

Challenges in the Maritime-Land Interface: Port Hinterlands and Regionalization

Jean-Paul Rodrigue^a, Theo Notteboom^b

^a *Department of Economics & Geography, Hofstra University, Hempstead, New York 11549, USA. E-mail: Jean-paul.Rodrigue@Hofstra.edu*

^b *Institute of Transport & Maritime Management, University of Antwerp, Keizerstraat 64, B-2000 Antwerp, Belgium. E-mail: theo.notteboom@ua.ac.be*

Abstract

In addition to the complex logistical setting in which maritime shippers and ports are operating, port hinterlands have received renewed attention. The integration of transport functions provided by logistics and the re-orientation of maritime networks have redefined the functional role of ports in value chains and have generated new patterns of freight distribution and new approaches to port development. Among the notable challenges are attempts to capture a greater share of added value by favoring the development of logistical zones in the vicinity of port sites. Further, the development of better hinterland connections in many cases has become as important as the port facilities themselves to secure additional traffic. Maritime shippers and inland transport companies have become actively involved in providing more efficient (capacity, cost and time-wise) hinterland connections. It can thus be argued that the development of port systems has entered a phase of “regionalization”. Regionalization represents a setting where inland distribution becomes of foremost importance in port competition, favoring the emergence of transport corridors and logistics hubs. The port itself is not the chief motivator for and instigator of regionalization. Regionalization results from logistics decisions and subsequent actions of shippers and third party logistics providers.

This paper provides an overview of the developments in the maritime-land interface on the issues of port hinterlands. First, a review of the traditional concept of maritime hinterland is covered and to what extent it is being challenged. Second, the hinterland concept is expanded to include contemporary changes in logistics and inland freight distribution. Finally, port regionalization is discussed as a paradigm to understand the fundamental changes in port hinterlands.

Keywords: Maritime Transportation, Seaport, Maritime-Land Interface, Hinterland, Regionalization.

Introduction

The hinterland remains a fundamental component in the port and maritime shipping industries. The density and extent of hinterland shapes inland freight distribution and port operations. Regionalization represents a new phase in the development of port systems, which has traditionally focused on the port itself. In this phase, inland distribution becomes of foremost importance in port competition, favoring the emergence of transport corridors and logistics poles. The port itself is not the chief motivator for and instigator of regionalization. Regionalization results from logistics decisions and subsequent actions of shippers and third party logistics providers. Port authorities are invited to embrace and enhance the regionalization process in view of addressing current port-related challenges, mainly congestion, growing costs, limited handling capacity and the generation of additional traffic while being able to answer the requirements of modern freight distribution. With a more efficient access to the hinterland, mainly through modal shift, port competitiveness is thus increased. This also leads to questions with respect to the limits of port regionalization in terms of capacity and cost efficiency.

Part 1
The port hinterland
and its challenges

1. Port hinterlands

Since transport terminals are points of transshipment, the nature and extent of the traffic they handle is directly related to the markets they service. For ports, like most terminals, the level of activity corresponds to the dynamics of the land they are connected to, which is subject to changes in the nature of its activities and in the level of accessibility. Any change implies either new opportunities to generate additional port traffic, a decline or a change in the nature and composition of the traffic. As ports are the nexus of maritime and land transport systems, port hinterlands are strongly shaped by port dynamics and location. Location is particularly relevant as it integrates maritime and land transport systems in a level of functionality which can be viewed as a pole or as a node. From the perspective of a pole, a port organizes its foreland and hinterland by acting as a point of *convergence*. From the perspective of a node, ports are *articulating* networks of trade taking place at different scales.

1.1. Forelands and hinterlands

Two fundamental concepts reconcile ports and the markets they service. Transport terminals are within a system of freight distribution which includes the notions of foreland and hinterland binding imports and exports activities and the geographical spaces they service. Each transport terminal has its own hinterland, representing a set of customers (manufacturing and retailing activities) with whom it has transactions. These transactions involve movements of freight (or people in a marginal way) that at some point will be transhipped by the terminal. Movements are either originating or are bound to a space that can mainly be categorized as the main hinterland and the competition margin:

- The **main hinterland** (or fundamental hinterland) illustrates an area where the terminal has a dominant, if not an exclusive, share of the flows. It is traditionally the core market area of the terminal where accessibility is the highest. It is possible for other terminals to compete over the main hinterland, but this is likely to be done at a notable disadvantage or in the case where a terminal offers a very poor level of reliability.
- The **competition margin** represents an area where a terminal can be competing with other terminals. The competitiveness becomes a matter of differential accessibility, costs and quality and reliability of service.

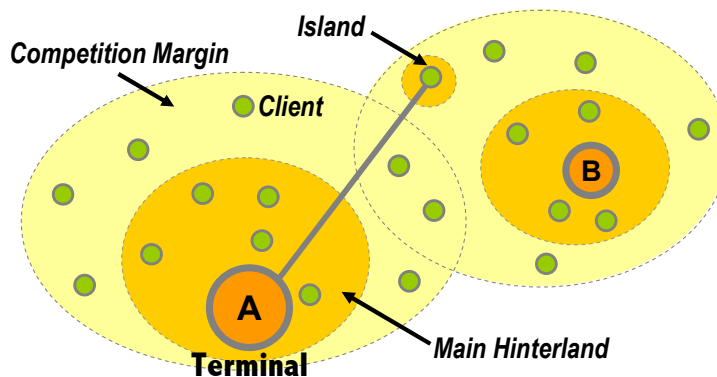


Figure 1 The Hinterland of a Transport Terminal

On Figure 1 terminals A and B are competing over two clients in their competition margin. An island within the hinterland of another terminal can also exist, mainly due to either a privileged relationship between the terminal and a client and/or because of an efficient inland distribution system serviced by a specific transport corridor.

The main nature of an hinterland is commercial and its importance is linked with the level of economic activity as well as the level of competition from other modes not linked to the terminal. Inbound hinterland traffic tends to be consumption based, except in the case when commodities and parts are involved in the fabrication of a product, while outbound hinterland

traffic is an outcome of extraction or production. Hinterlands can further be discriminated by the type of commodity as each is part of a specific supply chain with its own spatial relationships.

- Bulk products (minerals, chemicals, raw materials, wood, grain, etc.). In this case distance is one of the most important factors shaping hinterlands. Due to the nature of the products and the high transport costs involved, hinterlands tend to be small and serviced by high capacity corridors to the direct location of extraction or production.
- Parts and manufactured goods. Mostly concerns containerized traffic. Improvements in intermodal transportation and economic globalization have considerably expanded the hinterland for this type of traffic. In many cases, the hinterland can encompass large economic regions, particularly if transport corridors are involved.

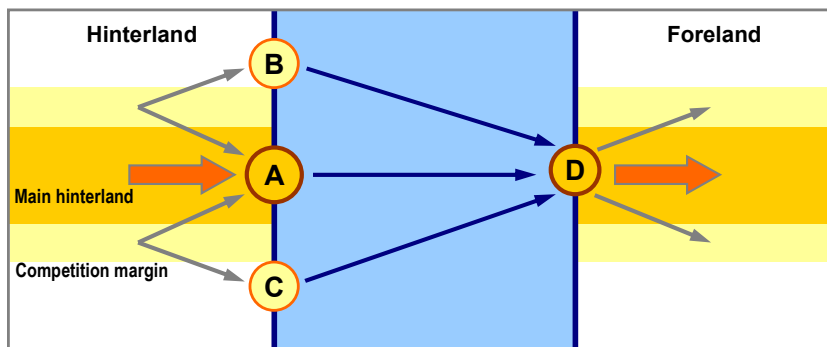


Figure 2 Port Foreland and Hinterland

The term foreland is the ocean-ward mirror of the hinterland, referring to the ports and overseas markets linked by shipping services from the port (Figure 2). The foreland is above all a maritime space with which a port performs commercial relationships. It includes overseas customers with which the port undertakes commercial exchanges. The foreland is measured by the share of a port, or a group of ports, being taken over their foreland relatively to the forelands of other ports. It defines the interactions of a port with elements of the global economy. As the global economy expanded, the foreland of ports became increasingly complex.

