

Chapter 49

Intermodal Terminals, Mega Ports and Mega Logistics

Jean-Paul Rodrigue

49.1 Introduction

Economic globalization has been accompanied by a growing spatial imprint of freight distribution on the landscape, particularly for intermodal terminals such as ports, airports and railyards, but also for logistical activities, namely distribution centers. Among economies that have relied on globalization to promote growth, China been the most eloquent example. It has relied extensively on major intermodal terminal projects, particularly ports (Rimmer & Comtois, 2009). All over the world, terminals and their surrounding areas face mounting pressures to accommodate large freight flows which are increasingly containerized. Containers are standard units that have been designed for simplicity and functionality which is reflected in the intermodal function of container terminals (Levinson, 2006). There is thus the setting of a “mega logistics” framework ensuring a continuous circulation of intermodal freight between clusters of production and major consumption markets. The reasons why intermodal terminals and ports in particular can be considered mega infrastructure projects involve three points:

1. They are heavy consumers of space since they require land for terminal operations, such as space for storing containers within a port terminal. No other single form of land use consumes such a large amount of space and this amount has increased substantially with containerization. They are large but functionally simple spaces.
2. Their construction and maintenance requires massive capital investment and a noticeable transformation of the landscape, particularly along the coastline with piers, docks and basins. For many ports, dredging is also a megaproject required to improve their accessibility to maritime shipping and maintain their operating conditions (siltation).

J.-P. Rodrigue (✉)
Department of Global Studies & Geography, Hofstra University, Hempstead, NY 11550, USA
e-mail: jean-paul.rodrigue@hofstra.edu

3. Their equipment is commonly massive in scale by its size and throughput, such as cranes and, most importantly, containerships. It is not uncommon to have an intermodal port terminal generating 1,000 to 5,000 truck movements per day. In the last decade, intermodal equipment has become even larger and capital intensive.

Yet, in spite of this impressive accumulation of infrastructure and space consumption for freight terminal activities, intermodal terminals remain an under-represented dimension of the geography of transportation. Mechanized freight transportation is a capital intensive activity that does not require much labor with the notable exception of trucking. Intermodal terminals, particularly, require little labor and thus the spaces they consume, in spite of being substantial, are not much part of the collective experience and spatial representation since very few individual ever see such locations. This underrepresentation can consequently be readily explained by the low labor intensiveness of terminals in spite of their intensiveness in traffic and added value activities. For instance, while the Newark Liberty international airport and the Port Newark Container Terminal are directly adjacent to one another and both are under the jurisdiction of the Port Authority of New York and New Jersey, few people have any familiarity with the container terminals which are larger than the airport site. While about 36 million passengers transited through the airport in 2008, only employees and truck drivers have access to the intermodal terminals.

In addition to the infrastructure and equipment required for intermodal operations, an ownership and management structure that reflects well the emergence of mega-terminals has been established. Like the industrial sector, the terminal operation business has seen a significant consolidation in the hands of a few global terminal operators. They maintain a global portfolio of terminal assets located at strategic gateways and intermediary locations. Thus, the global intermodal freight industry has become mega in its modes, terminals ownership and operations.

49.2 Major Drivers of Intermodal Terminal Development

49.2.1 Drivers of Growth

Intermodalism and its consumption of large amounts of space through mega terminal facilities is the outcome of two main driving forces. The first and most obvious is the growth in volume of containerized traffic which is correlated with terminal volume and the incentive to add to existing terminal capacity and develop new terminals when suitable. On par with traffic growth came an extension of the geographical scale at which flows were taking place. This involved additional terminal capacity and an array of intermediary locations such as intermediary hubs and inland terminals (Notteboom & Rodrigue, 2009). Thus, for a similar amount of traffic, a larger number of terminal facilities and distribution center are required

to handle transport sequences taking place over longer distances and with more inventory in transit. The second driving force concerns the functional specialization of terminals that has required a growing spatial separation of modal activities within the terminal itself with space allocated for ship, truck and rail intermodal operations. This specialization also required a substantial buffer (storage space) to synchronize the service sequence and the flow volumes of respective modes. Thus, within intermodal terminals larger amounts of space were required to ensure an interface between the different modes since each has its own capacity and temporal characteristics.

