

Functions and Actors of Inland Ports: European and North American Dynamics

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Abstract

The emergence of inland ports took place in several regions around the world, notably where the growth of inland freight distribution required a massification of flows. Yet, there is no definitive consensus about how such inland facilities should be labeled, with terms such as dry ports being advocated. It is suggested in the paper that the term inland port is a more appropriate construct since it considers terminal activities as well as the crucial logistics activities taking place in co-location or in proximity of inland terminals. This perspective requires the investigation of how transport and supply chain functions and the various actors involved in their setting and operations are taking shape in inland ports. Case studies pertaining to European and North American inland ports are presented. Although inland ports are planned, set and operated by a wide variety of actors, ranging from public to private interests, transport and supply chain functions tend to label them as satellite terminals, load centers or transmodal centers.

Keywords: Containerization, Freight distribution, Inland Ports (Terminals), Europe, North America.

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1. Inland Ports: Towards a Taxonomy

Ports, Terminals, Platforms? A Problem of Definition

The role and function of inland ports has been the object of some confusion since there is no specific consensus, even concerning the definition of the term itself. Although inland freight distribution has been taking place since the industrial revolution, developments in intermodal transportation since the 1970s favored the setting of inland terminals performing functions that are synchronized with global supply chains (Hayuth, 1980, 1982). As intermodalism was dominantly taking place at ports and over maritime shipping, inertia induced to consider the development of inland freight activities from a maritime standpoint. For instance, the term “dry port” is often used to refer to a terminal where various cargo handling and added value activities are performed, connected to a seaport with either rail or barge services (Roso et al. 2009; Wiegmans et al., 1999). The term dry port is also subject to contention as “dry” appears to exclude inland terminals serviced by barges. Further, it has been argued that coastal terminals solely serviced by feeder services can functionally be an “inland terminal” as far as the hubs they are connected to are concerned (Rodrigue and Notteboom, 2010). A wide variety of scales is also observed as some inland ports are just simple terminals while others are complex entities that include logistics zones and a governance structure, such as a port authority.

There are also some variations of the terms used based upon geography and semantics. For instance, in France, the term “port avancé” is increasingly used by port authorities to label inland terminals performing functions that conventionally were not found inland. A major reason behind this multiplicity of terms is that inland ports have emerged in a variety of *geographical settings*, are servicing a variety of *functions* and involve a variety of *actors*. Thus, it is not surprising that representations and approaches differ. First, are we dealing with inland ports, inland terminals or platforms? Are these terms interchangeable? It is suggested that the term inland port appears a more accurate construct to reflect facilities of different sizes, function and ownership, some having a close relation with port terminals as they can be the outcome of port authorities or global terminal operators establishing an inland facility. It is argued that three main criteria are fundamental in the definition of inland ports:

- **Containerization.** An inland port is dominantly linked with the handling of containers, both maritime and domestic, but other intermodal activities, such as swapbodies also play a role. This involves an array of added value activities such as consolidation, deconsolidation, transloading or light manufacturing.
- **Dedicated link.** An inland port must be linked with a port terminal with a high capacity corridor. Although truck shuttle services can be used, rail or barge dedicated links are the best options.

- **Massification.** An inland port must permit economies of scale in inland distribution by being able to handle larger volumes at a lower unit cost. Otherwise, direct services from the maritime terminal are a better option. A dedicated link and massification are mutually reinforcing.

Since a port is considered a complex interfacing two systems of circulation (inland and maritime), mainly through terminals, an inland port performs a similar task, but within an inland system of circulation. However, a fundamental difference remains; while a port is an obligatory node for the maritime / land interface, albeit with some level of inter-port competition, the inland port is only an option for inland freight distribution that is more suitable as long as a set of favorable commercial conditions are maintained. For instance, a satellite terminal (an inland terminal often in proximity to a maritime terminal) is a suitable option when the port facilities are congested, enabling several less added value tasks, namely storing empty containers, to be relocated inland (Slack, 1999). However, if for any reasons, such as a decline in traffic, maritime terminal expansion or new high performance terminal infrastructures, the port terminal can recapture the activities performed at the satellite terminal, which becomes a much less desirable option. The term platform has also some appeal as it encompasses various other logistics and freight distribution functions that are commonly present in proximity of inland ports, particularly those larger in size. Still, inland port and inland platform can be considered as interchangeable terms. As inland port is the simplest common denominator that can capture various geographies, actors and functions, it is suggested that the term remains the most suitable.