The provision of services to a wide range of markets around the world is considered to be an advantage. Generally, there have been far fewer assessments of foreland than hinterland, yet in port publicity documents the foreland is usually one of the elements stressed. Geographers have long criticized the distinction, arguing that foreland and hinterland should be seen as a continuum, rather than separate and distinct elements. This point has achieved greater weight recently, with the emergence of door-to-door services and networks, where the port is seen as one link in through transport chains (Notteboom and Winkelmans, 2001; Robinson, 2002).

1.2. Pendulum Services, Cabotage and Feeders

The emergence of post-panamax containerships has favored the setting of pendulum services across the Atlantic and the Pacific since the maritime landbridge of Panama is no longer accessible to this new class of ships. Pendulum services involve a set of sequential port calls along a maritime range, commonly including a transoceanic service from ports in another range and structured as a continuous loop. They are almost exclusively used for container transportation with the purpose of servicing a market by balancing the number of port calls and the frequency of services. For instance, pendulum services between Asia and Europe have on average 8 to 10 containerships assigned and involve 8 to 12 port calls. Most

transatlantic pendulum services have 6 to 8 containerships and involve 6 to 8 port calls. A pendulum service is fairly flexible in terms of the selection of port calls, particularly on maritime ranges that have nearby and competing ports grouped as regional clusters (e.g. North American East coast, Western Europe). This implies that a maritime company may opt to by pass one port to the advantage of another if its efficiency is not satisfactory and if its hinterland access is problematic. The shipping network consequently adapts to reflect changes in market conditions. The setting of pendulum services has particularly impacted port hinterlands since the selection of a few port calls along a maritime façade is likely to expand the hinterlands of the concerned ports. If a port is dropped from a pendulum service, its hinterland could “vanish”.

Cabotage concerns the transport between two terminals (a terminal of loading and a terminal of unloading) located in the same country irrespective of the country in which the mode providing the service is registered. Cabotage is often subject to restrictions and regulations. Under such circumstances, each nation reserves for its national carriers the right to move domestic freight or passengers traffic. In some instances, such as within the European Union, cabotage may also apply to international shipments between neighboring countries.

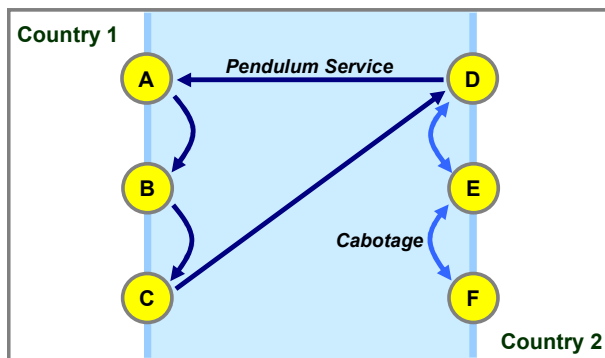


Figure 3 Pendulum Services and Cabotage

Pendulum services must be specifically structured in order not to infringe national cabotage laws (such as the Jones Act in the United States) that prevents a foreign maritime company to carry freight between domestic ports. For instance on Figure 3, for a pendulum service D-A-B-C-D, a maritime company registered in country 2 has the right to unload or load freight at ports A, B or C in country 1 as long as this freight is coming from or bound to a foreign port (port D in this case). Moving freight from port A to port B or C would not be permitted since it would be considered cabotage. That same maritime company would however be able to carry freight between ports D, E and F (cabotage) since it is registered in country 2.

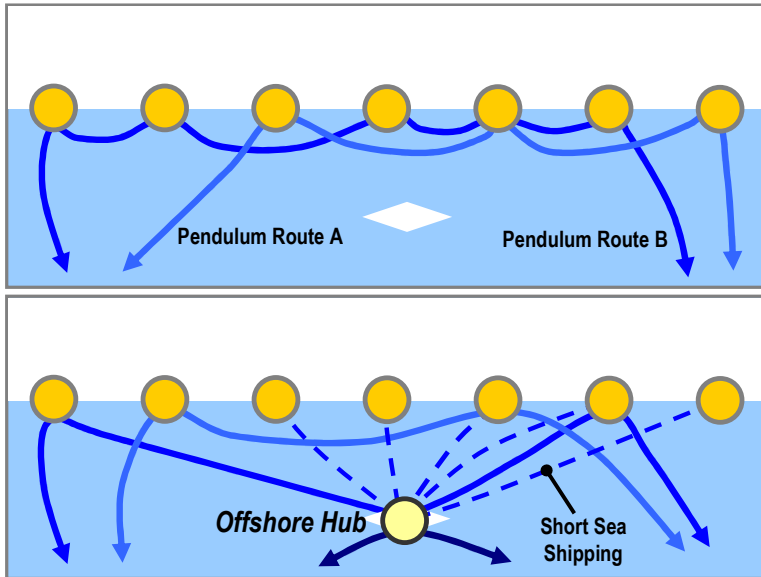


Figure 4 Feeding and Offshore Hub Terminals

In a conventional pendulum container service, a maritime facade could involve several port calls (Figure 4). If the volume is not sufficient, this may impose additional costs for maritime companies that are facing the dilemma between market coverage and operational efficiency. By using an offshore hub terminal in conjunction with short sea shipping services, it is possible to reduce the number of port calls and increase the throughput of the port calls left. Offshore terminals can thus become effective competitive tools since the frequency and possibly the timeliness of services can be improved. An outcome has been the growing share of transshipments in regard to the totality of containerized traffic, from around 11% in 1980 to about 28% in 2005 (Drewry Shipping Consultants). While in theory offshore hubs do not have an hinterland, but a significant foreland, the impact of feeding (mainly by short sea shipping) confers them a significant indirect hinterland.

Feeding combines short sea and deep sea containerized shipping at a hub where traffic is redistributed. The usage of larger containerships has led to the concentration of traffic at terminals able to accommodate them in terms of draft and transshipment capacity. Smaller ports, particularly those well connected to inland transport systems, can become feeders through the use of short sea shipping.

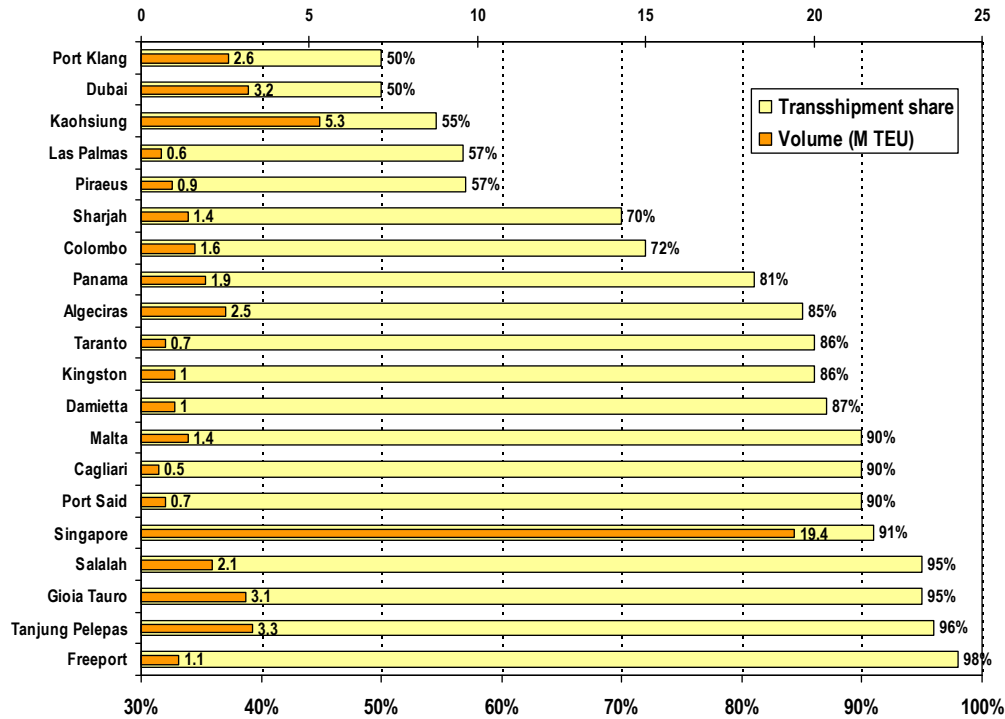


Figure 5 Ports with the Highest Transshipment Function, 2004

Source: Drewry Shipping Consultants.