Containerized traffic growth requires particular attention. Global trade has grown both in absolute and relative terms, particularly after 1995 where global exports surged in the wake of rapid industrialization in developing countries, particularly China. The value of global exports first exceeded \$US 1 trillion in 1965, and by 2005 more than \$US 10.3 trillion of merchandise was exported. During the same period, the share of the world GDP accounted for exports almost doubled; from 7.6 to 14.7%. This trend was accompanied by a sharp growth in international containerized transportation (Fig. 49.1).

From the early 1990s to the early 21st century, containerized throughput has tripled to surpass 500 million TEU (Twenty-foot Equivalent Unit)¹ for the first time in 2008. This surge is concomitantly linked with the growth of international trade in addition to the adoption of containerization as the privileged vector for maritime shipping and inland transportation. This growth was on par with the growth of container traffic handled by the world’s largest ports (Fig. 49.2) which underlines the intricate relationship between export-oriented ports (e.g. Shanghai and Shenzhen),

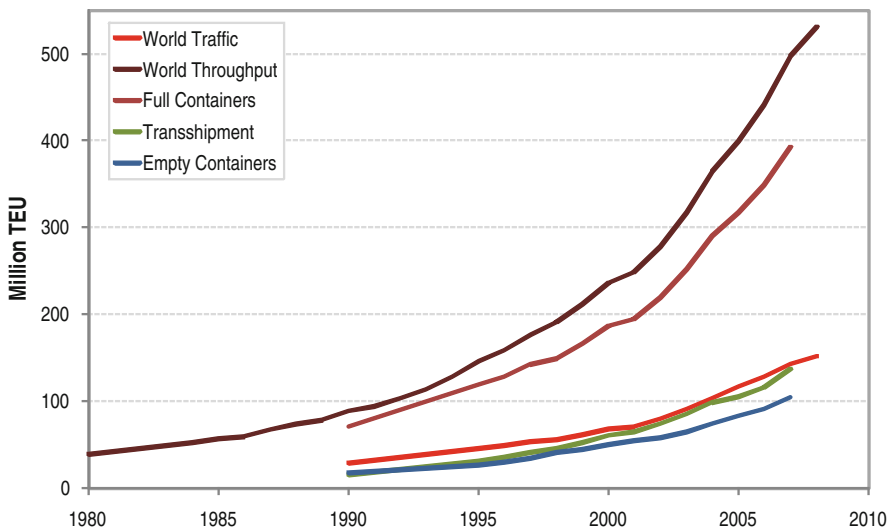


Fig. 49.1 World container traffic and throughput, 1980–2008. (Source: Drewry Shipping Consultants)

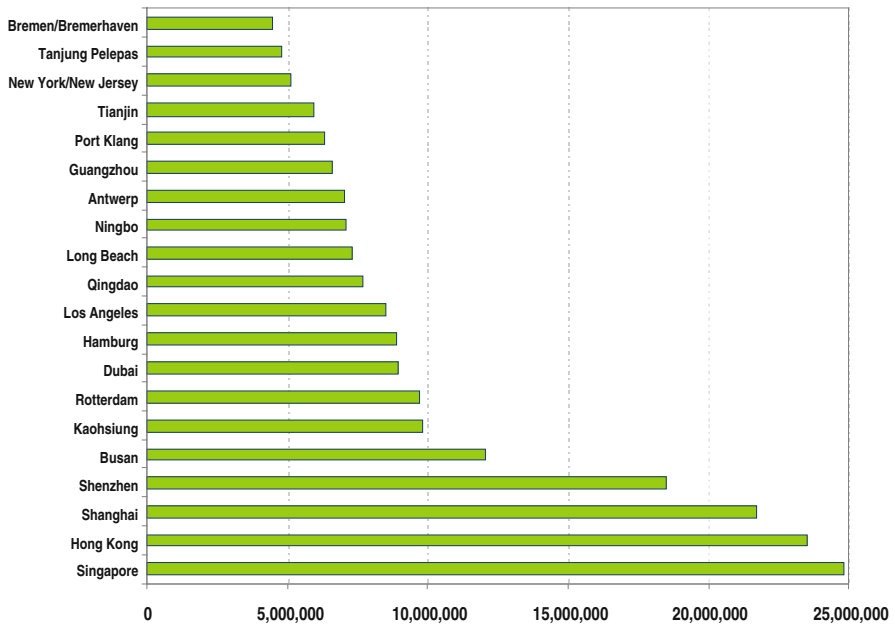


Fig. 49.2 Traffic handled by the world’s 20 largest container ports, 2007. (Source: Containerization International)

import-oriented ports (e.g. Los Angeles/Long Beach) and intermediary hubs (e.g. Singapore and Dubai).

