal as feed may be able to switch to oil or gas as feed if the economics shift in favor of the latter. Port costs to handle coal are one of the factors that impact the economics of utilizing coal as feed and exports of coal through the port could certainly be impacted if the foreign buyer shifts to gas or oil as feed.

**Magnitude of switching costs for substitution** — There may be significant cost in switching to other sources, products or assembly sites that will impact the ability of port users to substitute globally. The greater this cost, the greater the port’s bargaining power. Ability to shift to other global sources can be limited by the port users’ reliance on value adding services in or near the port involving integration of imported intermediate goods with domestic produce for final sale to the domestic or export market. These value adding services can be cost-
ly to replicate elsewhere and impact the ability to shift to other global sources. For example, the large free zone in Jebel Ali enables tenants to import and assemble intermediate products into final products, utilizing a large pool of inexpensive expatriate labor for the assembly process. While many of the value adding activities performed in Jebel Ali can be performed elsewhere, the alternatives may involve significantly higher labor cost and a less friendly government environment. It may also entail walking away from a high sunk cost. Reebok, for example, has established a large final assembly and distribution center in the port of Rotterdam to service the European market. While this value adding activity could be shifted to another location, there is a sizable sunk cost associated with the existing facility (see Box 4).

Demand elasticity of exports and imports — Another factor determining the potential for global substitutes is the elasticity of demand for the country’s exports and imports. The greater the elasticity, the greater the potential that buyers can do without the product. Doing without the product is a form of substitution by the buyer that will impact the volume of traffic in that product for the port.

Importance of port costs in total delivered price — Cutting through all of the above is the issue of how significant port related costs are as a percentage of total delivered price. Many shippers consider port costs to be among the more controllable expenditures in the logistics chain. In general, the higher the percentage that port costs are of total delivered price, the more impact port costs will have on buyer behavior. For high value commodities such as electronics, port costs can be less than 1 percent of the delivered market value. For low value commodities such as bagged rice, port costs can be more than 15 percent of the delivered market value. Shippers of electronics may be less influenced by port costs in selecting ports than shippers of rice. However, small cost penalties may not be acceptable even when port costs are a small percentage of the total delivered price. These penalties may represent the difference between profit and loss in the marketplace and, depending on whether the port user has the option to ship through another port, not buy the product or find another market, influence the selection of port.

Bargaining Power of Port Users

Carriers, shippers and tenants utilizing the port have varying degrees of bargaining power and control over port management actions. This is the fourth force shaping the competitive landscape in a port. Bargaining power of port users is determined by a number of factors.

Concentration of port user power — The more an individual port user controls a large percentage of traffic in the port, the more bargaining power the user has in negotiations with port management and port service providers. In some situations, the port user can be so powerful that the port literally can not afford to lose its business. Even the largest ports must contend with extremely
Box 4

Reebok Logistics Center in the Maasvlakte Distripark

Value adding activities have been created in many ports to enhance trade and generate employment for the local area. The key ingredients are efficient port operation, availability of good transport services and attractive prices for land, labor and energy. The newly opened Reebok state-of-the-art logistics center in Rotterdam illustrates how one port helped create a value-adding service that generates employment for 300 personnel and contributes $6 million in direct income to the local community.

Reebok Product Line and Logistics

Reebok has two product lines, footwear and apparel. In 1998, footwear accounted for 57 percent of international sales, apparel 43 percent. Reebok products are actively marketed in 170 countries or territories. The U.K. is the largest market for Reebok products in Europe, representing 30 percent of total European sales. Spain is another big market for Reebok products. Almost all footwear is supplied from plants in the Far East. Most apparel is supplied from plants in southern Europe. Footwear moves in containers from the Far East. Apparel moves by truck and container from plants in Portugal, Greece, Turkey, etc.

Restructuring of Logistics Activities

As part of a global restructuring of logistics activities, Reebok in 1995 decided that warehousing and distribution activities in Europe should be consolidated. In place of having warehousing facilities in each market, a bulk logistics facility would be established in mainland Europe to supply pick-and-pack warehouses in the U.K. and Spain, as well as directly supply other markets in Europe. Except for some very large accounts (which are serviced direct) and apparel for Southern Europe (which is warehoused in Spain), all product flow to the European market would pass through this logistics center. France, Belgium and the Netherlands were considered as potential locations. Following assessment of each of these locations, Reebok decided to locate the logistics center in the Netherlands. The site chosen is in the newly created Distripark 3 in Maasvlakte at the ocean edge of the port property. In November 1998 the facility began receiving product.

Why the Port of Rotterdam was Selected

Reebok had a variety of reasons for choosing this site. It is close to the new deepwater terminal in the port of Rotterdam, a container handling facility that is generally regarded as one of the most advanced and capable terminals in Europe. The location is on the coast, which provides easy access to short sea transport to the U.K. market. There is a good supply of warehousing labor in the Rotterdam area, despite the fact that the general labor market is tight. Most people in the Netherlands understand English, which was considered by Reebok to be important. Customs in the Netherlands is considered to be efficient and business friendly. While not an advantage, labor costs and regulations concerning labor practices were considered to be similar to those of other countries in Europe. But most importantly, space was available and the port wanted to have a launching customer in the new Distripark. So the port, in combination with the municipal government, proactively pursued Reebok and provided strong incentives to locate the facility in Maasvlakte. Based on a six-year operating lease with a five-year renewal option and substantial residual value guarantees by Reebok, the port funded construction of the state-of-the-art 700,000 sq. ft. logistics facility. The port also created the necessary infrastructure to connect the facility to the adjacent container terminal, facilitated creation of bus service fitted to the plant shift system and provided a contact person to deal with problems and issues. Reebok describes its relationship as “a partnership with the port.”
powerful carriers that have the option to take their business elsewhere. Recently, a major container carrier wielded its power to get concessions from the Port of New York and New Jersey as a condition of utilizing the port as a load center on the U.S. East Coast. The port didn’t want to lose a carrier that represented 20 percent of the port’s container volume. Given this control over a large port, consider the bargaining power that the carrier has in dealing with a small or mid-size port where there are options for using other facilities. In the Caribbean, large cruise lines such as Carnival, Royal Caribbean and P&O have great bargaining power with the cruise ports that they serve. These three companies control more than 50 percent of industry capacity and their decisions on which ports to call can have major impact on a local economy. Recently, Carnival decided to reduce or eliminate cruise ship visits to Grenada as a protest to the imposition of cruise taxes by the government, an action that stands to seriously impact the economy of the small nation.

Impact of changing business relationships — Business realignments and agreements among port users can result in powerful players that port managers and port service providers must contend with in contract negotiations. These can take the form of conferences, slot sharing arrangements, strategic alliances, mergers, etc. The result in each case can be greater concentration of port business among a smaller number of port users. When representatives of the Grand Alliance sit down with a port to negotiate future contract terms, the port is dealing with a formidable alliance of carriers that previously had been individual customers. Acquisitions can change the negotiating picture as well. P&O Nedlloyd’s recent acquisition of Harrison Line has resulted in the carrier having a considerable increase in market share in the East Africa trades. Ports such as Mombasa, Tanga and Dar es Salaam are now facing a more powerful port user, whose market share in the Europe/East Africa trades has increased from 9 percent to 12 percent.

Presence of large value adding tenants — Bargaining power will be influenced by the existence of large value adding tenants that the port wants to attract and retain. A major tenant employing a large number of personnel and substantially contributing to the local economy is in a position to extract concessions from the port that would not necessarily be available to smaller players. The port authority in Portland, Oregon has targeted auto imports as a strategic business sector that it wants to retain and grow. Three car manufacturers (Hyundai, Honda and Toyota) now lease several terminals from the port authority to process and accessorize imported cars. Keeping these three auto manufacturers in the port is a high priority objective and the port authority provides favorable terms to these large users that may not be available to smaller tenants.

Importance of port to the economy — The more important the port to the national economy, the more pressure there will be on port managers to attract and retain valuable customers. Some ports can be extremely valuable players in the national economy and the loss of
major customers could have a big ripple effect on employment and local income. For example, the port of Rotterdam is a key element in the Dutch economy and development projects undertaken by the port over the past six years have created 45,000 man-years in temporary employment and 17,500 man-years in permanent employment in the Netherlands. Current and prospective port users can employ the importance of the port to the local economy as a bargaining chip in negotiations over tariffs, service, facilities, etc. The larger the contribution of the port user to the local economy, the greater the user's bargaining power with the port.

**Ability to replicate port services** — Port users will have strong bargaining power if the services provided by the port can be replicated elsewhere. Essentially this comes down to whether there are alternative facilities available to the port user. The more opportunity there is to utilize other facilities, the less bargaining power the facility owner has over the user. Nowhere is this better illustrated than in Northern Europe, where a number of large container handling ports are available for entry and exit in the European market. Carriers can react to tariff increases, efficiency issues, problems, etc. by shifting or threatening to shift to other ports. Recently, the Grand Alliance decided to temporarily shift one of its five Europe/Asia services from Rotterdam to Antwerp on the basis that it was experiencing delays in Rotterdam. This decision shifted, on an annual basis, some 125,000 TEU from Rotterdam to Antwerp, until the delays in Rotterdam were corrected. In the mid-Mediterranean, Malta Freeport and Gioia Tauro are equally situated to provide transshipment service to carriers. Each port must consider the potential actions of the others when negotiating with current or prospective customers, as the customer has the ability to take his business to the other port.

**Facility investments by port users** — A carrier, shipper or tenant who has a major investment in facilities in the port, or has structured its operations in a way that precludes easy transfer of operations to another facility, faces switching costs that limit bargaining power. For example, a joint venture of Saudi and U.S. interests began operating a rice processing plant in the port of Jeddah in October 1995. It is the largest rice handling facility of its type in the Middle East and the investment in the facility creates an exit barrier should the operator become dissatisfied with the service received from the port. Another example is the container load center in Salalah, where Maersk Sealand is a major investor in the terminal along with the Government of Oman. It’s difficult to pack up and leave this facility if there is unhappiness with port policies. At the same time, sunk costs in facilities don’t preclude leaving when things get too bad. ICTSI decided to pull out of the port of Rosario after having invested $27 million in a failed effort to operate the container terminal. ECT left Trieste after a 1 1/2-year effort to operate the Molo VII container terminal. Both contractors decided that future losses would be greater than the cost of pulling out.
Bargaining Power of Service Providers

The final force shaping the competitive landscape is the bargaining power of port service providers. A variety of operators and groups within the port often have the ability to exercise control over the port by threatening to curtail or cancel services. Particularly important is the increasing role of a handful of port service developers who have accounted for more than 50 percent of all new port development utilizing private capital over the past two years. These large players can tilt the scale in negotiations with small and midsize ports, sometimes even large ports. The extent of service provider bargaining power is determined by a number of factors.

Experience and capabilities of service provider — Experience and unique capabilities that the service provider brings to the port is a factor determining its bargaining position. The greater these capabilities, the more power the service provider has in dealing with the port. A contractor that has operated in a port for many years, has established a cadre of very experienced personnel and has accumulated a large inventory of equipment needed to perform the job, would more likely be able to extract favorable terms from the port than a start-up company. Likewise, a contractor with unique skills such as handling hazardous cargo and/or chemicals is in a good bargaining position. Large global terminal operators are also in a good bargaining position, as they are often perceived as bringing experience and unique capabilities based on their operations elsewhere, loyalties of a customer base, networking possibilities and access to financing. A concession to the Dubai Ports Authority (DPA) to manage the port of Djibouti was largely based on the perception that DPA could transfer experience in port operations in Dubai and increase regional market access to Djibouti.

Participation in facility financing — A service provider that participates in the financing of an activity is clearly in a better bargaining position than one who does not. Many port services that are privately operated as concessions involve some degree of financing by the operator and, in many cases, the contractor offering the best financing terms is in position to get the concession. The developer of the new container terminal in Aden chose PSA Corporation as the operator, partially because PSA was willing to participate in financing the $200+ million infrastructure development.

Choke points in the port — Existence of choke points in the port that facilitate slowdowns or stoppages of port operations provides a power that is often employed to extract concessions from port management. Sometimes the choke point can be an activity in the port, without which the port cannot function effectively. Tug service is an example. If tugs are not available for ship assist, the port may continue to function but not necessarily at the normal level of efficiency. Sometimes the choke points can be personnel in the port. A labor stoppage in cargo handling or other strategic services can shut port operations down. And sometimes the choke point can be trucking to and from the port, warehousing operations and other services, where a slowdown for whatever reason can quickly choke operations in the port.
Service providers in these types of activities have considerable bargaining power in dealing with port management.