The world’s leading offshore hub is the port of Singapore, where about 91% of its 19.1 million TEU volume was transshipped in 2004 (Figure 5; Drewry Shipping Consultants). Its large volume is mainly attributable to its strategic location at the outlet of the Strait of Malacca, the world’s most heavily used shipping route that transits about 30% of the world trade. Other major offshore hubs are Freeport (Bahamas), Salalah (Oman), Tanjung Pelepas (Malaysia) or Gioia Tauro (Italy), Algeciras (Spain), Malta, Taranto (Italy) and Cagliari (Italy).

2. Types of Port Hinterland

To understand the spatial and functional nexus that hinterlands have become, three basic sub-components can be applied: the macro-economic, the physical and the logistical hinterland (Table 1). The macro-economic hinterland tries to identify which factors are shaping transport demand. The physical hinterland considers the nature and extent of the transport supply, both from a modal and intermodal perspective. Finally, the logistical hinterland is concerned by the organization of flows as they reconcile transport demand and supply. Although the rationale behind these components appears simple, the shape they take is subject to complex spatial and functional structures.

Table 1 Types of Port Hinterland

	Macro-economic	Physical	Logistical
Concept	Transport demand	Transport supply	Flows
Elements	Logistical sites (production and consumption) as part of GPNs	Transport links and terminals	Mode, Timing, punctuality and frequency of services
Attributes	Interest rates, exchange rates, prices, savings, production, debt	Capacity, corridors, terminals, Physical assets (fixed and mobile)	Added value, tons-km, TEU, Value of time, ICT
Challenge	International division of production and consumption	Additional capacity (modal and intermodal)	Supply chain management

2.3. The macro-economic hinterland

The macro-economic hinterland is a matter of transport demand. The simplest way it can be represented is by a set of logistical sites with some focusing on production and others on consumption. They tend to be clustered often as an outcome of economies of agglomeration and regional specialization, underlining the discontinuity of most port hinterlands. The macro-economic hinterland now goes beyond the consideration of the clients of the port, either existing or potential, within a regional setting. Globalization has insured that additional macro-economic issues have to be considered. They include interest rates, exchange rates, prices, savings, productive capacities and debt. These conditions have often been considered in the concept of port forelands and hinterlands, but always as exogenous forces. In the current context, the structure of international trade has become fundamental to port-hinterland relationships. Since international trade is rarely a balanced account, trade imbalances, especially at the regional level, have a significant impact on port hinterlands since they impose a general direction in traffic flows completely outside the level of intervention of ports.

Regarding this, port hinterlands around the world have been shaped by powerful macro-economic forces. For example, the US – Asia imbalance in container flows is particularly revealing; containerized exports have simply not kept pace with imports. In recent years containerized freight flows between Asia and Europe have become three times as voluminous as containerized flows between Europe and the United States. For the United States, this implied an imbalance of 8.68 million TEU with Asia and Europe in 2004. The outcome are rate imbalances across the Pacific as it costs more per TEU for westbound flows than for eastbound flows, making freight planning a complex task for container shipping companies. About 70% of the slots of containerhips leaving the United States were empty in 2005 (Boile et al., 2006). Thus, production and trade imbalances in the global economy are clearly reflected in physical flows and transport rates. The impacts on the geography of maritime transportation are major, requiring a re-assessment of their strategies in terms of port calls and hinterland transportation.

2.4. The physical hinterland

The physical hinterland is a matter of transport supply, both from a modal and intermodal perspective. It considers the network of modes and terminals connecting the port to its hinterland; the means to achieve regional accessibility in freight distribution. Intermodal transportation has become of particular relevance to improve the efficiency and accessibility

of hinterlands as it links the global access of the port (through its intermodal facilities) with regional customers.

Port hinterland is physically articulated by port ranges and gateways. Ranges can be conceived as lateral corridors of port competition in which gateways provide access to inland freight corridors. The growing amount of containers handled by ports has been a significant indication of globalization. From a physical standpoint, the imbalances are associated with a new geography of container ports. It is clear that the balance of economic power, in terms of production, has shifted, which is illustrated by the preponderance of the container ports of Asian export-oriented economies. This can also be seen as a sign of over-investment in production and export capacities underlining Asian's (China's) dependency on exports. This surge in export has created pressures for container ports worldwide to provide physical capacities at the terminals, but also at the hinterland.

2.5. The logistical hinterland

The logistical hinterland is a matter of flows, how they are organized and how they are taking place considering the existing macro-economic and physical settings. Main issues involve modal choice and the sequencing/synchronization of maritime and inland freight distribution. Maritime shippers are becoming increasingly active in the management of hinterland flows in many ports, namely through alliances and contracts with rail and road transport companies. For many global maritime operators the control of maritime distribution networks as well as port access (some have become terminal operators as well) has been firmly established. The matter has become to synchronize more efficiently inland distribution capacities with port / maritime distribution capacities while coping with congestion and the costs associated with a high throughput maritime / land interface. A shift to other modes (or other distribution channels) appears to be a suitable alternative to increase port hinterland efficiency.

3. Challenges to port hinterlands

In recent years the relevance of the hinterland concept has been questioned, especially in the context of contemporary containerization (Slack, 1993). The mobility provided by the container has greatly facilitated hinterland penetration, so that many ports compete over the same market areas. The notion of discrete hinterlands with well defined boundaries is questionable since many hinterlands have become discontinuous, a process facilitated by the development of corridors and inland intermodal terminals (Figure 6, see also Notteboom & Rodrigue, 2005). Nevertheless, the concept is still widely employed, and port authorities continue to emphasize their port's centrality to hinterland areas in their promotional literature. From a context where port hinterlands were considered as rather fixed, contemporary hinterlands are much more flexible.

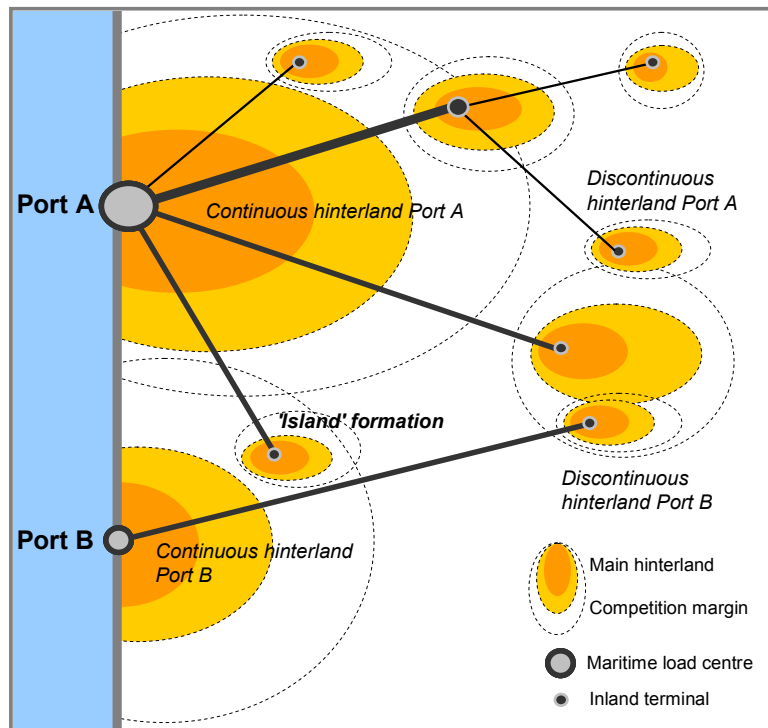


Figure 6 Continuous and Discontinuous Hinterlands

The direct hinterland of a seaport (or another terminal) is rather continuous. The more distant hinterland features tend to be discontinuous in nature, since the density of hinterland origins or destination of port cargo is lower and because of the accessibility effect of transport corridors and inland terminals. The service areas of a container load centre by rail and barge takes the form of sets of overlapping service areas of individual inland terminals. The size of each of the inland service areas depends on the service frequency and the rates of intermodal shuttle services by rail and or barge, the extent to which the inland terminal acts as a gateway and the efficiency and price of pre- and endhaul by truck. By developing strong functional links with particular inland terminals a port might intrude in the natural hinterland of competing ports. "Islands" in the distant hinterland are created in which the load centre achieves a comparative cost and service advantage vis-à-vis rival seaports. This observation increases competition among ports of the same port system as the competitive margins of hinterlands become increasingly blurred.

Larger ships making fewer port calls are concentrating their services in large markets. Jointly this favors the growth of gateways and corridors and changes the nature of hinterlands. Larger ports tend to have an advantage to capture this traffic.