Like their size, the ownership and operations of the major port terminal complexes is dominantly assumed by a limited number of global port operators. The top five handled about 50% of the global container throughput, underlining asset portfolios that span the globe. For instance, the Port of Singapore Authority (PSA) has several terminals in Singapore as its main assets, but also operates terminals in other major ports such as Antwerp and Busan. The Singapore/Tanjung Pelepas cluster (mainly owned by the A.P. Moeller–APM–group which is a subsidiary of Maersk, the world’s largest maritime shipper) is the world’s major hub with about 90% of its traffic being transshipped between different shipping routes. The Chinese operator Hutchison Port Holdings (HPH) has a solid asset base in Hong Kong and has expanded along the Chinese coast (e.g. Shanghai), in Europe and Latin America. Incidentally, the Hong Kong/Shenzhen cluster is the world’s largest gateway system with a container traffic volume that dwarfs any other region. In comparison with Singapore the same mega facilities thus perform completely different functions. Dubai Ports World (DPW) is also a major player with a portfolio that began in the Middle East and expanded in South Asia, Europe and Latin America. Put together, APM, DPW, HPH and PSA have stakes in 181 container terminals around the world accounting for 11,350 ha (28,045 acres; 113.5 km²; 43.5 mi²) of land.

49.2.2 The Need for Storage Space

A feature of most intermodal freight activity is the need for storage, which requires a significant amount of space, most of which as simple paved areas where containers can be stacked and retrieved with a set of cranes, straddlers and holsters. Assembling bundles of goods to be loaded into containers may be time-consuming and thus some warehousing space may be required. Containerization, because of its large volumes, has forced a significant modal and temporal separation at terminals as well as a variety of transloading activities in the vicinity of terminals. Intermodal terminals are thus much more space intensive than conventional freight terminals.

Due to congestion, capacity, and availability of inland transportation, containerization contributed to a significant buffer in the form of large stockage areas (Notteboom & Rodrigue, 2009). Each transport mode received a specific area on the terminal, so that operations on vessels, barges, trucks and trains could not obstruct one another. Each transport mode follows its own time schedule and operational throughput. Since rail, road or barge modes have completely different operational characteristics, namely capacity and sequence, a large buffer is required within the terminal's facilities. Under the indirect transshipment system, the terminal stacking area functions as a buffer and temporary storage area between the deep sea operations and the land transport operations that take place later in the process. As a consequence, and in spite of higher turnover levels, the space consumed by container terminals increased substantially. In turn, these space requirements changed the geography of ports and the migration of terminals to new peripheral sites where such space was available.

Europa Terminal, a facility of 72 ha (178 acres) in the port of Antwerp, is managed by the terminal operator PSA and is only one of the seven major container terminal complexes within the port. It is a good example of the modal separation in space that characterizes modern container terminals and the large handhold required for various container terminal operations (Fig. 49.3). While terminal space reserved for rail and truck operations are directly adjacent to the buffer (container storage) of deep sea services, locational constraints have placed the barge terminal in a nearby location behind the locks linking the port's basin (upper part) to the river Scheldt (lower part).

The synchronization between elements of the intermodal terminal varies according to the geographical setting and its related inbound or outbound logistics. For instance, the export-oriented manufacturing clusters of China are adjacent to major port terminal facilities and the bulk of containerized exports arrive by truck. The assembly of container shipping loads for exports brought in by trucks thus requires a large amount of terminal storage space. In North America, many port terminals have access to double-stack rail corridors with inland terminals enabling a higher turnover volume that proportionally reduces pressures on port terminal facilities to relocate them inland where land is much less scarce. A similar situation applies to Western Europe, but with barge services linking main gateways to inland terminals in addition to single stack rail services.



Fig. 49.3 Europa container terminal, port of Antwerp. (Source: Notteboom & Rodrigue, 2009)

49.3 Intermodal Terminal Facilities

49.3.1 Container Port Terminals

The container port terminal is the intermodal facility that has the most substantial spatial imprint since it consumes large amounts of waterfront real estate, which is always scarce. It also requires intensive connections to the inland transport system through rail and road infrastructures.