*Ability to absorb downtime* — The ability of service providers vs. port management to absorb downtime is a factor that impacts the balance of bargaining power. Service providers with deep pockets may be willing to take a loss of revenue for a substantial period to get what they want from the port. Meanwhile, the port can be under substantial government and commercial pressure to resolve the conflict and get the port back into operation. The recent strike in the Israeli ports of Ashdod, Haifa and Eilat created a backup of vessels in the ports and generated calls from many sides to reach resolution as soon as possible.

*Interrelationships between providers and port users* — The existence of interrelationships between service providers and port users can influence the power structure in the port. These interrelationships can impact decisions regarding port operations, leases, berthing rights, etc. Uniglory, for example, is the feeder-ship subsidiary of Evergreen, which in turn is one of the major linehaul container carriers. A port that wants to attract linehaul calls by Evergreen could be willing to extend berthing terms to Uniglory that are more favorable than would be given to a feedership operator who is independent. P&O Ports is a sister organization to P&O Nedlloyd. The former can utilize this relationship to strengthen its bargaining position in negotiating terminal concessions.

*Rights and obligations conveyed by contractual agreements* — Lease agreements and other contracts to utilize port facilities include provisions that convey legal rights and obligations to the port service provider. These contract terms will set boundaries on the port service provider and port in future negotiations. The rights can be extensive, giving the provider exclusive rights to operate in the port for 20+ years with little if any control by port management. Or they can be very limited, giving the port the right to exercise a great deal of control over the performance of the service provider, including provisions in the contract specifying an investment program that must be fulfilled by the contractor. As the contract between the port and service provider will set the boundaries for future bargaining position, the need for a well planned negotiation to develop the contract can’t be overstated.

**The Bottom Line**

Ports no longer operate in an insulated environment. They face the same competitive forces that companies in other industries experience. There is rivalry among existing competitors, continuing threat of new entrants, potential for global substitutes, presence of powerful customers and powerful suppliers. Dealing with these forces is a continuing challenge for the port manager. It requires that the port manager be keenly aware of port user requirements, know their constraints in the global market and have a strategy for making the port a partner in business development.
SECTION 2
PORT DYNAMICS IN THE 21ST CENTURY

The 21st century will see radical changes in the business base underlying port operations. Increasingly, intense global competition will force changes in the way all players in the international logistics chain, including ports, do business in the future. Innovative systems and new technology will radically change requirements for port infrastructure and increase the degree of specialization, raising the financial stakes of port investments and the need for a highly specialized workforce. Realignments and consolidations among port users and port service providers will continue, creating a fluid base of players with whom ports do business. Changes in distribution patterns and in the structure of the maritime geography will increasingly create a hierarchy of ports and some historical port related activities will be shifted to inland sites. Environmental and safety concerns will force on ports the requirement to impose regulations and provide facilities that may have no commercial return on investment.

Globalization of Production

The world economies are becoming increasingly interrelated as a result of increasing trade and the growing trend toward globalization of production. Over the past half-century, most countries have seen an increase in exports as a share of GDP and there has been an increase in vertical specialization of world trade (see Box 5). In addition, sourcing of raw materials and finished products has become increasingly globalized and producers in various, often distant, areas of the world are increasingly forced to compete with one another for the same markets. The basic forces that have triggered the greater interrelation and interdependency of the world economies remain active. Thus, there is no reason to think that the observed trends will not continue.

Vertical specialization — The increasing vertical specialization of world trade has had significant impact on the global logistics system of many manufacturers. It has added links to global supply chains and increased the transport intensity of production processes. Firms have been increasingly concentrating on exploiting their core competencies and subcontracting a number of non-core manufacturing and assembly activities to outside contractors. Tasks traditionally performed at the start or the end of the production line are increasingly moving away from the main plant to be carried out by manufacturing subcontractors or distribution centers. Pre-assembly and sequencing of parts for on-line production chains are activities increasingly outsourced to specialist logistics providers. Customization of product, which can range from labeling or re-packaging of goods to re-configuration of items, is one of the fastest growing areas of logistics outsourcing.

Focused manufacturing — Manufacturers have been concentrating production capacity in fewer locations, replacing the traditional system of nationally based production with
Increasing Vertical Specialization of World Trade

A recent study published in the Economic Policy Review of the Federal Reserve Board of New York traces the impact of vertical specialization of world trade over the past 30 to 40 years. The authors point out that a major feature of globalization has been the enormous increase in international flows of goods and services and countries are now trading much more with each other — and an increasing amount of this trade is due to vertical specialization.

Increasing Trade Flows
Using IMF data, the authors show that the export share of GDP in most countries has increased since 1962. Reproduced right is a chart from their study. Each dot in the chart represents a different country. Dots that lie above the 45° line indicate that the country’s export share of GDP in 1995 was higher than that in 1962. The authors point out that export shares have been increasing for all types of countries, and countries as distinct as Bangladesh, the Congo, Germany, Ireland, Korea, Malaysia and the U.S. all lie above the 45° line.

Increase in Vertical Specialization
In the study, the authors assess the role that vertical specialization is playing in these increased flows. Vertical specialization occurs when a country uses imported intermediate parts to create a good it later exports — i.e., the country links sequentially with other countries to produce a final good. For example, country 1 supplies intermediate parts to country 2, which in turn combines these intermediate parts with domestic and other import parts to produce a finished or semi-finished product, which is then shipped to country 3.

Exports Shares of GDP in 1962 and 1995

Increasing Vertical Specialization of World Trade

Drawing information from four case studies as well as OECD input-output tables, the authors find that vertical specialization has accounted for a large and increasing share of international trade over the last several decades. For most of the countries sampled, growth in vertical trade accounted for 25 percent or more of the growth in overall trade. As shown below, the percentage of change in export share of gross output attributable to increased vertical trade for the sampled time period has varied from 47.4 percent in the Netherlands to 3.2 percent in Japan.

<table>
<thead>
<tr>
<th>Country</th>
<th>Time Period Sampled</th>
<th>Change in Export Share of Gross Output</th>
<th>Percentage of Change Vertical Trade</th>
<th>Due to Increase in Horizontal Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1968/89</td>
<td>0.06</td>
<td>13.4</td>
<td>86.6</td>
</tr>
<tr>
<td>Canada</td>
<td>1971/90</td>
<td>0.08</td>
<td>43.7</td>
<td>56.3</td>
</tr>
<tr>
<td>Denmark</td>
<td>1972/90</td>
<td>0.17</td>
<td>27.3</td>
<td>72.7</td>
</tr>
<tr>
<td>France</td>
<td>1972/90</td>
<td>0.11</td>
<td>28.4</td>
<td>71.6</td>
</tr>
<tr>
<td>Germany</td>
<td>1978/90</td>
<td>0.09</td>
<td>19.4</td>
<td>80.6</td>
</tr>
<tr>
<td>Japan</td>
<td>1970/90</td>
<td>0.03</td>
<td>3.2</td>
<td>96.8</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1972/86</td>
<td>0.10</td>
<td>47.4</td>
<td>52.6</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1968/90</td>
<td>0.15</td>
<td>29.6</td>
<td>70.4</td>
</tr>
<tr>
<td>United States</td>
<td>1972/90</td>
<td>0.07</td>
<td>11.9</td>
<td>88.1</td>
</tr>
</tbody>
</table>


The authors conclude "the nature of trade has changed to the point where countries increasingly specialize in producing particular stages of a good, rather than making a complete good from start to finish. This vertical trade is also what links heightened international trade to greater international production. In all likelihood, the forces that have led to increased vertical trade — lower trade barriers and improvements in transportation and communications technologies — will continue. Thus, we can expect the importance of vertical trade to grow as the world economy heads into the 21st century."
"focused manufacturing." Instead of a factory manufacturing a broad range of products for a local market, the entire production of a particular product for a continent or, in some cases the world market, is focused at a single location. While this has enabled companies to maximize economies of scale in the production operation, it has often made their logistical system more transport-intensive and transport-dependent.

Expanded logistics reach — Companies have steadily expanded the geographical scale, or "logistics reach" of their sourcing and distribution operations. Extension of this reach on a global scale has been one of the dominant trends in international business and logistics over the past 30 years. The emergence of a new generation of high value manufactured products, particularly in the electronics industry, and a general reduction in the density of consumer products (i.e., lesser but better known brands) have contributed to an increase in logistics reach. Hewlett-Packard, for example, estimates that the various parts in a computer workstation in a New York office were moved a total of 96,000 kilometers from their points of production in places such as Singapore, Japan, France and the Western United States.

Increased sourcing alternatives — Producers in one area of the world are increasingly competing with producers in other areas for the same international markets. This is true across the spectrum of primary and intermediate products. Examples of sourcing alternatives are virtually endless. Wholesalers of fruit and juice in Europe can source from Latin America, Southeast Asia, Australasia, Eastern Mediterranean, Southeast U.S. and Africa. Textile manufacturers can source in Southeast Asia, the Indian sub-continent, Africa, East Europe and a wide variety of other locations. The sourcing decision ultimately is determined by total delivered cost, which in turn can be greatly dependent on the logistics cost to acquire primary and intermediate products and deliver the finished products to market.

Impact of globalization on ports — While ports have always been important nodes in the logistics system, globalization of production has sharpened the need for ports to be value adders, not value subtractors in the supply chain and has given ports a unique opportunity to become value-adding entities. A port is the interface between intercontinental transport and a place in the hinterland being considered for production, assembly or final distribution. Its capability and efficiency can greatly influence the decision for locating a plant or distribution center, and often determine whether a local producer can compete globally or regionally with other producers. The challenge is for ports to relate to the needs of their customers and assist them in improving their competitive positions by providing low cost, efficient port services.

Changing Technology

Major technology changes are taking place in the ocean shipping sector which impact requirements for port infrastructure and services. The most obvious is the increasing containerization of global trade, a trend that is widely expected to continue into the future.
Containerization of seaborne trade is less than 50 years old and deep-sea containerization is only 35 years old. Yet it has dramatically changed requirements for cargo handling and port facilities, raised the financial stakes of investing in these facilities and radically impacted manpower and labor skills required to handle cargo, creating serious labor redundancy issues and retraining needs in many ports. In addition, the ocean transport industry is employing increasingly sophisticated information technology to manage logistics; and ports, if they are to remain competitive, must be key players in future IT logistics networks.

**Containerization of world trade** — More than 60 percent of world general cargo trade moved by sea is carried in containers. On trades between highly industrialized countries the percentage approaches over 80 percent. This is a remarkable market penetration for a technology that dates only from the mid-1950s, when the first converted ship carrying 58 containers made its initial voyage between New York and Houston. Since then there has been a continual increase in both number and average size of containerships (see Box 6). There is now a world capacity of more than 6 million TEU in operation and about 1 million TEU on order. Even more significant is that there are about 130 post-Panamax containerships now in operation. These ships have a capacity exceeding 4,000 TEU and, with a length in excess of 295 meters and a beam of over 32.3 meters, they are too big to transit the Panama Canal.

The trend toward bigger and bigger containerships is continuing. At the beginning of 2001, 130 post-Panamax containerships were on order, including 63 ships with capacity exceeding 6,000 TEU. Among the ships on order is a new class of 10,000 TEU capacity containership for Maersk (see Box 7 and Box 8).

**Future containership designs** — Ships with 10,000 to 12,000 TEU capacity are widely expected to make their appearance within the next five years. They are expected to be deployed on the Europe-Far East route. At the Asian end, the ports of Singapore, Hong Kong, Yantian, Shanghai and Yokohama are seriously planning for ships of this size. At the European end, the port of Rotterdam is planning the Maasvlakte II expansion in order to be ready for these mega containerships, while the port of Algeciras can receive these vessels now.