In light of the above, it is argued that assessing a definition appropriately capturing the inland port concept resides in accounting for the functions as well as the various actors involved in their setting and operation. While some inland ports are dominantly private and linked with supply chains quite unrelated to the regions they are set in (such as those implemented by terminal operators), others are the outcome of public initiatives with the goal to anchor and develop freight distribution within regional economies. Some are strongly commercial as they finance their operations through the revenue they generate while others are heavily subsidized, particularly for infrastructure provision. In some cases inland ports can be highly dedicated to a specific metropolitan area or even to a single customer. Additionally, actors have various relations, particularly if public and private interests are at stake, implying different possible outcomes that can service the functions related to an inland port. A particularly relevant development that has placed inland ports within the agenda has been several public and private actors capturing the term as a symbol (sometimes even as a “buzz word”) helping articulate their strategies and the expectation to capture added value activities. Many inland intermodal centers have thus been labeled as inland ports, a simple process that should not be underestimated, even if they are established to suit rather unique functional and operational realities for freight distribution.

Inland Ports within the Intermodal Development Framework

The development of inland ports is part of a trend involving a closer integration between maritime and inland freight transport systems, a process that has been labeled as port

regionalization (Notteboom and Rodrigue, 2005). This trend has been favored by technology, commercial interests and public policy. Containerization and supply chain management are powerful vectors where the integration of transport chains has made inland ports an element helping to reconcile the massification of maritime transportation and the atomization of inland distribution, particularly in light of congestion nearby port terminal facilities, limited land for terminal expansion and various environmental pressures (Rodrigue and Notteboom, 2009; Pettit and Beresford, 2009). Actors in the commercial sector, particularly maritime terminal operators, shipping companies, global logistics service providers and even real estate promoters have been active at exploring and developing inland freight distribution options (Notteboom and Rodrigue, 2010; Debrue and Gouvelal, 2006; Gouvelal and Daydou, 2005). Additionally, public actors have recognized this trend and began to articulate the development of inland ports within their planning frameworks. Thus, in recent years, there has been a remarkable convergence of interests favoring the setting of inland ports within public policy and commercial strategies, such as those of maritime shipping companies (Verhoeven, 2009; Fremont, 2009). In particular, port authorities are becoming increasingly aware and proactive in the coordination of freight distribution activities within their hinterland (Van Der Horst and De Langen, 2008).

Like intermodal transportation, inland ports also fit within development cycles where various actors intervene for their siting, design, establishment, expansion, maturity and even to mitigate their eventual decline (Leitner and Harrison, 2001). Another dimension of this cyclic behavior concerns competition as a successful commercial idea often leads to many imitators and attempts at differentiation. Since inland ports are an option for inland freight distribution, commercial changes and competition from other inland ports can substantially change their business model and push them up the business cycle into maturity (stabilization of traffic), decline or obsolescence. The market they service, the functions they perform and the actors involved will go a long way in anchoring the commercial viability of an inland port. Yet, as a hinterland becomes the object of increased competition, the commercial viability of several inland ports can be questioned. While the market can quickly clear an excess in supply by putting several producers out of business, terminals are another matter since many have various forms of subsidies (e.g. land, taxation regime, etc.), which can be highly contentious if a rationalization was to take place. More so, if some inland ports were developed to accommodate capacity restrictions at port terminals, significant improvements in the capacity of the port terminals may change the commercial viability of the inland port as they could recapture the functions they lost to inland ports.