Figure 49.4 depicts the standard configuration of a large port container terminal and is a synthesis of the Port Elizabeth container terminal, one of the four main container terminal complexes within the Port Authority of New York and New Jersey (operated by APM) and one of the first container terminals to be built in the 1950s. A port container terminal occupies a substantial area, mainly because of storage requirements, even if this storage is short term. The main elements are:

Docking area. Represents a berth where a containership can dock and have technical specifications such as length and draft. A standard post-panamax² containership requires about 325 m (99 ft) of docking space as well as a draft of about 13 m (45 ft). Some terminals have separate facilities for handling barges, although most barges are handled alongside the deep sea quays.

Container crane (Portainer). Represents the interface between the containership and the dock and commonly the most visible structures of a port terminal (Fig. 49.5). Cranes have technical specifications in terms of number of movements per hour, maximum weight, and lateral coverage. A modern container crane can have a 18–20 wide coverage, implying that it can service a



Fig. 49.4 Port container terminal facility. (Source: Author)

containership having a width of 18–20 containers. A gantry crane can perform about two movements (loading or unloading) per minute. The larger the number of cranes assigned to the transshipment process the faster it can take place. However, significant portside capabilities must be present to accommodate this throughput.

Loading/unloading area. Directly adjacent to the piers and under the gantry cranes, it is the zone of interaction between the cranes and the storage areas where containers are either brought in to be lifted on the containership or unloaded to be immediately picked up and brought to storage areas. This is mainly done with straddlers or holsters. In the case of straddlers, the containers are left on the ground while with holsters the containers are loaded from or unloaded to a chassis.

Container storage. Represents a temporary buffer zone where containers are left while the assigned containership is available to be loaded or while picked up for inland distribution. It is the component that consumes the largest amount of space. The larger the containerships handled by a port, the larger the required container storage area. Container storage can be arranged by shipbound (export) and landbound (import) stacks of containers. Stacks are



Fig. 49.5 Panamax containership, port of Le Havre. (Source: Author)

commonly up to three containers in height which is the maximum for loaded containers and also enables straddlers to operate on top of them. Specific storage areas are also attributed to empties, which can be stacked up to 7 or 8 containers in height. Stacking areas tend to be linear since an overhead gantry crane is circulating over a row of containers.

Gate. This is the terminal's entry and exit point and is able to handle in many cases up to 25 trucks at once. This is where the truck driver presents proper documentation (bill of lading) for pick up or delivery. Most of the inspection is done remotely with cameras and intercom systems where an operator can remotely see for instance the container number of an existing truck and verify if it corresponds to the bill of lading. For a delivery, the truck is assigned to a specific slot at the truck loading or unloading area where the chassis holding the container will be left to be picked up by a holster or a straddler. For a pick up, the truck will be assigned to a slot in a waiting area while the container is being picked up from a storage area, put on a chassis (if the truck does not bring its own chassis) and brought to the proper slot. The truck will then head out of the terminal, be inspected to ensure that the right container has been picked up, and head inland. If well managed, the container will already be available for pick up (on a chassis in the truck loading/unloading area). However, delays for pick up can sometimes be considerable (hours) when a large containership has just delivered a significant batch of containers and there is a "rush" to be the first to pick them up.

Chassis storage. Area where empty chassis are stored while waiting to be allocated to a truck or a holster. These areas can also be outside the terminal

facilities. In inland freight distribution, there are on average three chassis available per container.

Administration. The management facility of the terminal, often having a control tower to insure a level of visibility of the whole terminal area. This is where many complex logistical functions are performed such as the assignment of delivered containers to a storage space location as well as the location and the loading or unloading sequence of containers by straddlers and holsters. Additionally, the complex task of designing the loading and unloading sequence of a containership is performed.

On dock rail terminal. Many large container terminals have an adjacent rail terminal to which they are directly connected. This enables the composition of large containerized unit trains to reach long distance inland markets.

Repair/maintenance. Area where regular maintenance activities of the terminal's heavy equipment is performed.

A sample of more than 296 container terminals reveals that the median size is around 30 hectares while the median depth is around 14 m (4.27 ft) (Fig. 49.6), enabling the average terminal to handle a post-panamax containership of 5,000 or 6,000 TEU. However, there is also a prevalence of mega-terminal facilities above the 80 ha (197 acre) threshold that act as major hubs for terminal operators and maritime shipping companies. 36 facilities were found to have more than 120 ha (296 acres). In addition to the impressive land consumption at the port terminal itself, nearby areas tend to have a high concentration of activities linked to freight distribution such as distribution centers, empty container storage depots, trucking companies and large retailers. All of these activities amount to a substantial land take among the world's most valuable locations.