3.1. Trade imbalances

The most important factors behind the reorganization of freight transportation are related to the macro-economic conditions of the global economy. Logistics and freight distribution are bound to this environment, which is quite volatile and unpredictable. In such a context port hinterlands are facing additional pressures due to the pace of the changes and the flexibility of production. Two factors are of particular relevance for global freight distribution:

- The growth of freight being carried both in tons and tons-km has placed additional demands on the capacity of modes and terminals to handle them; and

- Imbalanced freight movements, the outcome of a global reorganization, are leading to disequilibrium in the division of labor, trade, production and consumption.

The case of China is by itself impressive; just 10 years ago it would have been difficult to forecast the current and still growing role of China in the global geography of production, not just for low costs and labor intensive goods but increasingly for technological products. In the last decade alone, China accounted for about 25% of the global growth of GDP imposing a major shift in global freight flows. Comparative advantages are shifting rapidly, leading to de-industrialization in North America and Europe and a re-industrialization of Pacific Asia.

While this global shift has been taking place trade flows have become dislocated, creating an array of challenges for the freight transport industry such as empty travel and inbound delays at gateways. Under normal circumstances, this imbalanced situation would have corrected itself with a recession in the United States, leading to a new equilibrium as consumers would have curbed their consumption of foreign goods. However, an intricate game of financial leverage came into play between the indebted United States government and consumer and its creditors; Asian central banks (Japan, South Korea and China dominantly). This has created a unique situation that conventional international trade theories do not grasp effectively. To simplify the situation, Asian capital gained from export based development was recycled in American securities (T-bills, bonds and equities), which in conjunction with an accommodative interest rate policy of the Federal Reserve led to an inflation of American assets, especially real estate. Consumers, because of cheap capital and a growth of the paper value of their residential assets, indulged in debt financed spending on imported goods. Commodities flow dominantly in one direction while capital flows on the other.

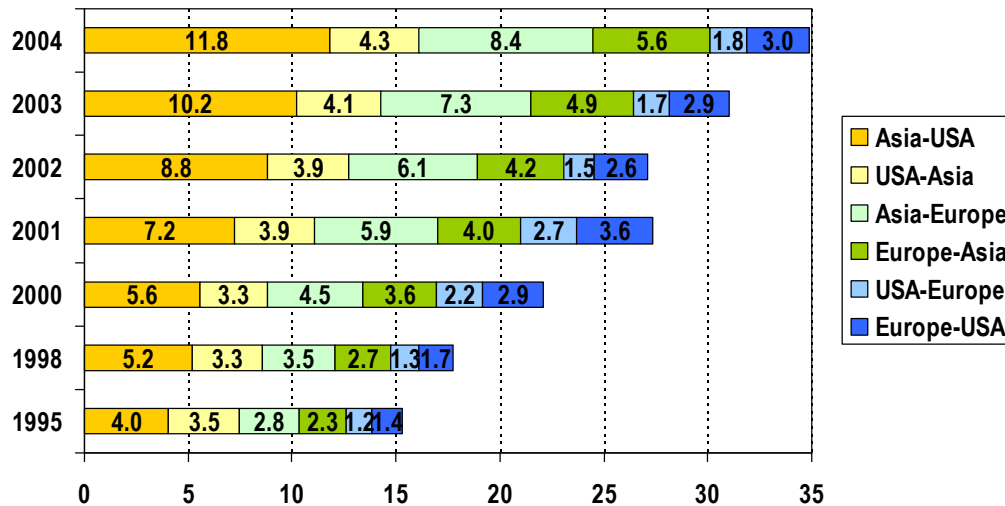


Figure 7 Containerized Cargo Flows along Major Trade Routes, 1995-2004 (in millions of TEUs)

Container flows are quite representative of global trade imbalances, which have steadily been growing since the 1990s. For instance there are 2.5 times as much containers moving from Asia to the United States (11.8 million TEUs in 2004) than there are from the United States to Asia. This implied an imbalance of 8.68 million TEU with Asia and Europe. By 2005, about 70% of the slots of container ships leaving the United States were empty. Thus production and trade imbalances in the global economy are clearly reflected in imbalances in physical flows and transport rates. It costs more per TEU for westbound flows than for eastbound flows, making freight planning a complex task for container shipping companies. Thus, production and trade imbalances in the global economy result in imbalances in physical flows and transport rates. Eastbound trans-Pacific rates are lower than westbound trans-Pacific rates, substantiating the argument of the lack of competitiveness of the American economy and its inability to take advantage of this benefit.

3.2. Physical capacity

The surge in inland freight distribution is placing additional demands to improve the physical capacity of the transport system, both from a modal and intermodal perspective. For many ports, the issue thus has become to provide physical capacity and finding funding for this capacity. Securing capital investment is particularly important due to the constraints of modern port operations and high capacity hinterland access. This is a factor behind the growing importance of port holdings. They have the financial means to invest in infrastructures as they have a wide variety of assets and the capacity to borrow large quantities of capital. They can use the profits generated by their efficient terminals to invest and subsidize the development of new ones, thus expanding their asset base and their operating revenues. Most are listed on equity markets, giving the opportunity to access global capital, which was realized in the last decade that the freight transport sector was a good source of returns driven by the fundamentals of a growth in international shipments. This financial advantage cannot be matched by port authorities even those heavily subsidized by public funds.

3.3. Supply chain management

The emergence of global logistics providers, each of which is having a level of penetration over hinterlands, has been a dominant trend for port hinterlands. This penetration takes the form of alliances with inland freight transport providers (rail, trucking and barge companies), often leading to direct ownership or a stake (stock purchase and/or profit sharing). The results are a higher level of integration along supply chains, both over the maritime space and the hinterland. This aspect was already discussed in the first paper by Notteboom and Rodrigue.

Part 2

Port regionalization

Inland distribution has become a core dimension of global supply chains. Structural changes in logistics have generated new patterns of freight distribution and necessitated new approaches to port operations. Customers are calculating the total logistic cost of transporting containerized goods. While the maritime segment of those costs is a fairly well known entity because reliable services between the world's major container ports and a high level of competition between maritime carriers, the inland segment of those costs is subject to a wide variety of costs and levels of reliability. Thus, current efficiency improvements in logistics, namely for container transportation, are derived for a large part from inland distribution. The development of global supply chains increased the pressure on the maritime haul, on port operations, and last but not least on inland freight distribution. Inland accessibility as such has become a cornerstone in port competitiveness. It thus appears that the battle over port forelands will be decided over the hinterland, a segment of the distribution chain over which port players and port authorities could play a more significant role. A conceptual approach to port / hinterland relationships in a changing market environment is thus required. A "regionalization" phase in port system development is introduced and further substantiated.

4.1. Port regionalization and inland freight distribution

One of the most widely acknowledged conceptual perspectives on port development is the Anyport model developed by Bird (1980) describing how port infrastructures evolve in time and space. Starting from the initial port site with small lateral quays adjacent to the town centre, port expansion is the product of evolving maritime technologies and improvements in cargo handling. This is also marked by changing spatial relationships between the port and the urban core, as docks are built further away from the central business district. In the later stages, increased specialization of cargo handling, growing sizes of ships, and ever increasing demands for space for cargo-handling and storage results in port activity being concentrated at sites far removed from the oldest facilities. In turn, original port sites, commonly located adjacent to downtown areas, became obsolete and were abandoned. Numerous reconversion opportunities of port facilities to other uses (waterfront parks, housing and commercial developments) were created.

The phase of port regionalization not only expands the anyport model of Bird. It also extends the existing literature on the spatial development of seaport systems in relation to maritime and hinterland networks. The model of Taaffe et al. (1963) suggests an increasing level of port concentration as certain hinterland routes develop to a greater extent than others in association with the increased importance of particular urban centres. The geographical system would evolve from an initial pattern of scattered, poorly connected ports along the coastline to a main network consisting of corridors between gateway ports and major hinterland centres. The models of Barke (1986) and Hayuth (1981) are quite similar, though they have introduced a process of port system deconcentration. Meanwhile, some authors have introduced modifications to the above models in order to reflect the uniqueness of some port regions (Wang, 1998). Empirical research has demonstrated that some port systems and port ranges are getting more spatially concentrated while others are evolving to a more evenly distributed system (Kuby and Reid, 1992; Notteboom, 1997; McCalla, 1999; Hayuth, 1988; Lago et al. 2001).