The paper will thus explore how the transport and supply chain functions and the various actors involved in their setting and operations are filtered and materialized in inland ports. Through these lenses and an analysis of case studies related to Europe and North America it is expected that a more revealing taxonomy can be established. Can this taxonomy be revealed by the functions, the actors involved or both?

2. Functions: Insertion within Regions and Supply Chains

A Three Tier System

Inland ports are fitting with a regional economic geography by linking a region to global supply chains. Over this issue, Wakeman (2008) uses a three tier system to represent the functional relations between an intermodal terminal and its hinterland (region), particularly within a port authority. This construct can readily be applied to inland ports with the first tier representing the terminal itself, notably in terms of volume, capacity and performance, the second tier the logistics activities related to the inland terminal, often in co-location, and the third tier represented by an array of retailing and manufacturing activities which inputs or outputs are handled or managed by the logistics activities of the second tier (Fig. 1).

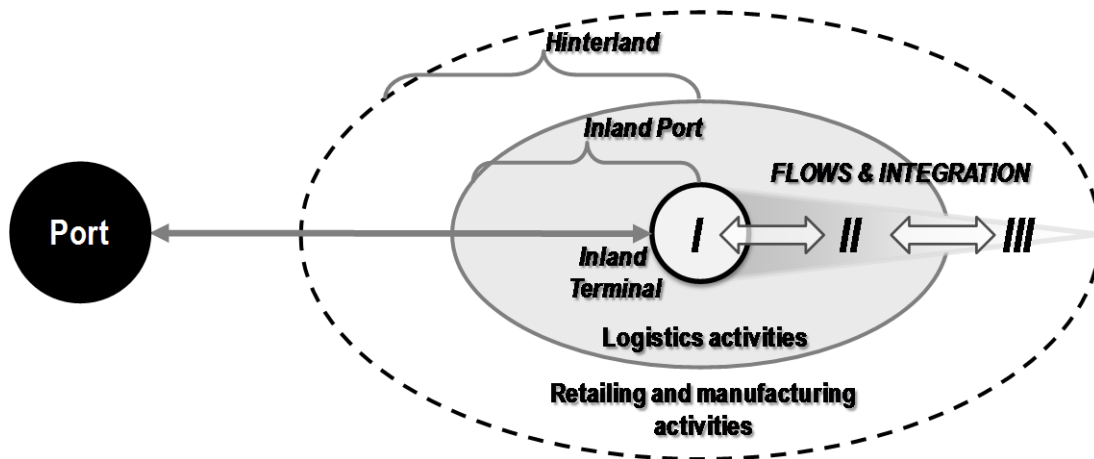


Figure 1 Functional Relations between Inland Ports and their Hinterland

In this framework an inland port is composed of an inland terminal and the nearby or co-located logistics activities that are in functional relation with it. As such, the hinterland is the summation of all the flows of the three tiers. Although the hinterland portrayed on Figure 1 is continuous, it can be discontinuous as well; particularly if an inland port is a node within a global supply chain.

Transport functions (Tier 1)

From a transport standpoint inland ports fulfill three major functions for the containerized loads bound to or coming from the hinterland (Figure 2):

- **Satellite terminal.** A facility located in relative proximity to a port terminal and which mainly serves to accommodate additional traffic and functions that are of lower added value, such as a container depot. It can be seen as an inland extension of the maritime terminal helping mitigate real estate pressures, the main reason why it is considered as an “inland” port. Although a satellite terminal can be serviced by truck shuttles and drayage operations, short line rail and barge services of less than about 200 km are a common option. A satellite terminal also offers the opportunity to perform transloading activities (changes in the load unit) for inbound or outbound maritime shipments, underlining its intermediary function for inland freight distribution.