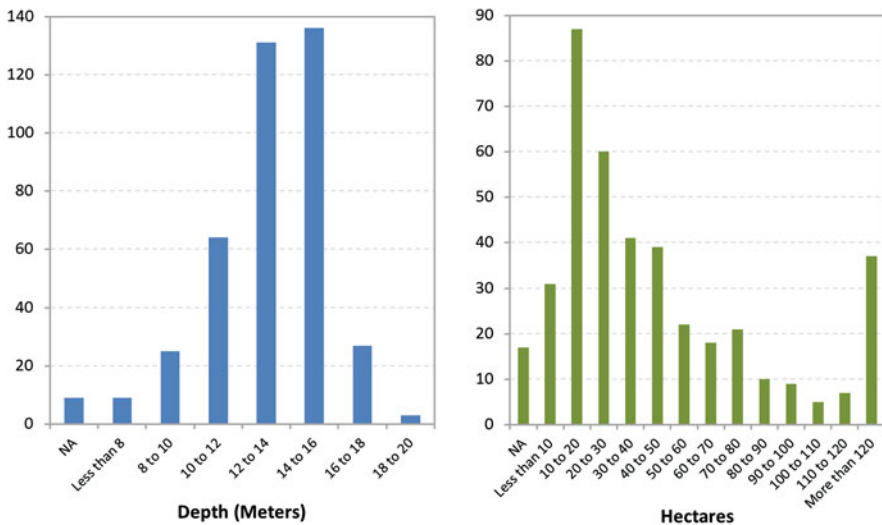


Fig. 49.6 Depth and surface distribution of a sample of container port terminals ($N = 296$). (Source: Author)

49.3.2 Intermodal Rail Terminals

An intermodal rail container terminal is commonly composed of the following elements (Fig. 49.7), each performing a specific function:

Intermodal yard. The core of the terminal where unit trains are loaded and unloaded by cranes (or lifts). In North America, they can be more than 2 km (1.2 mi) in length due to the large size of container unit trains (100 cars) while in other parts of the world they are much shorter. In many cases, unit trains are broken down in two parts in the yard, which leaves a midway corridor for the circulation of chassis within the yard (otherwise movements between the storage area and unit trains would be much longer). Containers are brought trackside or to the storage area by hostlers. While older generations of intermodal yards (or those with small volume) worked on a one-to-one basis (one trackside space available for loading or unloading for each car), new intermodal yards tend to operate on a two-to-one basis (one trackside space for loading and one trackside space for unloading).

Storage area. Acts as a buffer between the road system and the intermodal yard. It often covers an area similar in size than the intermodal yard as modern rail intermodal yards are heavy consumers of space. Unlike a maritime terminal, it is uncommon that containers will be stacked. They are simply left stored on a chassis, waiting to be picked up for delivery or brought trackside. To optimize truck pickup and delivery, chassis are parked at about a 60° angle so they can be stored closer to another.

Classification yard. Can be present if the terminal has been upgraded from a regular freight to a container terminal, but for most modern intermodal rail terminals the classification yard will be absent. Its function is mainly related to the assembly and break down of freight trains. This is necessary because each rail car can be bound to a different destination and can be shunted on

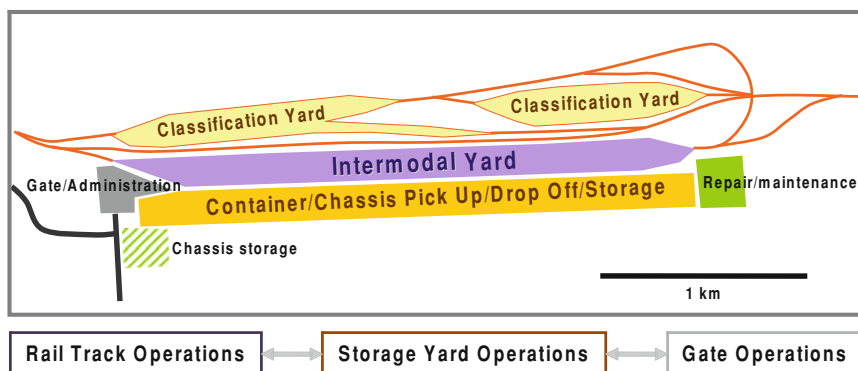


Fig. 49.7 Intermodal rail facility. (Source: Author)

several occasions. This assignment mainly takes place at the origin, destination or at an intermediary location (such as Chicago or North Platte). Classification yards are often operated independently from the intermodal yard.