Similarly to the Bird model, the models on port system development up to now (a) did not explain the recent rise of new hub terminals and (b) did not incorporate inland freight distribution centers and terminals as active nodes in shaping load centre development. This paper proposes a revised model on port system development founded on two extensions.

The **first extension** encompasses the explicit integration of 'offshore' hubs on island location or locations without a significant local hinterland. Examples are plentiful: Freeport (Bahamas), Salalah (Oman), Tanjung Pelepas (Malaysia) and Gioia Tauro, Algeciras, Malta, Taranto and Cagliari in the Mediterranean to name but a few. There are many factors behind the emergence of offshore hubs. They tend to have greater depth since they were built recently in view to accommodate modern containership drafts, placing them at a technical advantage. In

addition, their sites often have land for future expansion, labor costs tend to be lower (no unions), limited inland investments are required since most of the cargo is transshipped, and terminals are owned, in whole or in part, by carriers which are efficiently using these facilities. In an initial phase these terminals solely focus on accommodating transshipment flows. As the transshipment business remains a highly volatile business, offshore hubs might sooner or later show ambition to develop services that add value to the cargo instead of simply moving boxes between vessels. These ambitions could trigger the creation of logistics zones within or in the vicinity of the port area, in many cases connected to the status of Free Trade Zone. The insertion of offshore hubs does not make the mainland load centers redundant. The terminals in the port system all have their role to play within the rich blend of liner service networks. In referring to the Asian hub/feeder restructuring, Robinson (1998) argues that a system of hub ports as main articulation points between mainline and feeder nets is being replaced by a hierarchical set of networks reflecting differing cost/efficiency levels in the market. High-order service networks will have fewer ports of call and bigger vessels than lower order networks. Increasing volumes as such can lead to an increasing segmentation in liner service networks and a hierarchy in hubs (both 'offshore' and 'mainland').

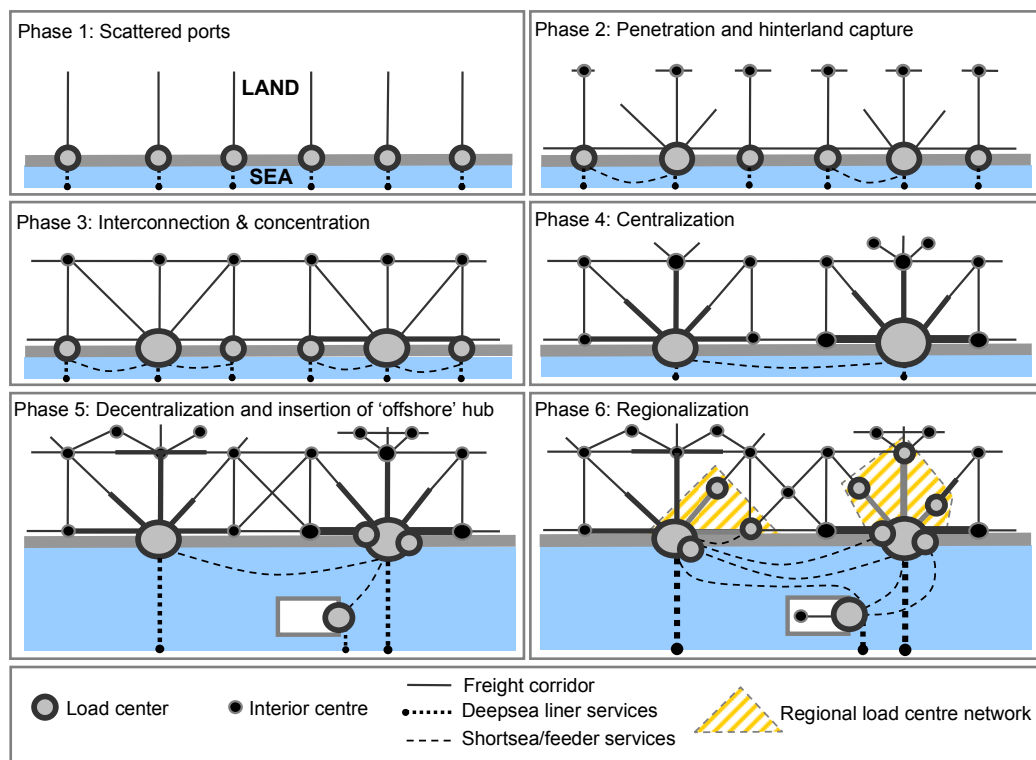


Figure 8 The Spatial Development of a Port System

The **second extension** relates to the incorporation of inland freight distribution centers and terminals as active nodes in shaping load centre development. The port regionalization phase adds to the models of Hayuth and Barke, and is characterized by strong functional interdependency and even joint development of a specific load centre and (selected) multimodal logistics platforms in its hinterland, ultimately leading to the formation of a “regional load centre network” (phase 6 in figure 8). Many factors favor the emergence of this phase, namely:

- **Local constraints.** Ports, especially large gateways, are facing a wide array of local constraints that impair their growth and efficiency. The lack of available land for expansion is among one of the most acute problem, an issue exacerbated by the deepwater requirements for handling larger ships. Increased port traffic may also lead to diseconomies as local road and rail systems are heavily burdened. Environmental

constraints and local opposition to port development are also of significance. Port regionalization thus enables to partially circumscribe local constraints by externalizing them.

- **Global changes.** Global production and consumption have substantially changed distribution with the emergence of regional production systems as well as large consumption markets. No single locality can service efficiently the distribution requirements of such a complex web of activities. For instance, globally integrated Free Trade Zones have emerged near many load centers, but seeing a FTZ as a functionally integrated entity may be misleading as each activity has its own supply chain. Port regionalization thus permits the development of a distribution systems that corresponds more closely to fragmented production and consumption systems.

In this new development phase the port system consequently adapts to the imperatives of distribution systems and global production networks while mitigating local constraints.

4.2. Port regionalization and logistics integration

The transition towards the port regionalization phase is a gradual and market-driven process imposed on ports that mirrors the increased focus of market players on logistics integration. International supply chains have become complex and logistics models evolve continuously as a result of influences and factors such as globalization and expansion into new markets, mass customization in response to product and market segmentation, lean manufacturing practices and associated shifts in costs and time dependent distribution strategies. Customers' need for a wider array of global services and for truly integrated services and capabilities (design, build and operate) triggered integrated logistics strategies and a shift from transportation-based 3PLs (Third Party Logistics) to warehousing and distribution providers and at the same time opened the market to innovative forms of non-asset related logistics service provision, that is 4PL (Fourth Party Logistics). Intensified competition at the supply side creates pressures on cost management and on margins. The evolutions in supply chains and logistics models urge market players such as shipping lines, stevedoring companies, inland transport operators and forwarders to re-think their role in the logistics process and poses great challenges to the role of ports as functional nodes in logistics networks. The tendency towards logistics integration in the port and maritime industry and the impact of changes in logistics on the functional role of ports in value chains are well documented in recent literature. Robinson places the role of seaports within a new paradigm of ports as elements in value-driven chain systems. Notteboom and Winkelmanns (2001) and Heaver et al. (2000) primarily discussed logistics integration and the changing role of port authorities in the new logistic-restructured environment, while Martin and Thomas (2001) addressed structural changes in the container terminal community.

The development of the logistics industry has enabled many freight forwarders to take control of larger segments of the supply chain. The level of functional integration of land distribution is increasing rapidly. Many distribution functions that used to be separated are now controlled by a single entity. In a conventional situation, the majority of distribution activities were performed by different entities ranging from maritime shipping lines, shipping and custom agents, freight forwarders and rail and trucking companies. Regulations were often preventing multimodal ownership, leaving the system fragmented. The shift from one segment to the other was characterized by additional costs and delays either administrative or physical (namely intermodal). With an increasing level of functional integration many intermediate steps in the transport chain have been removed. Mergers and acquisitions have permitted the emergence of large logistics operators that control many segments of the supply chain (megacarriers). In turn, this has supported the development of economies of scale in distribution. Technology also has played a particular role in this process namely in terms of IT (control of the process) and intermodal integration (control of the flows).