- **Load center.** An intermodal rail or barge terminal enabling access from a port terminal to a regional production and consumption market. This is the most common transport function of an inland terminal where massified containerized loads carried along corridors are composed or decomposed. As such, the inland terminal confers a centrality within inland freight distribution systems.
- **Transmodal center.** A more marginal transport function where an inland port links large systems of freight circulation either through the same mode (e.g. rail to rail) or through intermodalism (rail to truck). The freight is bound to another hinterland, but added value functions can be performed. Such an inland terminal acts as an intermediary location linking inland freight distribution systems.

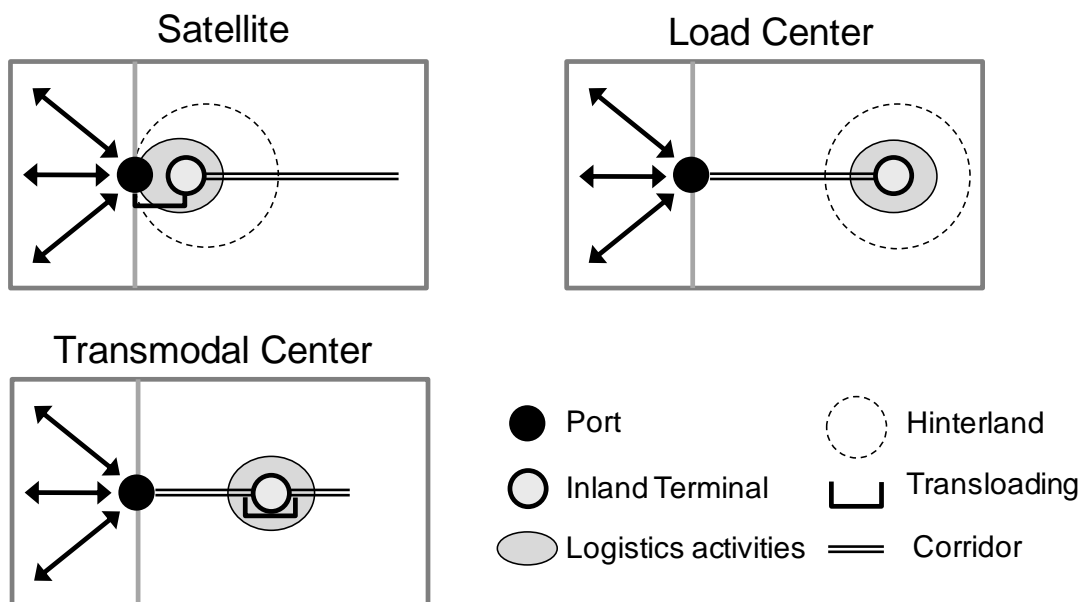


Figure 2 Types of Inland Ports

Supply chain functions (Tier 2)

The transport functions of the first tier of the inland port are servicing an array of supply chain functions where some added value activity is performed on the cargo. The most significant are:

- **Consolidation / Deconsolidation.** Conventional inventory management practices where the cargo is consolidated (or deconsolidated) into container loads. This can also involve paletization so that loads are adapted to the required shipment sizes for the supply chains they are part of. Consolidation can also involve attaining a batch size (group of containers) fitting a barge or a train shipment while deconsolidation can involve breaking down batches so that they can be picked up by trucks.
- **Transloading.** Many inland freight distribution systems tend to be designed to handle specific freight loads that are adapted to capacity and regulatory constraints,

which are different than the standard maritime container of forty foot. For instance, in North America the optimal domestic load for truck and rail is the 53 foot container while in Europe the truckload unit is about 45 foot. A common logistical activity performed at an inland port thus involves the transloading of maritime containerized units into domestic units (or vice versa). Very often, consolidation, deconsolidation and transloading operations are mixed together.

- **Postponement.** A form of inventory management where an inland terminal, through the available dwell time, offers an opportunity to route freight according to last minute and last mile considerations. The inland port becomes a buffer within a supply chain, which represents of form of “warehousing-based terminalization” (Rodrigue and Notteboom, 2009). This practice is particularly prevalent for large retailers having a system of stores and are thus using inland ports to “fine tune” their distribution.
- **Light transformations.** Various forms of product and package transformations such as packaging, labeling or customization to national, cultural or linguistic market characteristics. As a location closer to final customers, an inland port can be used to improve the flexibility of supply chain management.