Looking further out, containerships with capacity of 15,000 TEU or greater are a real possibility. The industry is abuzz with rumors that orders for ships of this size are just a matter of time. A new term, Malacca-Max, has even been coined for the largest of these vessels. This ship would be capable of carrying 18,000 TEU. It would be 400 meters long, 60 meters wide and have a draft of 21 meters, which would be the maximum depth for transiting the Malacca Straits, making it effectively the maximum sized container ship that theoretically can be envisaged. Also under consideration is introduction of containerships capable of considerably faster service speeds than ships now in service. One carrier, Norasia, is contemplating orders for 2,000 TEU
**Box 6**

**Evolution of Containerized Shipping**

Container shipping got its start in April 1956 when the tanker Ideal X owned by SeaLand (then known as Pan Atlantic Steamship) made its initial voyage between New York and Houston carrying 58 trailers on deck. The trailers were detached from their chassis and lifted aboard the ship with a dockside gantry crane. This initial voyage was rapidly followed by plans to convert six dry cargo ships to full containerships fitted with onboard cranes. The first of these began operating in October 1957, and had capacity to carry 226 35 ft. containers, equivalent to about 480 TEU. By 1963, the company was employing converted tankers between the U.S. East and West Coasts able to carry 476 containers (about 830 TEU). Meanwhile, in 1960 Matson began containerized service between the West Coast and Hawaii, utilizing cargo ships able to carry 436 24 ft. containers on deck (about 520 TEU). There was also an unsuccessful attempt by Grace Line in 1960 to introduce container service between the U.S. and Central/South America. International service using containerized vessels began in 1966 with the introduction of SeaLand’s weekly container service between the U.S. East Coast and Europe.

**First purpose-built containerships** — Ships built prior to 1969 were converted from breakbulk ships or tankers. They generally had capacity in the 750 to 1000 TEU range, draft of about 9 meters, service speeds of 18 to 21 knots and were fitted with shipboard cranes to handle containers. In 1969 the first ship specifically designed for container shipping service was built. This began a new generation of larger and faster containerships with capacity in the 1000 to 1500 TEU range and service speeds of 20 to 23 knots — and some ships could achieve higher speeds to 27 knots. These ships were designed to utilize dockside rather than shipboard cranes. Removing the cranes both increased cargo-handling productivity and allowed more containers to be stowed on deck.

**Containerships get to Panamax dimensions** — Ships built in the early 1970s had capacity in the 1000 to 2500 TEU range, draft up to 10 meters and service speed of 22 to 26 knots. Built during this period were the first Panamax-size containerships, with dimensions narrow enough to pass through the Panama Canal, which limits ships to 289.5 meters length, 32.3 meters beam. This generation included a containership design that moved the technology goalpost on service speed. In 1972/73, SeaLand took delivery of eight 33-knot Panamax-size containerships capable of carrying 1900 TEU. To make this speed, the ships had 120,000 bhp installed power. They turned out to be an economic failure when fuel prices went skyrocket as a result of OPEC action in the mid-1970s. To date, the speed of these SeaLand ships has not been exceeded by subsequent designs. The late 1970s/early 1980s saw further increase in containership size, with capacity moving into the 1500 to 3000 TEU range, including a number of Panamax design ships. However, the abrupt rise in fuel cost brought about a slower generation of containerships during this period. The design emphasis was on achieving fuel efficiency and service speed generally fell into the 20 to 24 knot range. Drafts deepened to 10.5 meters.

During the second half of the 1980s, capacity of Panamax containerships grew to more than 4000 TEU through design improvements. Included among Panamax ships built during this period were 12 4400 TEU “econoships” designed by U.S. Lines to operate on a round-the-world service. These were relatively slow 19-knot ships with a small power plant designed to maximize fuel efficiency. While these ships were too slow for the intended service, they initiated the concept of a round-the-world service that Evergreen and other carriers continue today.

**Post-Panamax ships enter service** — Even more important during the second half of the 1990s was the introduction of the first post-Panamax ships by American President Lines, who ordered five 273 meter long, 39 meter wide ships with capacity of 4400 TEU for use in transpacific service. These were the first containerships unable to transit the canal and paved the way for increasingly larger post-Panamax ships over the next decade. According to APL, the principal advantage of the post-Panamax ship is virtually unlimited container capacity. Other advantages include the fact that a large Panamax ship must carry as much as 12,500 tons of water ballast and an equivalent size, but wider post-Panamax ship requires little or no ballast and consumes less fuel. Also, for the same TEU capacity, the post-Panamax ship is 5 percent cheaper to build, as length is the most expensive dimension.

In the 1990s, post-Panamax containerships were ordered by most of the major linehaul carriers, including Maersk, OOCL, Hanjin, Evergreen, Hyundai, Cosco, NYK, MOL and NOL. The most notable orders were those of Maersk and P&O, who took delivery of a string of ships with capacity of more than 6000 TEU, designed for service speed of 25 knots at maximum draft of 13.5 meters. Additionally, through design changes the capacity of Panamax size containerships increased to 4800 TEU. In the late 1990s, Hapag Lloyd ordered seven 4800 TEU containerships with service speed of 25 knots and draft of 13.5 meters, yet designed within the size limits of the Panama Canal.
Box 7

TEU Capacity in Service by Containership Size Class

![Graph showing TEU Capacity in Service by Containership Size Class](image)

Box 8

Post Panamax Ships on Order as of February 2001

<table>
<thead>
<tr>
<th>Company</th>
<th>No. of Ships on Order</th>
<th>TEU Capacity</th>
<th>Total TEU</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cosco</td>
<td>17</td>
<td>5,250-5,618</td>
<td>92,323</td>
<td>12%</td>
</tr>
<tr>
<td>CMA/CGM</td>
<td>12</td>
<td>6,250-6,500</td>
<td>77,000</td>
<td>10%</td>
</tr>
<tr>
<td>K Line</td>
<td>12</td>
<td>5,500-5,608</td>
<td>66,216</td>
<td>9%</td>
</tr>
<tr>
<td>MSC</td>
<td>10</td>
<td>6,408-6,700</td>
<td>66,416</td>
<td>9%</td>
</tr>
<tr>
<td>NYK</td>
<td>11</td>
<td>6,200</td>
<td>68,200</td>
<td>9%</td>
</tr>
<tr>
<td>NOL</td>
<td>10</td>
<td>5,500</td>
<td>55,000</td>
<td>7%</td>
</tr>
<tr>
<td>Hapag Lloyd</td>
<td>6</td>
<td>4,805-7,200</td>
<td>38,495</td>
<td>5%</td>
</tr>
<tr>
<td>Costamare</td>
<td>5</td>
<td>4,890-6,252</td>
<td>29,898</td>
<td>4%</td>
</tr>
<tr>
<td>CP Ships</td>
<td>6</td>
<td>4,800</td>
<td>28,800</td>
<td>4%</td>
</tr>
<tr>
<td>Evergreen</td>
<td>5</td>
<td>6,000</td>
<td>30,000</td>
<td>4%</td>
</tr>
<tr>
<td>Hyundai</td>
<td>5</td>
<td>6,500</td>
<td>32,500</td>
<td>4%</td>
</tr>
<tr>
<td>Mitsui OSK</td>
<td>5</td>
<td>6,000</td>
<td>30,000</td>
<td>4%</td>
</tr>
<tr>
<td>OOCL</td>
<td>5</td>
<td>5,468-7,400</td>
<td>31,250</td>
<td>4%</td>
</tr>
<tr>
<td>P&amp;O</td>
<td>4</td>
<td>6,788</td>
<td>27,152</td>
<td>4%</td>
</tr>
<tr>
<td>Yangming</td>
<td>6</td>
<td>5,500-5,551</td>
<td>33,202</td>
<td>4%</td>
</tr>
<tr>
<td>Nord Deutsche</td>
<td>4</td>
<td>5,551</td>
<td>22,204</td>
<td>3%</td>
</tr>
<tr>
<td>Conti</td>
<td>2</td>
<td>5,600</td>
<td>11,200</td>
<td>1%</td>
</tr>
<tr>
<td>Lloyd Triestino</td>
<td>2</td>
<td>5,364</td>
<td>10,728</td>
<td>1%</td>
</tr>
<tr>
<td>Maersk</td>
<td>1</td>
<td>9,146</td>
<td>9,146</td>
<td>1%</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>2</td>
<td>5,750</td>
<td>11,500</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>130</td>
<td></td>
<td>771,230</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Fairplay Newbuildings, January 2001
ships capable of 32 knot service speed and has been exploring concept designs for ships capable of 40 knots. Another carrier, FastShip, plans to order four 1,430 TEU vessels capable of a 38 knot service speed, with specially designed terminal facilities at both ends of the route capable of discharging and loading the ship in four hours (see Box 9).

**Impact on port operations** — The contrast between container and earlier breakbulk operations is startling. Most significantly, it has much reduced the ship’s time in port and at berth. Containerization has dramatically reduced personnel requirements for cargo handling, raised berth productivity and increased the capital intensity of port operations. Prior to containerization, about 200 men, working simultaneously in four gangs, were typically required to load and unload a large general cargo ship, a process that could take a week to ten days in port. Containerships require only 50 to 60 men to load and unload cargo. Assuming a four gantry crane operation, a container ship requires some 30 workers directly allocated to the vessel. This figure, moreover, depends on the type of terminal operation that is used; e.g., more for straddle carrier operation, less for rubber-tire gantry (RTG). A typical general cargo berth can handle roughly 130,000 to 150,000 tons per year of cargo throughput. A modern container berth, equipped with four ship-to-shore gantry cranes, will handle 400,000 container moves annually (typically 600,000 million TEU). Assuming three-quarters of the containers are full and the average full load is 10 tons per TEU, the throughput of this berth is some 4.0 mil-

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**Box 9**

**FastShip Container Terminal**

FastShip plans to start a containerized service between Europe and the U.S. East Coast in 2002 designed for high value, time sensitive cargo. Four 1,423 TEU vessels capable of 38 knot service speed would make the 3,266 mile ocean crossing in less than four days, with the goal of providing seven day door-to-door service between major destinations in Europe and the U.S. To provide this service, the developer plans a new type of highly automated terminal designed to minimize turnaround time.

Assuming the project proceeds, new terminals would be built in Cherbourg and Philadelphia specifically for the FastShip service. A proposed concept by TTS Handling Systems is a novel approach to achieving fast port turnaround. In the TTS concept, each terminal would be designed to accommodate container pallet trains that would be preloaded with double stack containers. These trains would carry the platforms on and off the ship via a specially designed link span. Prior to the ship arriving in port, rows of container platforms would be loaded with outgoing containers. These platforms would be positioned on 24 lanes of rail track in the marshalling area. When the ship arrives, a train would pull a lane of container pallets from the ship and another train would pull a lane of platforms from the marshalling area into the ship. This sequence of activity would continue until 24 lanes of inbound containers aboard the ship are unloaded and replaced with 24 lanes of outbound containers.
lion tons annually. A super post-Panamax container crane with 57 meters outreach will cost about $6.0 million. Four to five of these cranes are needed to efficiently handle the largest post-Panamax containership now coming into service (see Box 10). Overall, the infrastructure improvements and super-structure (cranes, straddle carriers or RTGs, tractors and trailers, etc.) needed for a modern two-berth container terminal will easily cost $100 million. In contrast, a typical 3 to 6 ton shoreside crane used for general cargo handling in the 1950s would have cost, at today’s prices, about $1 million.

Need for container port productivity improvements — A recent study concludes that "the economics of containership operation are critically dependent on port productivity . . . (and) continued general worldwide improvements in port productivity will so fundamentally alter the container shipping cost environment that, in the absence of any technological constraint, ship size optimums for all routes will continue to increase as they have done in the past" (see Box 11). A typical container terminal today has a density of 100 to 500 TEU per acre (depending on the yard stacking system in use), crane productivity of 25-30 gross moves per gantry crane hour, average container dwell time of five to six days and truck turnaround of one hour. But future terminal requirements will be considerably more demanding. In order to accommodate the mega containerships coming into service, new terminals will require a density of 1000 to 2000 TEU per acre, crane productivity of 200 moves per ship-hour at berth, maximum three days average dwell time and truck turnaround of less than 30 minutes. Water depth at the future terminal will need to be at least 15 to 16 meters and increasingly larger cranes will be required to accommodate ships with a deck stack of up to 28 rows across.

Growing role of information technology — Equally important in the future is the need for ports to expand the use of information technology (IT) to support port user requirements, particularly relating to containerized traffic, although not exclusively. IT is being increasingly employed throughout the ocean transport sector and has revolutionized the way intermodal traffic is handled. IT systems electronically link port administration, terminal operators, truckers, customs, freight forwarders, ship agents and other members of the port community (see Box 12). The technology provides port users with real time data on the status of cargo, paperwork and availability of port facilities, and enables ships and terminals to be part of an integrated office infrastructure. IT reduces time for delivering cargo, provides more accurate transfer and recording of information, reduces manpower to prepare paperwork involving port use and operation, offers advance information on ship, barge, truck, wagon, container and cargo movements, improves planning and coordination of berths, handling equipment, storage facilities, etc. (see Box 13). Ports unable or unwilling to keep pace with information technology will be left behind in the competitive ocean transport market.
Future Containerships Will Require Increasingly Larger Container Cranes

Panamax — A typical Panamax containership is about 290 meters long and has 13 meters draft. The ship is limited in breadth to 32.2 meters to allow passage through the Panama Canal. This breadth limitation constrains the number of rows to 13 containers. Up to 4800 TEU can be carried in these vessels. The outreach of the crane must be capable of spanning 13 rows of containers stacked 14 to 15 high.