In the regionalization phase it is increasingly being acknowledged that land transport forms an important target for reducing logistics costs. Regionalization as such provides a strategic answer to the imperatives of the inland distribution segment of the supply chain in terms of

improving its efficiency, enhancing logistics integration and reducing distribution costs. Globally, inland access costs account for 18% of the total logistics costs, and could be reduced by one third with appropriate regionalization strategies. On the crucial China-US trade link, bringing a container from inland China to a gateway port such as Shanghai alone accounts for more than 60% of the total transport costs. Inland container logistics thus constitutes an important field of action.

The liner shipping industry is a prime example of an increased focus on logistics integration. More economical ships and alliance co-operation have lowered ship system costs, but at the same time intermodal costs share an increasing part of the total cost. The portion of inland costs in the total costs of container shipping would range from 40% to 80%. Many shipping lines therefore consider inland logistics as the most vital area still left to cut costs. Some shipping lines have gone rather far in door-to-door services and integrated logistic packages, managing the container terminal operation and inland transport and bypassing the freight forwarder by developing direct relationships with the shipper. Other shipping lines stick to the shipping business and try to enhance network integration through structural or ad hoc co-ordination with independent inland transport operators and logistics service providers. A last group of shipping lines combines a strategy of selective investments in key supporting activities (for example agency services or distribution centers) with sub-contracting of less critical services. Shipping lines generally do not own inland transport equipment. Instead they attempt to use trustworthy independent inland operators' services on a (long-term) contract base. The formation of global alliances has taken inter-carrier co-operation to new heights, with members sharing inland logistics information, techniques and resources as well as negotiating collectively with suppliers (terminals, rail operators, feeders, barge operators, etc.). Lines that are successful in achieving cost gains from smarter management of inland container logistics can secure an important cost savings advantage and deliver extra value to the customers. Moreover, because this is difficult to achieve, it is likely to be a sustainable way of differentiating business from rivals.

Logistics integration thus requires responses and the formulation of strategies concerning inland freight circulation. The responses to these challenges go beyond the traditional perspectives centered on the port itself. Port regionalization thus represents the next stage in port development (imposed on ports by market dynamics), where efficiency is derived with higher levels of integration with inland freight distribution systems. Containerization, intermodality and ICT enhance the spatial and functional reconfiguration among logistics nodes. In discussing the functional development of the port of Rotterdam in the Netherlands, Van Klink (1995) used the term "borderless mainport" to describe the functional development from port city to port network. Many ports are reaching a stage of regionalization in which market forces and political influences gradually shape regional load centre networks with varying degrees of formal linkages between the nodes of the observed networks.

4.3. The role of freight distribution centers in regionalization

The development of inland terminals is not sufficient by itself to ensure an efficient port regionalization and inland distribution. Infrastructures servicing freight are required at a location of convergence of inland freight, a function assumed by distribution centers where vast quantities of freight are processed.

Manufacturers increasingly outsource logistics manipulations to their products towards distribution centers located near consumer markets. As such, a large part of the value creation in the supply chain is transferred to logistics service providers. These activities are referred to as value added logistics services (VAL) and they imply the integration of production and distribution parts of a supply chain. On top of low-end VAL activities that add little value to the goods (e.g. labeling, insertion of manuals, etc.), logistics service providers are further upgrading the functional role of their logistics centers by developing high-end VAL activities. The latter might even include postponed manufacturing activities like systems assembly, testing, software installation, etc. By doing so, logistics service providers take over an ever larger part of the added value creation within the product chain. Freight distribution centers come to the fore as turntables for low-end and high-end VAL services and develop a

strong orientation on short transit times. Logistics platforms incorporate additional functions such as back-office activities, e.g. the management of goods and information flows, inventory management, tracking and tracing of goods and the fulfillment of customs and other formalities. While setting up their logistics platforms, logistics service providers favor locations that combine a central location (i.e. proximity to the consumers market) with an intermodal gateway function. Seaports and sites along hinterland corridors typically meet these requirements.

Corridor development enhances the polarization and zoning of logistics sites in transport nodes (seaports and inland ports) and along the axes between seaports and inland ports. Logistics poles exert a location pull on logistics sites by combining a strong intermodal orientation with cluster advantages. This tendency is depicted in figure 9. Conventional location theories support the tendency towards polarization (e.g. the growth pole theory). Logistics companies frequently set up close to one another, since they are attracted by the same location factors such as the proximity of markets and the availability of intermodal transport and support facilities. The geographical concentration of logistics companies in turn creates synergies and economies of scale which make the chosen location even more attractive and further encourages concentration of distribution companies in a particular area. Geographical differences in labor costs, land costs, availability of land, level of congestion, the location vis-à-vis the service markets, labor mentality and productivity and government policy are among the many factors determining observed (de)polarization of logistics sites, see e.g.

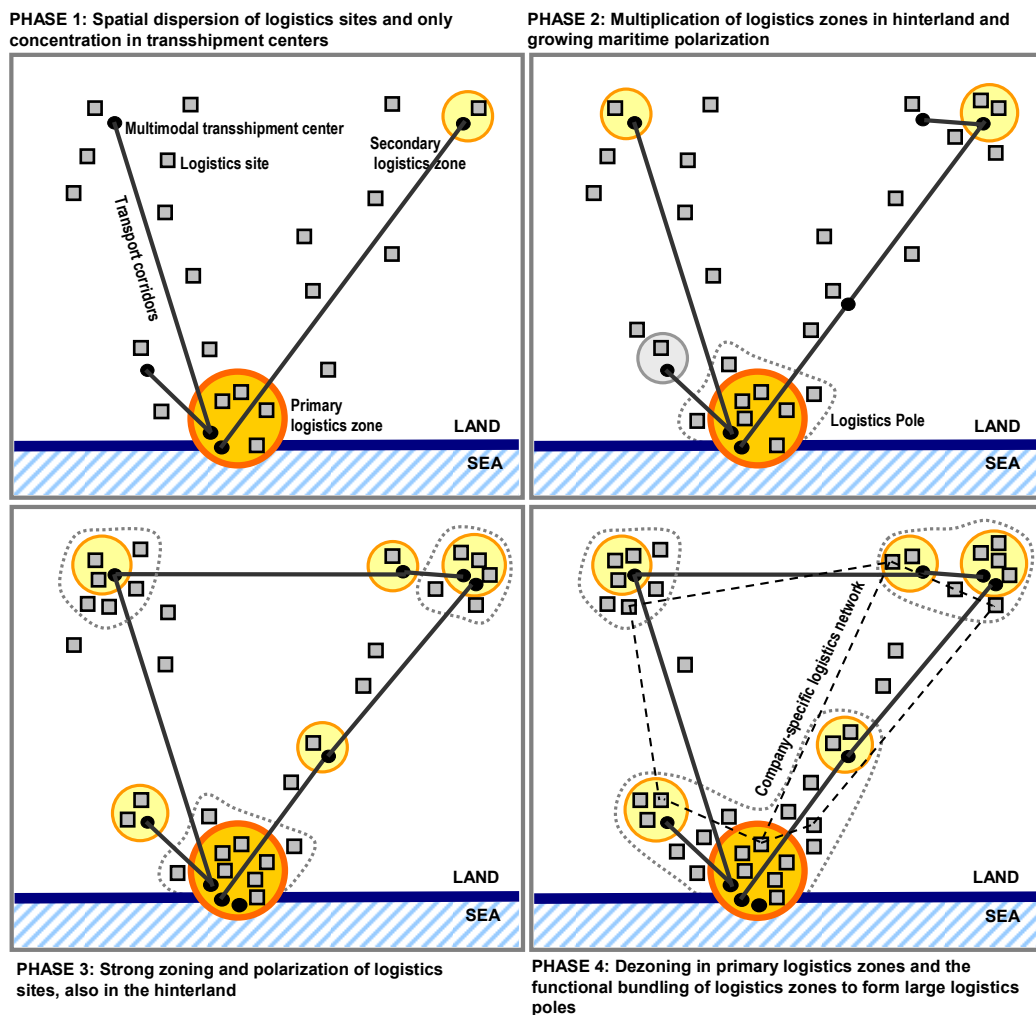


Figure 9 A Spatial Model on Logistics Sites in the Port Hinterland

Phase 4 in the model introduces the regionalization of port activity. The concept of a 'logistics pole' is the logistical equivalent of the concept 'regional load centre network', being that the latter is defined out of a cargo-flow perspective. A logistics pole can only perform well if an efficient regional load centre network is in place to guarantee the cargo linkages in and between logistics zones. In the regionalization phase, the interaction between seaports and inland ports and terminals leads to the development of a large logistics pole consisting of several logistics zones. A virtuous cycle is created, producing scale effects, which ensures high productivity from intermodal synchronization and the compatibility of goods flows with the logistics of shippers. Seaports are the central nodes driving the dynamics in a large logistics pole. But at the same time seaports rely heavily on inland ports to preserve their attractiveness.