Gate, chassis storage and repair/maintenance. Perform a similar function to that of the maritime terminal.

49.3.3 Freight Distribution Clusters

Another fundamental and often neglected component of the terminal space is the distribution center, which has seen several technological changes impacting their location, design and operation (Hesse, 2008). From a locational standpoint, distribution centers mainly rely on trucking, implying a preference for suburban locations with good road accessibility and land availability. They have become one-storey facilities designed more for throughput than for warehousing with specialized loading and unloading bays and sorting equipment. The growth in freight volumes has been proportional with the growth of the size and the number of distribution centers. Another tendency has been the setting of large freight distribution clusters where an array of distribution activities agglomerate to take advantage of shared infrastructures and accessibility. If coupled with a rail or a barge terminal, they take the form of an inland port logistically linked with port terminal facilities.

49.4 Economies of Scale in Transport Modes and Terminals

49.4.1 Distortions in Scale Relationships

The principle of economies of scale has served transportation well with, for instance, larger containerships and larger port facilities. However, this is not without causing intense pressures on locations to handle the modes and flows of global trade. In general terms, there is a relationship between the size of a port and the size of the metropolitan area where it is located, particularly for coastal cities having good port sites. Conventionally, because of high inland transport costs, city size and port size tended to converge. Maritime activities were a direct driver of urban growth. Containerization has however changed this relationship by supporting the establishment of much larger port terminals and by expanding hinterland access. This change permitted a higher level of possible divergence between the level of port activity and city size. Intermediate hubs are the most notable example of such a process since little, if any traffic, is bound to the hinterland. The port size can thus be completely unrelated with city size. The setting of gateways also contributes to the divergence between port size and city size since they service vast hinterlands. For instance, European gateways, such as Antwerp and Rotterdam, are salient examples of medium sized cities where the port area is larger than the metropolitan area.

The rationale of maritime container shipping companies to have larger ships becomes obvious when the benefits, in terms of lower costs per TEU, increase

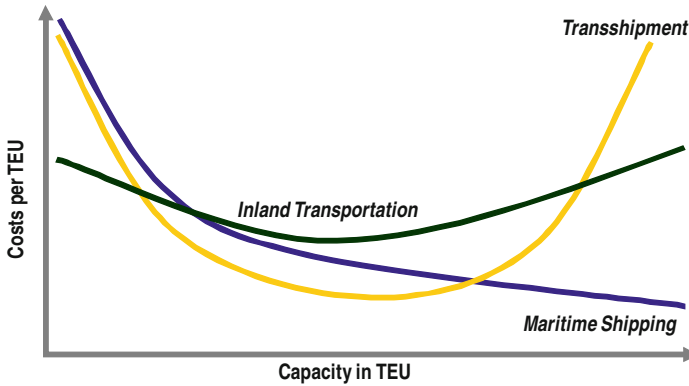


Fig. 49.8 Economies and diseconomies of scale in container shipping. (Source: Author)

with the capacity of ships. There is thus a powerful trend to increase the size of ships, but this may lead to diseconomies in other components of container shipping (Fig. 49.8). This is particularly the case for transshipment, notably at port terminals. The growth in capacity comes with increasing problems to cope with large amounts of containers to be transhipped over short periods of time as shipping companies want to reduce their port time as much as possible. Larger cranes and larger quantities of land for container operations, namely temporary warehousing, may become prohibitive, triggering diseconomies of scale to be assumed by port authorities and terminal operators. The same principle applies to inland transportation where congestion, such as more trucks converging towards terminal gates, leads to diseconomies. Because of technical innovations and functional changes in inland transportation, such as using rail instead of trucking to move containers from or to terminals, it is unclear what is the effective capacity beyond which diseconomies of scale are achieved.