Post-Panamax — These ships are too wide to transit the Panama Canal. The first post-Panamax ships delivered in the late 1980s carried 4300 TEU. Recent ships entering service for Maersk and P&O are designed to carry 6000 to 7000 TEU. The new post-Panamax vessels are almost 43 meters wide and are capable of handling 16 to 17 rows of containers on deck. Draft is 13.5 to 14 meters. The container crane must be capable of spanning 17 rows of containers stacked 15 to 16 high.

Super post-Panamax — Designs are available for containerships able to carry 9000 TEU and it is widely expected that orders for such vessels will be placed in the near future. The width of these vessels will be 44 to 46 meters and the draft will be about 14 meters. They will accommodate 18 rows of containers on deck, 16 below deck. The crane required to handle the containers on this vessel will be a massive structure capable of spanning 18 rows stacked 16 to 17 high.

Mega-containerships — There are concept designs for containerships able to handle 15000 TEU (or greater). The massive vessels would be about 400 meters long and almost 70 meters wide. These dimensions are substantially greater than the largest crude carriers now being built, which till now have defined the limits of commercial vessel size. Some concepts call for accommodating 28 rows of containers on deck. To handle the containers, it will likely be necessary to utilize a different type of container crane and special berthing basin for the vessel.
Box 11

Impact of Port Productivity of Unit Voyage Cost of Large Containerships

A recent study of economies of scale in large containerships gives an indication of the unit cost benefits that can be obtained by use of increasingly larger containerships — and the benefits that can be achieved by increased cargo handling productivity that reduces port time. The study prepared by K. Cullinane and M. Khanna and published in the Journal of Transport Economics and Policy models the impact of using containerships with nominal capacity to 8000 TEU, assuming current cargo handling rates and rates that would be 100 percent higher.

Declining Unit Cost With Larger Ships

To the right is a chart taken from the study that shows the relationship between voyage cost per TEU, ship capacity and route distance on three major linehaul routes. Unit cost declines at a decreasing rate as ship capacity increases. In deriving these unit costs, the authors assume that port time for various size ships reflects current cargo handling productivity, which in turn is a function of the number of cranes assigned to a ship and the handling rate per crane. Based on a questionnaire by the authors, current practice is to typically employ one to two cranes on ships under 1000 TEU capacity, three to four cranes on ships 3000 to 4000 TEU capacity and five cranes on ships of 6000 TEU capacity. Crane productivity under current practices is assumed to average about 22 moves per hour. On this basis, five cranes working a 6000 TEU containership can load and discharge 2000 20 ft. boxes and 2000 40 ft. boxes at a rate of 110 moves per hour, and the ship can be fully discharged and loaded in 72 hours.

Increasing Port Productivity

The authors then examine the sensitivity of reducing port time through increased cargo handling rates. They show that a cargo handling rate double that of the current rate will significantly reduce the unit cost, as the ship will be able to carry more containers in a given time period. For example, doubling the cargo handling rate will reduce the unit cost of a 6000 TEU ship from $114 to $91 per TEU on a trans-Atlantic voyage. The unit cost of a similar ship on a trans-Pacific voyage would drop from $182 to $159 per TEU and on a Europe-Far East voyage from $242 to $218.
**Port requirements for large cruise ships** — The cruise industry is producing requirements for more ports and enhanced facilities in existing ports to accommodate the growing number and size of cruise ships. This industry has had tremendous growth over the past ten years. Particularly significant is the growth in number of mega-cruise ships, i.e., those over 70,000 and up to 140,000 gross tons that carry 2,000 to 3,000 passengers or more. Prior to 1988, there was only one ship of that size. Today there are 32 mega-ships serving the Caribbean and Mexican Riviera market and there are at least 22 more on order. These ships are typically 260 to 280 meters long, some as long as 310 meters, and require infrastructure and port services capable of receiving large numbers of tourists.

With the growth in numbers of ships, the cruise lines need more ports in order to vary their itinerary. In selecting a
cruise port, cruise ship operators look at: 1) location of the port and cruising distance relative to other ports on a particular itinerary; 2) "marquee" value and activities available for passengers; 3) visitor safety and comfort; 4) existence of head taxes; and 5) physical capabilities of the port to accept their ships (see Box 14). The challenge for ports wanting to be cruise destinations is to develop a strategy jointly with tourism officials to maintain tourism
product quality and maximize visitor spending. For ports able to satisfy cruise operator needs, there is a possibility that the operator may be willing to establish long-term agreements to bring its ships to the port on a regular basis for periods up to 25 years. The key issue here remains what guarantees a port has if the cruise operator stops his calls before the end of the agreed period. Such an agreement could be the basis for arranging financing by a developer to acquire the physical facilities and services in the port needed to accommodate cruise ships.

**Box 14**

**Physical Requirements to Accept Cruise Ships**

The handling of massive cruise ships with large numbers of passengers in a very short turnaround time is a huge logistics problem. The newer cruise ships entering the market today are vessels with capacities of 2,000 to 3,500 passengers. Cruise ships spend an average of 7 to 9 hours in port, during which passengers debark and embark and various services are provided to the vessel. The combination of large ships and demand for quick turnaround places significant strain on port facilities and services. According to Gee & Jensen, a designer of cruise facilities, to accept modern cruise ships a port must be able to provide:

- minimum 500 ft. entrance channel width, 34 ft. navigational depth, 32 ft. berth depth, 500 ft. service apron length, 50 ft. apron width, 50 to 100 ton design load range for bollards, cleats and dolphins, and 1300-1500 ft. minimum turning basin diameter
- protected passageway between ship and terminal capable of embarking all passengers within 2-3 hours, disembarking all passengers within 1-2 hours and ability to stay connected to the cruise ship over the full tidal range
- staging area for three to five 40 ft. containers, adequate bus and taxi queues to support passenger embarkation/debarkation, facilities to collect and dispose of waste, potable water and other services to support the ship in port

Cruise ships are a $300 to 500 million capital investment. Their successful operation is highly dependent on maintaining a tight schedule with no disruptions. A standard in the industry is that cruise ships can never be denied or have access delayed to and from a berth. This is a very real challenge that ports wanting to be cruise ship destinations must have as an objective.

**Other technology impacting port services** — Introduction of podded drive propulsion systems has the potential to reduce requirements for harbor tug services in port. These high power azimuthing systems significantly improve maneuverability of a ship, potentially eliminating the need for tug assist services for berthing. While podded drive to date has largely been limited to cruise ship and ferry propulsion, there are indications that use of the technology may spread to other types of ships, particularly where maneuverability is especially important (see Box 15). Self-unloading bulk carriers have been very popular on the U.S. Great Lakes and their use is spreading to other trades. These bulk carriers have the capability to discharge without use of shoreside equipment, reducing the need for special facilities to unload bulk cargo. The need to have large land areas to store the bulk cargoes will remain.

**Shifting Bargaining Power**

Bargaining power results from the relative strength of the parties involved in a negotiation. The stronger the bargaining power, the more likely the party will get the greater gain in a transaction. In the port sector, the major parties to a negotiation are port users and port service providers. Events taking place are
reshaping the relative strength of each of these parties. On the one hand, consolidation now occurring among ocean carriers is producing increasingly stronger, more formidable customers that port authorities, terminal operators and other port service providers must contend with in pricing and service negotiations. On the other hand, a relatively small number of companies have been acquiring terminals in ports in all areas of the world, creating terminal operators with global coverage that have financial depth and negotiating strength to withstand demands of terminal users.

Adding to this situation is the growing role of global logistics service providers who have considerable strength in dealing with both shipping companies and terminal operators. Finally, there is the unmistakable trend for carriers to wish to own and manage their own port and inland terminals. These changes are creating a shifting playing field on which negotiations will take place among port users and port service providers.

Consolidation among ocean carriers — Over the past decade there has been substantial consolidation in the ocean shipping sector (see Box 16 and Box 17). While this has been occurring in all sectors of the industry, it is most apparent in container shipping where it is estimated that 25 carriers now control 60 percent of container fleet capacity. This sector has witnessed a significant number of major mergers and acquisitions over the past ten years, a trend that appears to have room to run.

The consolidation movement in the container shipping sector began with slot sharing arrangements, where carriers purchased slots in other carriers’ ships to provide service flexibility and more extensive geographical coverage. This expanded into multi-trade alliances among carriers that focused on achieving efficiencies and better service by sharing vessels, utilizing common terminals, joint feeder service, joint purchase of containers, etc. The current activity in mergers and acquisitions is a third step in this pattern of cooperation. It simply takes the alliance concept to its ultimate stage — full ownership and control under one corporate umbrella.
The three largest container carriers illustrate the patterns of growth in the container shipping sector. Maersk Sealand, by far the largest player in container shipping with almost 250 ships and 550,000 TEU capacity at the end of 1999, illustrates a progression from global alliance to single corporate ownership. Until 1990 both Maersk and SeaLand operated as separate entities, each a major player in its own right. In 1991 they formed a global alliance to improve service and generate operating efficiencies. Continuing the progression, in mid-1999 Maersk purchased the ocean transport assets of SeaLand for $800 million. The combined company is almost twice the size of its nearest competitor.

Evergreen, a Taiwan-based company that traces its origins to 1968, illustrates growth primarily through internal expansion (although the company did acquire Lloyd Triestino). Evergreen is now the second largest player in the container shipping sector, with more than 130 ships and 310,000 TEU capacity. The third largest player, P&O Nedlloyd, results from a 1996 merger between P&O Containers and Nedlloyd. The company operates about 120 ships with about 270,000 TEU capacity. Interestingly, the combined company is not a natural progression from an alliance. Prior to the merger the two companies were members of different alliances, with P&O a member of the

Box 16

Top 20 Container Carriers (as of September 1999)

A substantial number of mergers and acquisitions among ocean carriers have taken place over the past several years, realigning the competitive landscape. Some of the more important recent consolidations are summarized below.

**Container Carriers**

At least a half dozen major mergers or acquisitions have taken place among ocean container carriers since the mid-1990s, concentrating control of capacity in the container sector among fewer and fewer companies.

- **Maersk/SeaLand** — In mid-1999 Maersk announced it was acquiring the ocean shipping division of SeaLand. This $800 million purchase was a natural progression of an alliance between the two companies that began in 1991. The consolidated group now operates about 250 ships on 35 liner services, covering virtually every corner of the globe. In terms of container fleet capacity, it is almost twice the size of Evergreen, its nearest rival. This was the second acquisition by Maersk in 1999. Earlier in the year, Maersk acquired Safmarine for $240 million to expand its presence in the north/south trades.

- **P&O/Nedlloyd** — In September 1996 P&O Containers announced its merger with Nedlloyd to form one of the largest container lines in the world. The combined company would operate 112 containerships and have a combined turnover of nearly US$4 billion. Subsequently, in February 1998 P&O Nedlloyd purchased Blue Star Line for $100 million to strengthen its position in the Australian trade. The company is the third largest container carrier (after Evergreen) in terms of TEU capacity.

- **Hanjin/DSR-Senator** — In early 1997 Hanjin Shipping bought a controlling stake in DSR-Senator, creating a combined company with 80 ships totaling 200,000 TEU capacity. This company is now the fifth largest container carrier in terms of TEU capacity, following fourth place Mediterranean shipping. The consolidation was a logical progression to a global alliance that the two companies participated in since 1996.

- **NOL/APL** — In late 1997 Neptune Orient Lines announced its acquisition of American President Lines for $825 million, creating a merged company with 76 containerships with a capacity of 200,000 TEU. NOL/APL is now the sixth largest container carrier.

- **CP Ships** — Over the past five years the company has acquired five companies to raise its presence in the container sector to 11th position in terms of TEU capacity. Until 1995 CP Ships was a niche player on the St. Lawrence Seaway/Northern Europe trade route. CP’s role began to expand in March 1995 when the company acquired CAST, a competitor on this route. Then in 1997 CP acquired both Lykes Line and Contship Container Lines, and in 1999 created a joint venture with TMM to gain more powerful presence in the Latin American trades. The company now controls about 133,000 TEU capacity.