The process described in figure 9 is highly dynamic. An unbalanced development of inland terminals and corridors might simply move bottlenecks from the load centre ports to corridors and inland centers. Given this constraint, companies might consider relocating their logistics sites from the saturated areas to nearby locations or even to locations far from the saturated logistics zone. Spatial relocation patterns might change the relative importance and internal spatial configuration of logistics poles.

The trend towards spatial (de)concentration of logistics sites in many cases occurs spontaneously as the result of a slow, market-driven process. But also national, regional and/or local authorities try to direct this process by means of offering financial incentives or by reserving land for future logistics development.

4.4. Issues about the Regionalization of Port Hinterland

Although regionalization appears to be a rather straightforward process, several issues can be raised concerning its setting.

- **Over-optimism.** The regionalization phase undoubtedly creates new opportunities for ports and inland distribution centers to develop integrated logistics concepts that meet customers' aspirations in terms of supply chain management solutions. Unfortunately, it often triggers a too optimistic attitude among planners in terms of the future development potential of specific port and inland sites. Different locations and load centre networks are vying for logistics sites and in pursuing this goal they often overestimate future traffic potential. A lack of clear insights into market dynamics could lead to wishful thinking by local governments and an overoptimistic perspective on the logistics development potential of the regions concerned. This can lead to overcapacity situations, redundancies and cutthroat competition between incumbent sites (ports or logistics zones in the hinterland) and newcomers in the market.
- **Slow start.** The development of a regional load centre network can take place over a long period of time. Even in the case that the benefits of port regionalization are quite obvious, it often demands years of efforts of port authorities and market players to gradually build the network.
- **Port-related activities.** Concerns also exist with respect to the spatial distribution of logistics activities in the load centre network. As the hinterland becomes a competitive location, the question remains as to which logistics activities are truly port-related. The chances for distribution centers in the traditional processing industries to locate in seaports may be good, because of the existence of large industrial clusters in seaports. Next, seaports may be attractive alternative locations for the relocation of distribution centers focusing on sea-sea operations.
- **The distribution of costs and benefits.** The (re)distribution of wealth among the players and nodes in the network is a major governance concern when developing regional load centre networks. The external spill-over effects of ports are expanding from the local port system towards a much larger international economic system. As such, the

regionalization phase enhances a situation where port benefits are likely to 'leak' to users in inland locations. But unfortunately at the same time, many of the negative externalities remain spatially concentrated in the seaports. This kind of situations potentially brings about major socio-economic conflicts related to seaport development and raises issues about optimal port location for a given region. For example, the local community might wonder whether it is getting a fair input payback for the scarce local resources used by ports. In the regionalization phase ports should no longer be taxed on their direct economic effects generated within the port perimeter, but on their contribution to wealth creation in the larger logistics pole and economic system. This implies that an appropriate toolbox should be in place to make the direct and indirect socio-economic payback of port activities (as part of a larger system) more transparent both to port users and community groups.

- **Free riders.** Another concern relates to the "free rider" phenomenon in the regionalization phase. Ports might develop strong ties with inland terminals in the hope that this will bind cargo to the seaport. However, cargo flows follow the most convenient route controlled by the freight forwarder, so a seaport cannot make cargo generated by an inland terminal captive to the port, even if inland terminal and seaport belong to the same load centre network. Investments of one load centre in setting up inland terminals might thus have positive cargo impacts on adjacent rival load centers that just benefit from the new inland terminals without having invested in them. Port authorities are generally aware of the fact that cargo flows cannot be forced to follow a specific route, and that free rider problems do exist. This might make port authorities less eager to embark on direct formal strategic partnerships with a selected number of inland terminals. Instead, port authorities typically favor forms of indirect co-operation, for example through joint marketing and promotion, which are less binding and require less financial means.
- **Politicization of and local rationality.** Regionalization is in principle a market driven process, yet for the most part ports still rely on governments to do the necessary investments in basic infrastructures. As such the public sector plays a key role in shaping the side constraints for what market players can achieve in the area of regionalization. Port regionalization therefore often turns out to be a process very heavily influenced by political imperatives rather than by the 'invisible hand' of an efficient market. Local rationality of port authorities and governments is a major factor as well. Port expansion schemes of major gateway ports which are intended to serve an entire economic region, tend not to be decided at the regional level, but at the local (i.e. port, city, national) level. The local economic aspirations of officials and politicians at cityport level promote the belief that existing ports will continue to be optimal locations in the future, which in some cases may not be the case. Any regionalization strategy developed by a port authority or local government has the intention to improve the competitive position of the port, but this does not necessarily imply that the final configuration of the related load centre network provides the most optimal solution for serving the larger hinterland regions as a whole.

List of references

- Barke, M., 1986, Transport and trade (Oliver & Boyd, Edinburgh)
- Bird, J., 1980, Seaports and seaport terminals (London, Hutchinson University Library).
- Boile, M., Theofanis S., Golias M. and Mittal N. 2006, Empty Marine Container Management: Addressing Locally a Global Problem. TRB Annual Meeting, Washington, DC. Paper # 06-2147.
- Hayuth, Y., 1988, Rationalization and deconcentration of the US container port system, *The Professional Geographer*, 40 (3), 279-288
- Hayuth, Y., 1981, Containerization and the load center concept, *Economic Geography*, 57(2), 160-176
- Heaver, T., Meersman, H., Moglia, F., Van de Voorde, E., 2000, Do mergers and alliances influence European shipping and port competition?, *Maritime Policy and Management*, 27, 363-373.
- Kuby, M., Reid, N., 1992, Technological change and the concentration of the U.S. General Cargo Port System: 1970-1988, *Economic Geography*, 68(3), 272-289
- Lago, A., Malchow, M., Kanafani, A., 2001, An analysis of carriers' schedules and the impact on port selection, *Proceedings of the IAME 2001 conference, Hong Kong*, 123-137
- Martin, J. and Thomas, B.J., 2001, The container terminal community, *Maritime Policy and Management*, 28, 279-292.
- McCalla, R., 1999, From St. John's to Miami: containerisation at Eastern Seaboard ports, *GeoJournal*, 48, 21-28
- Notteboom, T., 1997, Concentration and load centre development in the European container port system, *Journal of Transport Geography*, 5 (2), 99-115
- Notteboom, T. and Winkelmanns, W, 2001, Structural changes in logistics: how do port authorities face the challenge ?, *Maritime Policy and Management*, 28, 71-89.
- Notteboom, T. 2002, Consolidation and contestability in the European container handling industry, *Maritime Policy and Management*, 29:257-269
- Notteboom, T., Rodrigue, J.-P. 2004, Inland Freight distribution and the sub-harborization of port terminals, *ICLSP2004, International Conference on Logistics Strategy for Ports, Dalian (China)*, 22-26 September 2004.
- Notteboom, T., Rodrigue, J.-P. 2005, Port Regionalization: Towards a New Phase in Port Development, *Maritime Policy and Management*, 32 (3), 297-313.
- Robinson, R., 1998, Asian hub/feeder nets: the dynamics of restructuring, *Maritime Policy and Management*, 25(1), 21-40.
- UNCTAD (2002-2005), *Review of Maritime Transport*, Geneva
- Van Klink, A., 1995, Towards the borderless mainport Rotterdam: an analysis of functional, spatial and administrative dynamics in port systems, *Tinbergen Institute Research Series*, no. 104
- Wang, J.J., 1998, A container load center with a developing hinterland: a case study of Hong Kong, *Journal of Transport Geography*, 6(3), 187-201

Yap, W.Y., Lam, J.S.L. and Notteboom, T. (2003), "Developments in container port competition in East-Asia", Proceedings of IAME 2003 Conference, International Association of Maritime Economists, Busan (South Korea), 715-735

Conclusions and Policy Recommendations

Related to the papers

*Challenges in the Maritime-Land Interface:
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And

*Challenges in the Maritime-Land Interface:
Port Hinterlands and Regionalization*

by

Jean-Paul Rodrigue and Theo Notteboom

In an era of globalization the maritime market environment is substantially changing. A basic driving force in this process consists of structural shifts in the economy, particularly regarding a shift from supply economy (carrier-based) to demand economy (shipper and trader-based). Network economies emerge by means of horizontal and vertical integrations and partnerships. The port industry is a dynamic one. Its dynamic character emanates from a constant aim at finding efficient ways to underline the ports' role as motors of economic development, particularly concerning sustainability.