49.4.2 Economies of Scale in Containerships

The evolution of containerization, as indicated by the size of the largest available containership, has been a stepwise process leading to significantly larger ships (Fig. 49.9). Changes are rather sudden and correspond to the introduction of a new class of containership by a shipping company (Maersk Line tended to be the main early mover), quickly followed by others. The major ship classes include L “Lica” Class (1981; 3,430 TEU), R “Regina” Class (1996; 6,000 TEU), S “Sovereign” Class (1997; 8,000 TEU), and E “Emma” Class (2006; 12,500 TEU). A new class generally takes the name of the first ship introduced with the new capacity. The world’s main containership yards are in South Korea, Japan, China, and Denmark, but most containerships are registered in Panama and Liberia, or other flag of convenience countries to take advantage of less stringent regulations, notably concerning

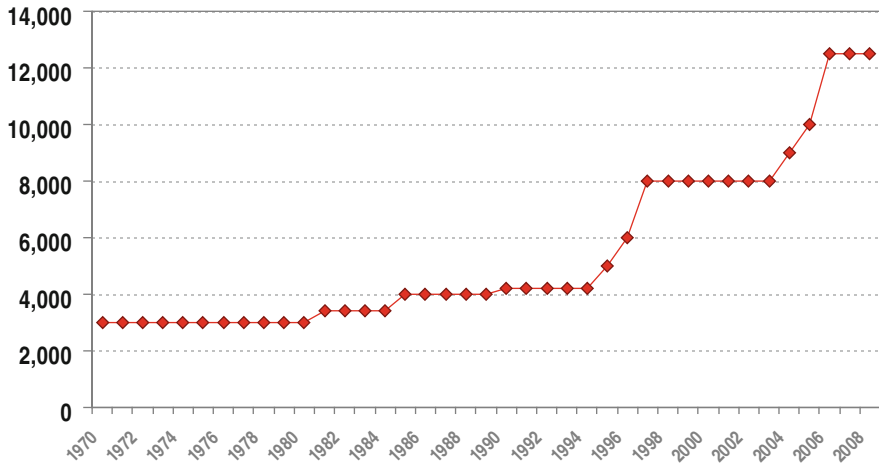


Fig. 49.9 The largest available containership, 1970–2008 (in TEUs). (Source: Notteboom & Rodrigue, 2009)

labor. There are some variations concerning how many containers can be carried by a containership depending on the method of calculation. For instance, for the Emma class, a ship could carry about 15,000 TEUs of containers if they were all empty, which represents all the available container slots. If all the carried containers were loaded with an average load of 14 tons per container, then about 11,000 TEUs could be carried (25% less). The official capacity figure used is 12,500 TEUs, which considers that containerships carry a mix of loaded and empty containers, but containerships are able to carry slightly more. Thus, container capacity figures should be treated with some caution as they are dependent on the cargo mix.

Since the 1990s, two substantial steps have taken place. The first involved a jump from 4,000 to 8,000 TEUs, effectively moving beyond the panamax threshold. This threshold is particularly important as it indicates the physical capacity of the Panama Canal and thus has for long been an important operational limitation in maritime shipping. The second step took place in the early 2000s to reach the 13,000–14,000 TEU level. This is essentially a suezmax³ level, or a “new panamax” class when the extended Panama Canal is expected to come online in 2014. From a maritime shipper’s perspective, using larger containerships is a straightforward process as it conveys economies of scale and thus lowers costs per TEU carried. From a port terminal perspective, this places intense pressures in terms of infrastructure investments, namely portainers. Thus, the matter of scale is bringing forward a paradox as the more economies of scale are applied to maritime shipping, the lower the number of ports able to handle such ships.

Containership speeds have peaked to an average of 20–25 knots and it is unlikely that speeds will increase due to energy consumption. Although economies of scale would favor the construction of larger containerships, there are operational limitations to deploy ships bigger than 8,000 TEU. Containerships in the range of 5,500–6,500 TEU appear to be the most flexible in terms of number of port calls

since larger ships would require less calls and thus be less convenient to service specific markets.

49.4.3 Economies of Scale at Terminals

With the growth of traffic and economies of scale applied to maritime shipping, port terminals are facing pressures to improve their productivity and efficiency. A standard container port accommodating panamax and post-panamax containerships has a set of technical characteristics related to berthing depth, stacking density, crane productivity, dwell time, truck turnaround time, and accessibility to rail services. A new generation of container port terminals is gradually coming online with significant improvements (Table 49.1). This change brings with it new infrastructures, equipment and procedures. It is also a matter of competitiveness, both on the maritime and inland sides since port terminals are competing with other port terminals to service continental hinterlands.