- **CMA/CGM** — In 1996, the French containership carrier CMA acquired the state owned CGM, creating a company that now is the 12th largest container carrier with capacity of 127,000 TEU.

**Other Shipping Segments**

While a pattern of consolidation has been most obvious in the containerized segment, M&A activity has been occurring in all segments of the business. For example,

- **Car carriers** — In 1999, two major players in this specialist trade, Wallenius and Wilhelmsen, created a joint venture company to assume control of their complement of car carriers and ro/ro ships. The resulting company controls 80 ships and has $1.4 billion in annual sales. In another deal, Leif Hoegh has recently taken full control HUAL, the sixth largest car carrier, by purchasing the 50 percent share owned by Ugland.

- **Cruise shipping** — This sector has been consolidating over the past decade and four companies now control more than 60 percent of the world cruise shipping capacity. The largest player in this sector, Carnival Corporation, has acquired five cruise companies since 1989.

- **Tanker and bulk shipping** — A number of mergers have recently occurred in this sector. One of the largest is the merger in 1999 between MOL and Navix, creating the world’s largest shipping company with a mixed complement of 422 ships. Another merger in 1999 was the $450 million acquisition of Bona Shipholding by Teekay Shipping, creating a company that operates 81 Aframax tankers.
Grand Alliance, Nedlloyd part of the Global Alliance. Their merger effectively resulted in a complete re-modeling of both the Grand Alliance and the Global Alliance.

Looking forward, many expect consolidation among ocean shipping companies to continue. There certainly appear to be more economies of scale and scope to be realized in the container shipping sector and further consolidation among container carriers can be expected. Consolidation will also likely occur in other sectors of the shipping industry, continuing a trend that has been obvious over the past several years. The result will be more powerful companies with whom ports and port service providers must contend.

**Box 18**

**Emergence of global terminal operators** — The past decade has seen the emergence of terminal operators who have established regional or worldwide presence. Like companies in other sectors, they see business opportunities in a period of globalization and have been capitalizing on the trend toward privatizing port facilities. According to a database maintained by the World Bank, 62 transactions involving privatization of container terminals took place between 1990 and 1998. Many of these transactions involved a relatively small number of players.

Among the principal international terminal operators are Hutchison Port Holdings, Maersk Sealand, P&O Ports, Sea-Land Terminals, ICTSI, PSA

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**Key Milestones of Hutchison Port Holdings in the 1990s**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>Acquires Port of Felixstowe</td>
</tr>
<tr>
<td>1992</td>
<td>JV s for 2 River and a Coastal Container Terminal in China</td>
</tr>
<tr>
<td>1993</td>
<td>JV s for Container Terminals in Yantian and Shanghai</td>
</tr>
<tr>
<td>1994</td>
<td>Acquires Midstream Holdings in HK</td>
</tr>
<tr>
<td>1995</td>
<td>JV for Freeport Container Port</td>
</tr>
<tr>
<td>1996</td>
<td>Concession to Operate Terminals in Cristobal and Balboa</td>
</tr>
<tr>
<td>1997</td>
<td>JV to Develop Container Terminal in Jakarta</td>
</tr>
<tr>
<td>1998</td>
<td>Acquires Thamesport Containerport and Harwich Int'l Port</td>
</tr>
<tr>
<td>1999</td>
<td>Acquires 35% Interest in ECT</td>
</tr>
</tbody>
</table>
Corporation, Dubai Ports Authority, Stevedoring Services of America and BLG-Eurokai. These terminal operators now account for about 40 percent of the world’s annual container liftings.

- Hutchison Port Holdings launched its global expansion in 1991, utilizing the experience and capabilities it developed operating container terminals in Hong Kong. It now operates container terminals in more than 17 ports and handles more than 14 million TEU annually (see Box 18).

- Maersk Sealand now manages 32 terminals worldwide and is involved in 36 other terminals, most of which conveyed with the acquisition of SeaLand. Algeciras is generally seen as the prototype of a modern Maersk Sealand terminal that has been designed to play the role of a global or at least a regional hub. One of the company’s most impressive investments has been the new transshipment terminal in Salalah, which is a joint venture with the government of Oman.

- P&O Ports, based in Australia, manages more than 20 ports worldwide and handles about 6 million TEU annually. The company recently acquired International Terminal Operating Company, giving it an extensive terminal operating presence on the U.S. Atlantic and Gulf Coasts.

- Sea-Land Terminals remains a major player in container terminal operation, despite the transfer of shipping and terminal operations to Maersk as part of the merger transaction. The company continues to operate terminals in the U.S., Hong Kong, China, Australia, Russia, Finland and the Dominican Republic.

- ICTSI, based in Manila, operates terminals in the Philippines, Pakistan, Argentina, Saudi Arabia and Mexico. Recently it entered a joint venture to manage a terminal in Thailand and signed a concession contract to manage and operate the Dar-es-Salaam container terminal. In 1999 the company handled about 2.2 million TEU.

- PSA Corporation in the mid-1990s embarked on a major effort to develop international presence in port operations, utilizing its experience in Singapore. PSA now operates terminals in Singapore, Yemen, Portugal, China, Italy, India and Brunei. In 1999 PSA handled about 18 million TEU, 2 million of which was from foreign ventures. The Corporation’s mission statement explicitly mentions that PSA over the next ten years aims to operate a string of ports overseas, handling some 10 million TEUs and managing up to a third of its port, logistics and related business overseas.

- Dubai Ports Authority has joined the global container terminal race and has recently set up a new company to seek out overseas port operating contracts. DPA now operates terminals in Beirut, Jeddah and Djibouti, as well as its base facilities in Jebel Ali and Port Rashid.

- SSA, based in Seattle, has for more
than 50 years been involved in cargo handling in U.S. ports. Building on this experience, the company has expanded globally and now operates terminals in Panama, Vietnam, South Africa, India, Indonesia and Mexico and plans new ones in Egypt and Bangladesh.

- BLG-Eurokai, a German stevedoring company handling about 3 million TEU annually, has gained international presence by acquiring stakes in terminals in Portugal and Italy, including the Medcenter Container Terminal at Gioia Tauro, and provides technical support for a new container terminal in Sepetiba (Brazil).

In addition, other shipping companies have developed container terminals in various parts of the world to support their shipping operations. Evergreen operates terminals in Taiwan, Panama, U.S., Italy and Vietnam. Cosco operates terminals in Hong Kong (in JV with HPH), China and Italy. NOL/APL has terminals in the U.S., Pakistan, Vietnam and Japan.

There are many indications that the trend toward global terminal operation, like the trend toward consolidation in the shipping sector, has much room to run. This activity appears to be quite profitable. In 1998 Hutchison Port Holdings generated an operating profit of HK$3.9 billion on turnover of HK$9.4 billion, an operating margin of 41 percent. Ports and related services accounted for 18 percent of total Hutchison Whampoa turnover, but 30 percent of the parent organization operating profit in 1998. With this type of profit potential, further expansion of current players can be expected and it should be no surprise to see some new players come into the sector. But the market is maturing and some caution is required. The operating margins are becoming slimmer as governments look for greater financial returns; many of the attractive terminals have already been privatized; and, finally, there are more parties competing for privatization projects such as carriers and global terminal operators in addition to local operators.

Some consolidation is already occurring among the players now in the terminal operating business. As a result of the Maersk Sealand merger, the terminals of each company have been placed under the combined company. P&O Ports has recently acquired International Terminal Operating Co., one of the largest stevedoring companies on the U.S. Atlantic and Gulf Coasts. Bremerhaven based BLG has recently merged with Hamburg based Eurokai to form BLG-Eurokai. It would not be surprising to see further mergers in this sector, perhaps involving some of the largest players.

**Potential emergence of other global port service suppliers** — While much international activity has been taking place involving container terminal concessions, global players could emerge as a major force in providing other port services as well. Harbor tug services have already attracted global players and other areas that could attract global or regional players are pilotage service, provision and maintenance of port information networks, maintenance dredging, etc.
Emergence of global logistics service providers — Contributing to the realignment in bargaining power is the emergence of companies who offer full-service logistics solutions to major shippers. These logistics service providers have substantial strength in dealing with shipping companies, terminal operators and other port service suppliers, adding to the growing complexity in achieving a balance in port service negotiations. They make decisions that impact all parties involved in the supply chain, including port service providers. Logistics service providers manage the combined logistics requirements of many large shippers they represent, giving them considerable strength in dealing with shipping companies, terminal operators and others in the logistics channel. In response to market demand, some substantial players have targeted this activity, including Federal Express, who recently announced that it would enter the global logistics market for ocean freight (see Box 19).

These developments are changing the way port services are bought and sold — Alliances and consolidation among carriers result in their having more business volume on the negotiating table, placing ports and terminal operators in an increasingly awkward position when it comes to negotiating strength. In some situations, the stakes are so high that the port and/or terminal can hardly afford to lose the carrier’s business. This can often result in the port having to make concessions to retain the traffic (see Box 20). Recently, for example, the Grand Alliance (P&O Nedlloyd, Hapag Lloyd, NYK, OOCL and MISC) notified the port of Rotterdam that for operational reasons it was temporarily switching one of its five Europe/Asia services to the rival port of Antwerp. This service represented 125,000 TEU per year to the port. It may only be coincidental, but a month later the Rotterdam municipal council decided not to increase harbor dues for the year 2000, citing growing competition between ports in general and tariff developments in directly competing ports in particular.

At the same time, the emergence of global terminal operators can result in pricing schemes that may not always favor the small volume or regional carrier. These global terminal operators may be willing to offer incentives to high-volume customers and there is at least the possibility that the terminal operator could cross-subsidize international operations as necessary to compete for a major carrier’s business. Another possibility is that a truly global terminal operator could offer a package deal to a

<table>
<thead>
<tr>
<th>Company</th>
<th>Revenue 1998 (US$ Billion)</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEODIS</td>
<td>10.500</td>
<td>23,000</td>
</tr>
<tr>
<td>Schenker</td>
<td>10.500</td>
<td>16,000</td>
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<td>TNT Post Group</td>
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<td>Danzas</td>
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<td>Maersk Moeller</td>
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</tr>
<tr>
<td>Panalpina</td>
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</tr>
<tr>
<td>Deutsche Post Fracht</td>
<td>4.800</td>
<td>30,000</td>
</tr>
</tbody>
</table>
carrier that would provide a lower price or give concessions if the carrier uses only its terminals wherever available in the world.

**Changing Distribution Patterns**

As containerization has spread in ocean shipping, distribution patterns have increasingly evolved into hub and spoke network. Facilities for devanning, clearing, staging and storing containers are increasingly shifting inland, thereby becoming more de-centralized. These developments are creating a hierarchy of ports and changing traditional port operations.

**Hub and spoke distribution** — Ocean carriers have been increasingly utilizing regional hubs for transshipment of containers. This is a worldwide trend that

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**Box 20**

**How a Major Port User Obtained $600 Million in Concessions from the Port of New York and New Jersey**

In 1998-99 the Maersk-SeaLand alliance (now a single company) had a highly publicized negotiation with major North American ports to determine which port would become the future U.S. East Coast hub for the shipping alliance.

**The Threat to Take Their Business Elsewhere**

The Maersk-SeaLand alliance in 1998 gave notice to the Port Authority of New York and New Jersey that it was considering leaving the port when its lease expired in 2000. Seven ports on the East Coast, including New York, were long listed as prospective super hubs for the alliance's future linehaul traffic. By December 1998 this list was reduced to three finalists (New York/New Jersey, Baltimore and Halifax).

**High Stakes Competition**

This was a very high stakes competition that New York/New Jersey needed to win. Losing the alliance's business would have major implications for the port and local community in New York and New Jersey. The Maersk-SeaLand alliance represented 20 percent of the container volume moving through New York/New Jersey and it was estimated that future traffic generated by the alliance through the hub would provide as many as 3,000 permanent jobs. Political action in both states to win this competition was intensive.

**The Final Deal**

Ultimately, the alliance selected the port of New York/New Jersey as its future hub. But winning the competition was a very expensive proposition. The two states offered to make $450 million in improvements in the port — and then New Jersey sweetened the deal by offering an additional $100 million to pay for dredging costs and another $20 million for infrastructure improvements.