The current issues port managers are facing are multiple and complex. The global market place, with powerful and relatively footloose players, extensive business networks and complex logistics systems creates a high degree of uncertainty in the port industry and leaves port managers puzzled with the question how to respond effectively to market dynamics. The focus of port competition is gradually changing, so are the roles of the various stakeholders involved. The consequences thereof are manifold and relate to strategic, administrative and operational activities.

In these two papers we have identified a number of challenges to port managers:

1. *Logistics chains are the relevant focus in port competition.* The vertical integration strategies of the market players have blurred the traditional division of tasks within the logistics chain and as such created an environment in which ports are increasingly competing within supply chains. This implies that improvements in terminal and landside operations are constantly required to guarantee that the savings at seaside are not lost on landside.
2. *Seaports are increasingly confronted with powerful port users* who possess a strong bargaining power vis-à-vis terminal operations and inland transport operations. In due course global terminal operators could represent a counterbalancing power in regard to the power of global mega-carrier combinations in liner shipping. The loyalty of a port client cannot be taken for granted. In this competitive environment, the ultimate success of a port is being more and more determined by the ability of the port community to fully exploit synergies with other transport nodes and other players within the logistics networks of which they are part.
3. *Seaports are natural habitats for logistics services.* The gateway position of major seaports offers opportunities for the development of value-added logistics (VAL). Seaports can act as central nodes driving the dynamics in large logistics poles. The creation of large logistics poles poses new challenges in the relations between seaports and inland ports.
4. *A new port hierarchy is emerging.* New liner service networks and larger ships force previously non-competing ports into head-on-head competition. This is particularly the case with the emergence of offshore hubs. New terminal facilities might give shipping lines and alliances more opportunities to use their bargaining power to play off one port against another. Dedicated terminals challenge the traditional rules as regards port competition and make it more difficult to keep port capacity (supply) and port traffic (demand) in balance in the framework of future cost intensive port expansion programs.
5. *Port hinterlands are being redefined* by changes in the logistics industry and the regionalization of port terminals. From a market area that used to be fairly secure with dedicated customers, port hinterlands have become more fragmented and competitive. This adds up to the uncertainty related to the selection of a port to be part of the port calls of maritime shippers' networks. Many ports are now pursuing aggressive inland strategies to gather market share.
6. *Containerization seems to have become a 'must' for ports,* as the provision of container facilities is considered to be one of the prerequisites for success in the newly logistics-restructured environment. Many container ports make significant investments without any degree of assurance that traffic will increase and shipping lines will retain their loyalty.

7. *A large part of the community takes the port and maritime industry for granted and is unaware of how the industry is organized and operated and to what extent it contributes to the global trade and local economies. Environmental and safety considerations are very prominent in community groups' strategy.*

The challenges described above invite to re-assess existing organization and management structures in seaports and port strategy:

- The traditional concept of a 'sea port' being a landlord or a total organization with single and/or multiple facilities in a single location is no longer straightforward. The modern port concept leads to a comprehensive organization taking care of multiple services across multiple locations. The introduction of the container and the concept of inter-modality revolutionized modern shipping as well as hinterland transportation so deeply, that there is definitely a need to re-assess the role and functions of (container) ports.
- The competitive position of a seaport is not depending solely upon its administrative structure. It is more a matter of commercial attitude and mentality. Port economics has indeed become more a matter of management style. Port management objectives nowadays are much more directed toward efficiency than to distributional equity. In theory port authorities operating in highly competitive markets follow modern more or less technocratic insights. In practice however, the commercialized and/or corporatized ports might find difficulties in avoiding politicization of the so-called technocratic port organizations, as they often rely on external political decisions, especially in case of government-funded port investments. Even full privatization schemes do not completely exclude the danger for politicization. Hence, the establishment of an appropriate legislative framework that guarantees an efficiency-oriented approach is one of the main challenges to port policy makers.
- Port authorities and terminal operators must play a vital role in the creation of core competencies and economies of scope by an active engagement in the development of port-related VAL activities, efficient information systems and an expanding inter-modality. The creation of port networking constitutes probably the most important new role for ports in the next millennium. Forming strategic alliances in the port sector itself could lead to secure the port own efforts and investments. The pressures port authorities and operators are facing are in fact the same as those faced by the shipping lines. However, most of the port and terminal activities are rather "location-bound", which is not at all the case for their customers, i.e. ship owners and shipping activities.
- Modern ports must be capable to accommodate larger port clients, who possess strong bargaining power vis-à-vis terminal and inland transport operators. As such ports must not expect to attract cargo simply because they are natural gateways to rich hinterlands. Major port clients concentrate their service packages not on the ports' sea-to-land interface but on the quality and reliability of the entire transport chain. Capturing and keeping important 'footloose' clients on a sustainable basis require services including plenty of qualitative market conditions such as reliability, flexibility, short time-to-market and large product varieties, as well as non-market conditions such as transparency within good (corporate) governance structures.
- Ports need to secure their basic investments. Given the present fierce port competition many ports are forced to make investment decisions of a rather speculative nature. Ports also need to deal with possible drawbacks of load centering, because the load centering strategy of shipping lines are creating major drawbacks for port authorities. On the one hand the fear for under-utilization of terminal facilities puts a strong downward pressure on the levels of port dues and container handling rates. On the other hand this downward pressure on market prices triggers an increase in the supply of terminal capacity. Gradually the port system will be confronted by diseconomies of scale under the form of lack of space for further expansion and/or congestion due to limited maritime or inland accessibility.

- Only by paying attention toward creating economies of scope the port industry will get and maintain a sustainable port competitive framework. Indeed, on the one side shipping lines demand consistently higher quality service at each port of call, whereas on the other side the constraints to growth of load centers encourage smaller ports to get carriers diverted from these load centers. Hence, port service providers on a global scale are wanted as well.
- Last but not least port operators should pay attention to broaden their social basis, e.g. by achieving a clear balance between the interests of the port (actors) and their principal 'stakeholders' (employees, trade unions, customers, environmental pressure groups, etc.). Stakeholder relation management today is to be considered as part of modern port administration. In other words port managers should elaborate on market situations and conditions both from a shareholder's and stakeholder's point of view. Increasingly one can ascertain that the success of the port no longer depends on its own performance, because other (f)actors and geo-political situations determine the port's final success. The extra-ordinary length of administrative and legal procedures for instance requires well-balanced time planning in order to get stakeholders' participation in port development processes secured and as such avoiding severe delays in port capacity (extensions).
- In relation to port development, governments should adopt the role of facilitator, e.g. via the harmonization of port working conditions, via incentives to stimulate accountability and autonomy of port authorities and via investment programs directed towards the provision of public goods. The efficiency-oriented market environment indeed brings about new challenges to seaports all over the world. The continuing process of consolidation in the cargo handling shifts competition from port authorities to private terminal operators and may lead to intra-port monopolies. The desirability of such monopolies are to be analyzed on a case by case basis, thereby taking into account the impact on port innovation and expansion schemes, the level of external competition, the value-added of possible port network strategies and the level of market contestability.
- The more international the maritime industry becomes, the more energy will have to be put in embedding ports in their local communities by means of following the rules of a sound customer and stakeholder relations management. This will influence positively both the port competitiveness and the creation of port specific competitive advantages. Relations management within ports implies a new approach vis-à-vis port competitiveness: once the basic resources of ports - such as land and water - are becoming scarcer while the social and environmental functions are permanently jeopardizing the economic functions of the seaport, port competition no longer depends solely upon market conditions. From that moment on also on non-market conditions – such as good relationships with government and community - are to be taken into account and by doing so this will create new specific competitive advantages. So, ports and port companies must demonstrate a high level of environmental performance in order to ensure community support. However, environmental aspects also play an increasing role in attracting trading partners and potential investors. A port with a strong environmental record and a high level of community support is likely to be favored.