In recent years the trend has thus been straightforward with the setting of larger container terminals facilities and port expansion. In some cases, the outcome has been the setting of megacontainer port terminal facilities with impressive engineering projects. Among the three most notable are:

1. *Maasvlakte II (Rotterdam)*. For decades, the port of Rotterdam, Europe's largest port, has expanded downstream. The growth of container traffic along with continued expansion of bulk traffic caused the port to consider expansion out in the North Sea. This led to the construction of an entirely new facility on reclaimed land at Maasvlakte in the 1980s. However, subsequent traffic growth in the 1990s resulted in the port authority proposing a new facility further out in the North Sea: Maasvlakte II. The project began construction in 2008 and should be open for traffic in 2010 and fully completed by 2030. Once completed, this terminal facility would likely mark the end of geographical expansion capacity for Rotterdam, outside the reconversion of existing terminal sites into more productive uses.

Table 49.1 Technical changes in container port terminals

	Standard container port	Emerging paradigm
Berthing depth	12–15 m (40–50 ft)	More than 15 m (50 ft)
Stacking density	1,000–1,200 TEUs per ha	2,000–4,000 TEUs per ha
Ship-to-shore gantry crane (portainer) productivity	About 30 movements per hour	About 50 movements per hour
Dwell time at container yard	About 6 days	About 3 days
Truck turnaround time	About 60 min	About 30 min
Rail access	In port area	On dock

Source: Ircha (2006)

2. *Deurganck dock (Antwerp)*. Like Rotterdam, the expansion options of the port of Antwerp are limited. With the right bank of the River Scheldt, where the bulk of the port's facilities are located, reaching capacity a new dock complex was built on the left bank. The Deurganck dock opened in 2005 and can add about 9 million TEUs to the existing capacity of about 10 million TEUs.
3. *Yangshan container port (Shanghai)*. A rare case where a completely new facility has been built from scratch, and this well outside the existing port facilities in the Changjiang delta to a facility located in Hangzhou Bay, 35 km (21.7 mi) offshore. It opened in 2005 and was built for two purposes. The first was to overcome the physical limitations of the existing port facilities, too shallow to accommodate the latest generation of containerships. The second was to provide additional capacity to meet traffic growth expectations as well as room for new terminal facilities if container growth endures. To link the port to the mainland, the world's third longest bridge was built with 32.5 km (20.1 mi) in length. Thus, one mega project, the port terminal, required the construction of another mega project, the bridge.

Still, there are doubts that this process of building mega port terminal facilities will continue. Many recent projects indicate almost extreme measures requiring large capital investments and based on expectations of substantial traffic growth. This can only take place at major gateway locations that have demonstrated enduring freight traffic. Still, new terminal sites are often challenging from an engineering standpoint and rife with environmental controversy.

49.5 Conclusion: Mega Port Terminals or Mega Terminal Clusters?

The growth of global trade and transportation has created a mega-geography for freight distribution, particularly for the modes and terminals used in containerized freight movements with notable impacts on the landscape. The principle of economies of scale has resulted in impressive high capacity engineering achievements that could not be economically justified without the high trade volumes associated with global freight distribution. The last decade has seen the emergence of mega containerships handling more than 10,000 TEUs and the world's 50 largest container ports having jointly handled more than 326 million TEUs in 2007 alone. The smallest port of that group handled well above 2 million TEUs, while the world largest port facility, Singapore, handled close to 28 million TEUs.

However, because of the ownership structure and the operations of the shipping industry, mega terminals have their limitations. A too large single facility would represent an undue risk of capital investment as they can take a long time to amortize and reach profitable traffic levels. It is thus more likely that the existing model aiming towards clusters of terminals owned by different operators within the same port or in ports in proximity will endure as it conveys flexibility and competitive pressures within port facilities.

In many ways, economies of scale have been less constraining for maritime shipping. Mega containerships, since they are mobile transport platforms, represent a lower risk as they can be repositioned in light of commercial changes. Still, it is on the land side that their limitations are being felt as their accommodation requires substantial transshipment and inland distribution capabilities. This begs to wonder if economies of scale have reached an optimum or if there is still potential to handle larger batches of freight both on the maritime and inland sides.

Notes

1. A standard measure of container volume handled based upon the common container of 20 foot in length. Most containers are now 40 foot in length and thus account for 2 TEU.
2. Panamax refers to the maximum dimension of a ship that can be fitted in the Panama Canal, which is about 294 m (965 ft) in length and 32 m (105 ft) in width.
3. The largest ship size that can be handled by the Suez Canal, about 16 m (52.5 ft) of draft and with no specific length and width restrictions since the canal has no locks.

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