**Implications for Future Port/Carrier Negotiations**

This deal has implications for other ports in future negotiations with large shipping companies. At a speech before a port industry group, an official of the Port Authority of New York/New Jersey said the Maersk Sealand negotiation was "the quintessential example of the application of the increased power available to a consolidation of liner companies." The executive director of the port of Baltimore observed that "as we move forward, the big carriers are getting bigger and even the small are getting bigger through vessel sharing agreements (and) it's very troubling for all the ports. An industry consultant observed that this was "a classic case of port negotiation 101 (and) they have shown the shipping industry what to do to get the best deal from port authorities."
is accelerating as larger containerships come into service and the advantages of hub and spoke operation become more apparent. The hub and spoke concept is intended to maximize utilization of large containerships while providing market coverage to a maximum number of ports. This is accomplished via a network of regional and sub-regional hubs with onward service to outlying locations. Large linehaul ships, often with 4000+ TEU capacity, provide service between regional hubs. Progressively smaller ships are used to pick up and distribute containers within the region (see Box 21).

**Becoming a hub** — The most important attribute carriers look for is the strategic location of the hub relative to primary origins and final destinations of container traffic. Beyond location, other attributes include the ability to safely accept large ships, extent of terminal facilities, efficiency of container handling operations, availability of frequent feeder services with an appropriate geographical coverage and attractive cargo-handling charges. Most carriers believe 15 meters depth is adequate to accept the largest containerships in service in the foreseeable future, although some carriers have recently specified 16 meters depth for entrance channels.

Containership draft has not been increasing in proportion to the growth of TEU capacity, with most of the capacity growth in post-Panamax ships the result of increasing the width of the ship. A depth of 15 meters should accommodate all but the largest containerships now in the concept stage. It is nevertheless indicated for potential hub ports to reckon with depths in excess of 16 meters in the not unlikely event container vessels in excess of 10,000 TEU would be ordered in future.

A transshipment hub should have terminal facilities that enable quick ship turnarounds. This includes adequate numbers of cranes, sufficient container handling/storage areas and first rate computer system to run the entire terminal. As discussed in an earlier section, container cranes capable of spanning at least 18 rows and 6 tiers of containers on deck will be required to handle the 8,000+ TEU ships now being built. There is already a demand from carriers to install ship-to-shore container cranes with a capability to handle 22 rows of containers across. Capability should be provided to berth one or more feeder ships front or rear of the mother ship along the same quay — requiring quay lengths of typically some 1,000 meters for a terminal designed to receive two main-line vessels and their feeder vessels — and container yard depth behind the quay should be not less than 400 to 500 meters. The latter factor much depends on the container dwell time, the selected stacking and recovery system, and the stacking rules among many others.

Container handling productivity is of obvious importance to a carrier in selecting the transshipment hub. Carriers measure productivity in terms of how long it takes to turn around the ship — i.e., enter port, discharge containers, load containers, leave port. Much of this is dependent on the availability of adequate facilities and suitable systems and the absence of administrative
Box 21

Hub and Spoke Container Distribution

Global distribution of containers is increasingly accomplished via a network of regional and local hubs with onward service to outlying locations. Utilizing a transshipment hub, a carrier can (1) service marginal markets that do not justify direct call with large linehaul ships, (2) interchange containers between liner strings at strategic crossing points and (3) realize economies from improved port asset utilization. All of these advantages ultimately result in greater profit to the ocean carrier.

Hierarchy of Ports to Maximize System Efficiency

The hub and spoke network involves a hierarchy of ports, some of which serve as regional or local hubs connected by feeder loops to outlying ports. Large linehaul ships, often with 4000+ TEU capacity, are utilized to provide service between regional hubs and progressively smaller ships (or barges) are used to pick up and distribute containers within the region.

Mega-Containerships Drive Need for Regional Hubs

Linehaul ships of 4000+ TEU are now common, 6000+ TEU ships have already been introduced on major routes, 8000+ TEU ships are being built and 10,000+ TEU ships are under consideration. The bigger the ship, the more time needed in port for loading and discharge. Assuming a handling rate of 165 TEU per hour, each capacity increment of 1000 TEU requires an additional half day in port to load and discharge containers on the round trip voyage. To offset this additional port time, the operator has the choice of (1) increasing the service speed of the ship, (2) adding another ship to the service string, (3) offering less frequent service, or (4) reducing the number of port calls. Mega-containerships are now being designed with service speeds of 24 to 26 knots; higher speeds for the largest size ships are economically impractical. The capital cost of an additional containership is $80 to 100 million, which makes adding a ship to the string an expensive proposition. Customers now expect same day of the week sailing, ruling out reduced service frequency. This leaves minimizing the number of port calls as the viable option, which then creates the need for regional hubs and feeder loops. Essentially, the operator offsets the additional time to load and unload containers by reducing the number of ports the ship enters and leaves.

Future Role of Multi-porting

While hub and spoke networks are producing a hierarchy of ports with associated mainline and feeder service, there is a countervailing development of increasing multi-port routes with direct port-to-port connections. For example, the increasing use of load centers in the Mediterranean has led to an increase in the number of routes having the Mediterranean as an end region, rather than a region connected by passing routes. A next step that can be expected is that these new routes will lead to more ports of call in the Mediterranean.

barriers. However, the capability to provide trained personnel on a seven-day week, 24 hour per day basis to operate cranes, position containers, handle documentation, etc. has a major influence over the productivity of the terminal. And, ultimately productivity determines the cost of utilizing the hub.

It is essential to have adequate feeder services to and from the transshipment hub. This in turn requires a flow of traffic that will make it attractive for common carriers to serve the hub. In effect, there is a chicken and egg situation. For the hub to be attractive to linehaul carriers there must be an established network of common feeder service that can be utilized to pick up and distribute containers. For feeder service companies to call regularly at the hub, there must be at least one and preferably sev-
eral major linehaul carriers whose containers need to be picked up and distributed.

**Benefits of hub status** — The most obvious benefit is the income generated from operations of a transshipment hub because of the double-handling of containers. Consequently, container throughput in hub ports can be greatly boosted particularly when expressed in TEUs. More importantly, transshipment hubs provide local importers and exporters direct access to linehaul service, reducing transportation time (and possibly freight rates) to and from overseas markets. Reduced transport time directly impacts the competitiveness of exporters and the cost of imports, in turn creating jobs and income throughout the economy. Many developing countries have created free trade zones in combination with the hub port as engines for economic growth. Jebel Ali illustrates how a hub port in conjunction with an associated free trade zone can create significant economic activity. The port, which began operating in 1979, now has 67 berths and is serviced by 100 shipping lines. About 1,450 companies from 85 countries have been attracted to start up operations in the free trade zone.

**Problems hubs face** — Hubs compete in a highly competitive market segment where customers have options to use other facilities and pricing. An issue confronting the developer of a transshipment hub is how to prevent “hub hopping” in a situation where the number of competing hub facilities is growing rapidly and carriers have the ability to take their business elsewhere (see Box 22). In such a situation, a carrier who represents a significant portion of the terminal’s business can assert considerable pressure on the terminal owner and/or port to increase the service level offered and at the same time reduce charges and make concessions by threatening to vacate the hub. The owner of the facility would be faced with the dilemma of a $100 to 200 million investment lying idle if the customer departs. This pressure could force the handling rates below the full cost of providing the transshipment facility. A long-term commitment from a carrier to utilize the facility before making major investment would be one way to minimize the possibility of hub hopping, although this does not constitute a solid guarantee. Another and possibly better way to retain hub traffic is to involve one or several carriers in the equity structure of the new facility.

Another consideration is that there are fewer terminal services on which to impose charges on transshipment traffic than on local traffic and, in general, the larger the percentage that transshipment traffic is to total volume, the smaller the additional revenue potential of the terminal. Additionally, ports with a mixture of local and transshipment traffic frequently set transshipment charges low to attract “motherships” to the port in order to improve throughput levels, achieve economies of scale and lower handling cost. Service for import/export traffic can thereby be improved. A port highly specialized in transshipment business is at a distinct disadvantage competing with ports that have a mix of local and transshipment
Hub Options on the Asia/Europe Route

More than two dozen transshipment hubs lie along the linehaul route between Asia and Europe. About half are east of Suez, half west of Suez. This large number of hubs provides plenty of opportunity for “hub hopping.”

Northern Europe — Major container terminal facilities in Northern Europe are located in Rotterdam, Hamburg, Felixstowe, Antwerp and Le Havre. All five ports are involved in both transshipment and local container traffic. Rotterdam is the largest port in Europe, handling about 6.4 million TEU in 1999, and boasts regular connections with more than 1,000 ports worldwide. Hamburg, the second largest port, handles about two-thirds the number of containers that Rotterdam handles. Antwerp and Felixstowe are smaller in throughput.

Mediterranean — There are a number of transshipment hubs in the Mediterranean and several more under development. Algeciras serves as a transshipment hub for the Western Mediterranean, West Africa and Northern Europe. It handled about 1.8 million TEU in 1998. Gioia Tauro, Marsaxlokk and Cagliari are trans-shipment hubs in the mid-Mediterranean and Damietta, Limassol, Piraeus and Port Said serve as hubs in the Eastern Mediterranean. Other transshipment hubs are being built or planned, including new container terminals in Sines, Beirut, Ashdod and East Port Said.

Arabian Sea/Gulf — UAE ports in Dubai, Khor Fakkan and Fujairah have developed a strong presence in container transshipment. These three ports handled about 3.5 million TEU in 1999, most of which was transshipment traffic. Containers passing through Dubai principally originate or terminate in the Arabian Gulf. Containers through Khor Fakkan and Fujairah are mostly transshipped to/from Pakistan, Western India, Arabian Gulf and East Africa. A three-day diversion from the east/west linehaul route is required to call at ports in the UAE, which has placed them at a disadvantage to the new transshipment hubs in Oman and Yemen.

Indian Ocean/Red Sea — Centrally located along the east/west linehaul route are Colombo, Jeddah, Salalah and Aden. Calls can be made at any of these ports with virtually no diversion from the linehaul route. Colombo is a major transshipment hub for Southern India and handled 1.7 million TEU in 1999. Jeddah is principally an import/export channel for Saudi Arabia, but about ten percent of traffic through Jeddah has traditionally been transshipped to other points in the Red Sea. Both Salalah and Aden are new facilities that have begun operating within the past two years. These new hubs had a combined throughput of about 1.2 million TEU in 1999 and plans call for significant future growth in transshipment traffic, much of which will be attracted from the UAE ports, Colombo and Jeddah.

Asia — At the eastern end of the route are Singapore, Hong Kong, Kaohsiung, Busan, Kobe and Yokohama. Hong Kong lays claim to having the world’s largest overall container volume (16 million TEU in 1999), the majority of which originates in or is destined for China. Singapore, which has the world’s second largest container volume (15.9 million TEU in 1999), is the major transshipment hub for Southeast Asia and the Indian Ocean. Busan is a transshipment hub for containers into and out of Northern China, and Kaohsiung is a transshipment center for Central Asia. Japanese ports such as Yokohama, Kobe, Tokyo and Nagoya are major centers for container activity, but the majority of containers are distributed inland by rail or highway. A variety of other ports such as Manila, Port Klang and Vung Tau function as local hubs for their respective areas.
business, where revenue from the former is frequently used to cross-subsidize the latter. This is only acceptable in as far as transshipment generates additional economic value.

**Inland container terminals are shifting activities away from the port** — To maximize intermodal efficiency and free up valuable real estate in the port area, inland container terminals are increasingly displacing activity traditionally performed in the port. While there are many advantages to inland container terminals, from a port’s viewpoint there can be serious drawbacks as they divert economic activity away from the local area and open the possibility of competition from other ports (see Box 23).

**Environmental and Safety Concerns**

Given the growing concern about protecting the environment, ports are increasingly faced with the need to implement regulations that impact the freedom of port users and to make significant investment in environmental and safety facilities. These have limited commercial value and often produce only indirect social payback. How to implement these regulations and/or finance related facilities is an important issue.

**Growing environmental concerns** — Eliminating oily ballast water discharge from ships is a major environmental concern. This issue is well recognized internationally and provision of adequate reception facilities in port is required under the IMO MARPOL Convention 1973/78. Regulation 10/7 and 12 of the pollution convention requires each state to ensure that sufficient oily ballast water reception facilities are available at oil loading terminals, ports with ship repair facilities and in those ports in which ships have oily residues to discharge to shore. To be in position to ratify this convention, states need to offer reception facilities for tank washings (slops), contaminated ballast water, oily water from engine room bilges and for residues from fuel oil purification, particularly heavy fuel oil. Providing such a reception facility entails a significant capital expense that produces little, if any, financial return. How to pay for this facility is a major issue confronting port authorities.

But environmental concerns relating to ships in port go beyond the issue of oily water discharge. They involve the entire range of environmental issues from water pollution, air pollution, aesthetics, noise, etc. Ports increasingly will be faced with the need to find suitable solutions for disposing of dredged materials and implement regulations and operating procedures for terminals and anchorages to address these types of issues (see Box 24).

**Issue of sub-standard ships** — Despite the fact that many ships have valid certificates issued by their flag states and classification societies, a number of ships do not comply with international standards for safety, pollution prevention and shipboard living and working conditions recognized in international conventions. Political and social pressures have been placed on governments to implement policies to reduce the amount of sub-standard shipping in their waters. At an international level, the Paris Memorandum of
Box 23

Duisburg Inland Container Terminals

The first Inland Container Terminals (ICT) appeared along the Rhine during late 1960s. The Rhine, which is the main inland waterway connection in Western Europe, has the largest container traffic in Europe and is for a significant part navigable with containers stacked up to 5 high. The port of Duisburg, which is situated along the Rhine, is the largest inland port of Europe. It serves as a main inland hub for all larger ports from Antwerp to Hamburg. The larger volume, however, goes through the port of Rotterdam. Main terminal facilities in Duisburg at this moment are the DeCeTe (Duisburg Container Terminal) terminals and the Rhein-Ruhr terminal. Currently ECT is building a tri-modal terminal in Duisburg.

As do most of the European river container terminals, Duisburg offers tri-modal facilities, including direct access to rail transport and container stuffing and stripping facilities on the terminal. Rail plays a very important role, especially in the further distribution of cargo from Duisburg to destinations deeper inland in Germany, Eastern and South Eastern Europe.

Currently Duisburg offers a wide range of intermodal services. These include:

- Services to and from most of the barge terminals along the Rhine, including those in the port of Rotterdam;
- Services to and from the ports of Hamburg, Bremen, Rotterdam and Antwerp by rail;
- Services to several destinations in Germany by rail (e.g. Germersheim, Donauwörth, Nürnberg, Augsburg, and München) and
- Services to several destinations in Eastern and southeastern Europe by rail (e.g. Northern Italy, Switzerland, Austria, Hungary, the Czech Republic, and the Slovak Republic, Poland, Russia).

The presence of ICT at Duisburg is characteristic of a partial shift of the collection and distribution function away from the seaports. Besides, these terminals help to relieve the seaport areas of potential congestion as they will function as satellites for these seaports.

Within Europe, the Rhine plays a central role in this context. The Rhine area presently consists of some 35 barge terminals for handling boxes. Most of these inland container terminals offer tri-modal facilities. Direct access to rail transport and container stuffing and stripping facilities improve the competitiveness of these ICTs. An important issue in this context is the key role ICTs play in the emerging door-to-door services of a large number of container barge operators desirous of extending their logistics services.

From a seaport’s point of view, inland container terminals attract economic activity away from the port area. Other ports might profit by competing to be the point of entry and exit for the ICTs. Smaller ports may benefit from the tendency of emerging ICTs by effectively competing with the larger ports. This may lead to a certain degree of deconcentration.

At present, the container throughput of these river terminals is rather modest, with about 100,000 TEUs for Duisburg and Strasbourg and about 200,000 TEUs for Germersheim, the three largest terminals.

The impact of inland terminal network development on the concentration pattern in and competitive advantages of seaport areas remains uncertain. The actual tendency (concentration or deconcentration) will primarily be determined by the success of the port authorities and port companies in developing strong functional ties with the nodes in the hinterland network. Also the ability to attract and retain some of the mega-carriers that are active in door-to-door transport logistics will be an important factor. A final important factor is the extent to which the load centres are able to benefit from public-private involvement in decision making on and financing of port infrastructure projects and cross-border hinterland network connections.
Understanding (MOU) on Port State Control, which came into effect in 1982 and includes 18 signatory countries, requires each maritime authority to inspect a total of 25 percent of the individual foreign merchant ships entering the port state during a year. If ships do not meet a set of standard criteria, port states may detain the ships until proper measures are taken by the shipowner. The Paris MOU has led to more than 17,000 inspections in ports worldwide. In 1998 the number of inspections reached 26.5 percent, slightly more than the agreed rate. Since 1995 the number of detentions is showing a decreasing tendency suggesting either a positive impact of the measures or less rigorous inspection norms (as possibly illustrated by the recent ‘Erika’ disaster).

While enforcement of policies to eliminate sub-standard ships has a commendable objective, the enforcement practice can impact the competitive position of individual ports. For example, if a situation exists where the strictness or accuracy of inspections varies among port states, sub-standard ships may alter their routes and choose more accessible ports of call in a same range. Ports with lax inspection procedures would therefore have an unfair competitive advantage. One approach to offset this negative competitive impact is to focus on rewarding good behavior,
rather than penalizing bad behavior. An example of an innovative approach that rewards good behavior is the Green Award, initiated by the port of Rotterdam (see Box 25).

Impact on Port Operations and Management

Developments taking place in international logistics, shipping technology, industry consolidation and environmental regulations are driving major changes in the way ports will operate in the 21st century. As the world economies become more intertwined, ports are being increasingly cast as partners in assisting customers to compete for business share in the global market. Technology in the shipping sector, particularly relating to containerization and information exchange, is changing at a rapid rate, creating the need for major financial commitments to stay ahead of the technology wave. Mergers and acquisitions in the shipping sector, along with the growth of a relatively small number of global terminal operators, is creating a small number of powerful players that change the way port services are bought and sold. Distribution patterns are increasingly evolving into hub and spoke networks, creating winners and losers among ports that achieve hub status. All through this is the increasing concern about the environment and safety, which impacts the way ports deal with their customer base.

SECTION 3

CHALLENGES AND OPPORTUNITIES

Changes taking place in the port sector present difficult challenges to port administrators, terminal operators and other port service providers. But these changes also present opportunities for new ways of doing business and open the door to entry of new players throughout the range of port activities. In short, it’s a brand new era for everyone involved in the port sector and the opportunities as well as the challenges are substantial.

Transferring Port Operations to the Private Sector

The traditional closed fraternity of entrenched players with widespread involvement of public entities in ownership and operation of ports is no longer acceptable. Port authorities worldwide are under increasing pressure to turn over operations in the port to the private sector. They are being forced by competitive pressures to step into a landlord and regulatory role, focusing on administrative activities that public entities do best.
The need for change — Traditional ways of doing business in ports are being challenged worldwide by demands for gains in port efficiency, increased customer responsiveness and lower costs to move cargo through the port. It has been widely demonstrated that use of private sector companies throughout the range of port operations provides an opportunity to eliminate traditional, bureaucratic operating procedures and controls, and modernize facilities and equipment through new financing channels. It is also widely accepted that service providers with operating and administrative experience in other ports have the opportunity to transfer this experience and bring to a port best practices and appropriate modern technologies employed elsewhere. But even more important, by passing the reins of port operations from the public to the private sector, privatization offers the ability to shift the financial burden of port expansion and development to the beneficiaries of the expenditures.

Impact of privatizing operations — There are numerous success stories where port authorities have transferred to the private sector operations previously performed by public employees. In Buenos Aires, for example, the award of terminal concessions to four competing companies in 1994 has brought down handling charges significantly through improved labor productivity. After transferring major port facilities to the private sector between 1995 and 1998, Panama attracted more than $380 million in investments for modernization and expansion. When management of the Kipevu container terminal in Mombasa was transferred to a commercial terminal operator, outdated equipment was temporarily replaced, bureaucratic procedures streamlined and productivity of the terminal improved. More generally, 112 privatizations since 1990 involving ports, have generated private investments exceeding $9 billion to rehabilitate terminals and renew superstructure in the ports that were privatized.

This is not to say that port privatizations have been without problems. There have been a number of incidents of privatizations involving ports that have not worked out. In Indonesia, the Koja container terminal under private management ran into difficulties and the public port company took back the facilities. The city of Rostock has demanded return of the terminal it contracted to a private group for operation, citing lack of compliance with the original contract. Following a dispute with the Port Authority of Trieste, the commercial terminal operator (Europe Combined Terminals - ECT) selected to operate the container terminal in the port under a 30-year contract withdrew from the contract after eighteen months. The terminal operator awarded the concession to operate the container terminal in the port of Rosario is reported to have lost more than $40 million under the contract as a result of work disputes and has cancelled the contract. And unfortunately, the success story in Kipevu was reversed when the commercial terminal operator terminated its contract with the port as a result of breakdown of equipment that the government failed to refurbish or replace.
Lessons learned from past privatizations — A major lesson learned in port privatizations is the need for transparency and open competition through a structured international tendering process. Many examples can be given of attempted port privatizations that have bogged down due to legal challenges to the selection of the company to be awarded a concession contract. Montevideo is a recent prominent example of how things can go wrong in a privatization process. Attempts at privatizing services in the port have failed four times due to court challenges and the privatization has yet to take place. The Government has now announced plans to auction off the terminal on the stock market.

Conflicts and legal challenges can be minimized by clearly presenting the bidding rules and selection process in the bid documents. Criteria to be used for selecting the successful bidder should be stated and a pro-forma contract provided with the bid documents so that everyone is competing for the same contract. The role of the port administration after the privatization and any limits on the contractor’s ability to operate should be stated in the bid package. Bidders should be requested to provide a business plan that will become part of the final contract. In the plan, bidders should state how they will address labor issues that may arise as a result of any downsizing of port operating personnel and/or changes in work practice rules. They should be asked to give references of how these issues were dealt with in other ports in which they operate. The bidders should be requested to state quantifiable targets for productivity gains and market development. This business plan should be accorded significant weighting in the selection process. Incentives and penalties should be provided in the contract should there be a significant deviation from targets in the business plan.

It is important to develop beforehand a well-reasoned plan for transitioning to private operation and have a clear understanding of how the port will function after the various port services are privatized. A number of important questions should be addressed. What changes in laws and regulations are needed to allow private sector operation in the port? How much management and operational autonomy will be granted to the private operators? What will be the role of the port authority in regulating rates and practices of private operators in the port? Who will be responsible for common area maintenance and upgrade, and how will the cost of these activities be recovered from port users? Will the port continue to have a marketing and planning function after privatization, or will this be left to the individual service providers? What resources will be required to carry out the functions that remain with the port authority? What type of re-training program and severance package will have to be structured to address the issue of redundant personnel?

Contingency plan — The best and tightest contract will still not assure there won’t be problems in operation of port services under a private contractor. There should be a contingency plan for default by port service contractors
where work stoppage could impact the functioning of the port or where inadequate resources are made available by the operator.

**Opportunities for the Private Sector**

The worldwide market for port services is estimated to generate available revenues of $45 to 60 billion annually. While these numbers are very rough, they indicate the size of the available market to companies active in the port sector. This is a large available market that should be of interest to a wide variety of global, regional and local port service providers (see Box 26).

**Terminal operations** — This area is the most advanced in terms of private operation of port services. Of the 112 port privatizations captured in the World Bank PPI database, 62 have been concessions or management contracts involving terminal operation. But there are many more opportunities. There are more than 2,800 ports worldwide, many of which still have publicly operated terminals that are candidates for private takeover involvement in management and operations under concession agreements or management contracts. We roughly estimate that the available revenue from container terminal operation is on the order of $30 to 40 billion annually.

**Tug assist services** — Port authorities in many ports own and operate the harbor tugs used for ship assist. This activity is ripe for privatization and is relatively easy for the private sector to provide. It has already attracted the attention of Smit, who has been actively pursuing this market internationally and now operates tug services in the Netherlands, Belgium, Germany, Panama, Nigeria, Mexico, Argentina, Venezuela, Gabon, Singapore, Malaysia, Indonesia, Netherlands Antilles and the Bahamas. Other global, regional or local tug operators could certainly find this market interesting if they can break the existing public or private monopolies. We roughly estimate that the harbor tug service market represents available revenues of $4 to 5 billion annually.

**Maintenance dredging** — This activity has traditionally been performed by commercial dredging contractors under contract to port authorities or by port authority personnel using publicly owned dredges. It is estimated that maintenance dredging is a $4 to 5 billion available annual market and this activity can be completely turned over to the private sector. Port authorities that own and operate their own dredging equipment could corporatize the dredging function and sell the business along with its assets to the private sector. But more innovative concepts for privatizing

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**Box 26**

<table>
<thead>
<tr>
<th>Estimated Available Market in the Port Sector</th>
<th>Estimated Annual Revenues (billions of $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container Terminal Operations</td>
<td>30 to 40</td>
</tr>
<tr>
<td>Tug Assist Services</td>
<td>4 to 5</td>
</tr>
<tr>
<td>Maintenance Dredging</td>
<td>4 to 5</td>
</tr>
<tr>
<td>Information Technology</td>
<td>2 to 3</td>
</tr>
<tr>
<td>Environmental and Ship Safety Services</td>
<td>1 to 2</td>
</tr>
<tr>
<td>Other Port Services</td>
<td>4 to 5</td>
</tr>
</tbody>
</table>
maintenance dredging might be considered. For example, maintenance dredging could be outsourced on a concession basis similar to the recent concession awarded for channel dredging and maintenance in the Rio Paraná, where a portion of the project revenues will come from direct charges by the concessionaire to future channel users and the Authority receives a concession fee. A more radical concept could be a contract between a dredging company and container shipping company to maintain specified water depths at the carrier’s terminals on a worldwide basis. Much depends, however, on the volumes to be dredged and the timing of the dredging.

Information technology — Increasingly sophisticated information technology is spreading throughout the port sector as port users demand more timely information to support their logistics systems. This is producing a variety of opportunities to design, install and operate IT systems in ports throughout the world. IT services can be totally outsourced by port authorities and terminal operators and the market is estimated to represent $2 to 3 billion in annual available revenues. Among options that can be considered for structuring IT service contracts are joint ventures between the port authority and the IT provider, an arms length concession for IT services or a concession based on in-kind service compensation.

Environmental facilities and ship safety — This is an area ripe for innovative privatization concepts, as many of these functions can be performed by the private sector. For example, a private company could be given the concession to operate a ballast water treatment plant in the port, with revenues derived from receiving charges and resale of recovered oil (see Box 27). A private company could install and operate the vessel management system in the port under a concession agreement. The functions of port state control could be contracted under a management agreement to a competent inspection company or classification society, assuming the latter properly apply the inspection rules. A company could be contracted to maintain and operate aids to navigation on a local or regional basis, such as now performed by MENAS in the Arabian Gulf area (see Box 28). Altogether, it is estimated that the available market from environmental and ship safety activities is $1 to 2 billion annually.

Other port services — Warehousing and storage, container freight station operation, port security, pilotage, equipment maintenance, etc. are all activities that can be operated by the private sector. It is estimated that worldwide these activities represent an available market of some $4 to 5 billion annually.
Middle East Navigation Aids Service

The Middle East Navigation Aids Service (MENAS), a registered non-profit organization based in London, maintains the lighthouses, light buoys, RACON beacons and other aids to navigation in the Arabian Gulf that are outside port limits. Over 500 navigation aids are installed and maintained in this area. MENAS’ services extend from Kuwait down the Arabian side of the Gulf to Didamar Island in the Strait of Hormuz and then south to Masirah Island and channel in the western Arabian Sea off the coast of Oman.

MENAS operates the lighthouse tender and buoy lifting vessel Relume to provide the maintenance services required for the lights and buoys in the Gulf, and obtains its income from charges (light dues) levied on vessels entering the Gulf. These charges, at £1.70 per 100 NRT for each visit a vessel makes, have remained constant for ten years. Income has risen from the increasing numbers of vessels entering the Gulf, particularly from the higher numbers of containerships calling at Dubai and Jebel Ali.

In addition to fixed navigation aids, MENAS broadcasts navigational information to shipping in the Gulf area as NAVTEX warnings. These are also copied to Muscat Radio in Oman, which re-transmits them as NAVTEX warnings, and to the Area IX office, where they are included in the Area IX weekly Notices to Mariners. Permanent changes to channels, pipelines etc. are then notified to mariners via a printed MENAS Notice to Mariners, distributed free of charge to vessels by all shipping agents in the Gulf area. The MENAS warnings are withdrawn after the British Admiralty publishes its Notices to Mariners covering the same changes.
Box 29

The Port of Hong Kong — Why is it so Successful?

A Success Story

By any standard, Hong Kong has established an enviable presence in the world port sector. The port annually receives about 42,000 seagoing vessels and 190,000 river trade vessels. In 1999, Hong Kong handled more than 16.1 million TEU, making it the largest port in the world in terms of container throughput. To accommodate traffic through the port, there are eight major container terminals, with a ninth now under construction and two more planned. Looking outward, container traffic is projected to grow to 24 million TEU in 2006, 33 million TEU in 2016. The port has the ability to provide shippers with a full network of competitive services and frequent sailings to all areas of the world. Hong Kong’s cargo handling productivity ranks among the world’s highest. One of the container terminals in Kwai Chung handles more than 1 million TEU annually at a single berth — more than twice the world standard. This terminal is capable of loading/discharging 1200 TEUs in ten hours with three gantries that average 40 moves per hour. The success of Hong Kong is based on a number of factors, including the port’s location relative to major markets, a natural harbor and, perhaps more than anything else, a business friendly environment with heavy reliance on the private sector.

Reliance on the Private Sector

Virtually all activities in the port are performed by the private sector. Three private firms operate the eight container terminals in Kwai Chung container port. HIT, the largest of these companies, controls four of the terminals and handles 60 percent of the containers passing through Kwai Chung. The remaining traffic is shared among Modern Container Terminals and SeaLand Orient Terminals. Four private operators provide mid-stream operations and more than 100 private operators offer warehousing services. Three firms provide tug service in the port, the largest of which is Hong Kong Salvage and Towage. Seven companies provide stevedoring services, six companies provide ship repair. Hong Kong Pilots Association Ltd., which is owned by the member pilots, provides pilot service in the port.

The government’s operational function in the port is limited to collecting refuse, preventing and cleaning up oil discharge, providing vessel traffic services, managing a ferry terminal, maintaining 61 harbor moorings and coordinating search and rescue in the South China Sea. The Marine Department performs these functions as part of its responsibility to facilitate safe and expeditious movement of ships, cargoes and passengers within Hong Kong waters. A Port and Maritime Board has been established to set overall policy for the maritime sector in Hong Kong, but this Board does not generally become involved in oversight of commercial operations in the port. Overall, the government has a hands-off approach to port operations, relying on competition within the private sector to shape and control activities.

Expansion and improvement of facilities in the port is entirely funded through the private sector. While the government develops long term strategic land use plans for the port, it relies on the private sector to finance, build, own and operate new facilities in response to market demand. For example, since 1972 the private sector has built eight modern container terminals in the port and a ninth is now under construction. In awarding such terminal contracts, the government earmarks an area of water to be put out for tender, defines the responsibilities the developer is to undertake and selects the bidder who offers the highest price for the development site. Once awarded, the contractor is responsible for making the entire investment in infrastructure and superstructure on the site. The government’s role is limited to providing the agreed water depth in the approach channel to the terminal.

Implications for Other Ports

A general reliance on the private sector to provide the necessary port services and infrastructure, with the government providing minimum oversight needed to protect the public interest has obviously worked very well in Hong Kong. While other factors have contributed to the success of the port, a business friendly environment, reliance on market forces and the government’s hands-off approach to managing port services have greatly contributed to Hong Kong’s leading position as an international shipping center. This model is worth considering, particularly in ports that have sufficient traffic volume to enable competition among service providers to thrive.
Box 30

Checklist for Negotiating a Terminal Privatization

1. The Proposed Transaction

- What are the government’s primary and secondary objectives in privatizing the terminal — generate proceeds to the government from the transaction, increase efficiency of port services, attract foreign investment to improve port infrastructure, rationalize the public labor force, reduce the government’s fiscal burden, etc.?
- What area and specific activities in the port are to be privatized in the transaction — and what is not included in the transaction?
- What modality is best suited to the transaction — outright sale of assets and land, long-term lease of the facility under concession arrangement, management agreement to operate the facility, other?
- How will the negotiations with the proposed contractor be conducted and who will be assigned to the government’s negotiating team to complete the transaction?
- Who will prepare the term sheet to be presented to the proposed contractor and what schedule will be set for completing the transaction?

2. Structure of Payment to the Government

- How is the compensation to be structured — is there an initial cash payment to the government or is the proposed compensation to the government based on some form of rent, revenue sharing, royalty or other deferred payment arrangement?
- Is a portion of the initial payment for the terminal rights non-cash compensation based on providing equipment and services — if so, how does the contractor propose to establish the fair value of the equipment and services?
- What is the discounted present value of the initial payment and flow of deferred payments from the proposed contract?
- How does this discounted present value compare with the discounted present value of the projected profits or surpluses of the terminal as currently operated?

3. Risk Being Assumed by the Government

In the event of losses being incurred by the contractor under the proposed agreement, will in any circumstances the government be liable for these losses?
- Under what circumstances can the proposed contractor hold the port authority or government responsible for terminal disruptions, missed performance targets, unexpected operating costs, etc.?
- Is there any possibility that the government could directly incur losses under the agreement?

4. Performance Targets

- What throughput does the proposed contractor project for the terminal over the next ten years from local traffic, transit traffic and transshipment traffic?
- How does the proposed contractor plan to reach these throughput projections?
- Does the proposal state targets for increasing minimum productivity standards (e.g., minimum average crane moves per hour) in the terminal?
- How does the proposed contractor plan to reach these minimum productivity targets?
- Is there a provision for penalties and incentives in the proposal for meeting the planned throughput and productivity targets?
- What assumptions has the proposed contractor made, or conditions has it set, as to the role of the port authority and/or government in achieving these targets?
### 5. Operational Issues

- What services are to be provided by the port authority to the terminal after takeover by the proposed contractor — and how will these services be paid for?
- Who will be responsible for maintaining the civil structures and water depth alongside the quay?
- Will the proposed contractor provide new management and senior operating personnel — if so, who will they be and what will be their qualifications?
- How many personnel does the proposed contractor plan to employ in the terminal?
- Will existing personnel in the terminal have priority for future job positions in the terminal after take over by the proposed contractor?
- Will the proposed contractor utilize the salary level and structure currently in effect for personnel employed in the container terminal — if not, what will be the changes?
- What interaction does the proposed contractor foresee with other service providers operating in the port — and how does it plan to cooperate with the other providers?
- If a concession or management agreement, will the port authority have full and unfettered rights at all times to enter and inspect the terminal after transfer to the contractor?
- Will the proposed contractor carry all-risk and liability insurance on the container terminal, what specific risks will be covered, what will be the limits on liability coverage and will insurance cover the actual cost of replacement of the equipment?

### 6. Terminal Handling Charges

- What structure and level of terminal handling charges does the proposed contractor plan to impose on containers and other cargo through the terminal?
- How much profit is built into these charges?
- Are these charges competitive with other ports in the region?
- What role will the government have in reviewing and approving any changes in the structure or level of container handling charges?
- If the contract provides for revenue sharing, what portion of terminal handling revenue is to be paid to the government?
- What process is to be employed to ensure that the government receives all of the compensation it is due?

### 7. Potential Contractual Conflicts

- What is the provision for disputes resolution — i.e., the process, venue, applicable rules and laws?
- What language will be paramount in event of any ambiguity in the contract?
- Will the proposed contractor agree to be subject to all prevailing local laws?
- Are there provisions for terminating the contract with the proposed contractor should terminal throughput and/or productivity targets not be met — if so, what is the process for terminating the contract?
- Is the terminology in the force majeure provision acceptable to the government — if not, what changes are required to make it acceptable?
- What provisions has the proposed contractor included in the proposal concerning its obligation for payment of taxes to the government?
- Will the proposed contractor provide a bank guarantee as security from the time the government accepts its proposal until the handover is complete?
- What performance guarantee will the contractor provide as security for complying with the obligations taken on in the proposed contract?
8. Handover of the Terminal

- What is the proposed timing of the handover of the terminal to the proposed contractor?
- What specific steps will be taken by the contractor to plan for and implement the handover?
- Will the proposed contractor have transition personnel in the terminal for a time period preceding the handover to organize the process — and how will these personnel interact with the current staff?
- What is the role of the port authority in the handover process?
- What responsibilities will the port authority and government continue to have after the transaction?

9. Terminal Development

- What commitments are being made by the proposed contractor to improve and expand the terminal?
- What type of training program will be provided by the proposed contractor for terminal personnel?
- Will the proposed contractor install a world class computerized information system — and in what other ports is this system now used?
- When will this system be installed?
- Will provision be made to connect this computer system to the current or future computer system operated by the port authority — and to what extent will the port authority have access to data in the terminal system?
- What role does the proposed contractor envisage for the port in competing for transshipment business with other ports in the region — and are there any potential conflicts of interest as a result of the proposed contractor operating terminals in one or several of these other ports?