These activities are standard logistical practices that conventionally were linked with maritime terminals, with some like transloading becoming practical with the setting of satellite terminals. Inland ports have permitted many supply chain functions to take place further inland, enabling new forms of rationalization through modal shift (e.g. road to rail) and by offering better access to inland markets. It can thus be embedded within sustainable supply chain practices.

Hinterland (Tier 3)

This tier is not directly linked with the inland terminal, but with its buffer (second tier) since it concerns its market area. Two main categories of flows are involved. The commercial (retail) sector dominantly concerns inbound flows and generates imbalances that must be managed by the second tier, namely the repositioning of empty containers. The manufacturing sector tends to have more balanced flows, notably for intermediate activities that also generate outbound flows since inputs become outputs. The inland port handles and/or processes freight flows related to the third tier.

3. Actors: Insertion within Strategies and Policies

Actors and their Strategies

Many actors are involved in an inland port, each having its own strategy depending on its core business even if vertical integration could lead to some overlapping (see Table 1). At the same time, various functions could be developed in an inland port depending on the actors involved. The most basic inland port is an inland terminal allowing the modal shift of the containers from barges or trains to trucks or vice versa. The warehousing function is almost non-existent. In this case, the inland terminal is a node in a transport chain, with an increasing level of integration due to containerization, but without a direct intervention on the goods being transhipped. Door to door services are provided mostly by freight

forwarders through merchant haulage or by shipping lines through carrier haulage. Trucking companies, rail or barge operators could also theoretically develop door-to-door services even if in fact they are the most basic transport providers, being subcontractors of freight forwarders or shipping lines.

Table 1 Main Actors and their Functions at Inland Ports

<i>Actors</i>	<i>Functions</i>		
	Land use	Transport	Logistics
Public authorities			
Planning agency (jurisdiction)	Ownership	Modal shift Economic development of the metropolitan area Rent	
Port authority	Ownership	Modal shift Port throughput Interport competition Rent	
Operators			
Real estate promoter	Ownership, rent and asset inflation		
Trucking companies		Volumes	Customs clearance
Rail operators	Ownership or right of way	Door-to-door transport organizer	
Barge operators	Right of way		
Shipping lines		Carrier haulage Massification and interport competition Container logistics	Customs clearance Buffer
Terminal operators (port, rail or barge)	Ownership or usage agreements	Intermodal Storage	
Freight forwarders	Ownership or renting	Merchant haulage	Customs clearance Consolidation / Deconsolidation Transloading Postponement Buffer Cargo added value

Actor relations at inland ports

The inland port is also a construct where actors involved in inland distribution interact to reach their goals. Shipping lines are mostly interested by inland terminals as a means to provide services to their major clients, to compete with other shipping lines and to improve the logistics of their containerized assets. Major clients offer regular flows of full container

loads between the port terminal and a fixed inland point, for instance a manufacturing facility or an inland distribution center. This opens the window to develop shuttle trains between the port and the inland terminal. Massification of inland haulage lowers inland transport costs, increasing competitiveness and enlarging the port hinterland. At the same time, the inland terminal becomes an inland container depot allowing the repositioning of empty containers in an attempt to better reconcile inbound and outbound flows. It can also be used as a buffer in order to deliver containers on time and also to postpone customs operations from the port to the inland terminal if an agreement with the customs authority exists. This provides a major advantage for the shippers which can better manage their cash flow for imported goods.

If warehouses are co-located with the inland terminal, operations could be done directly on goods, which is a step above only using the container as an intermodal tool. Freight forwarders are interested by these operations. If shipping lines develop logistics activities on goods, they do it most frequently through a logistics subsidiary. Basic logistics operations (second tier activities) performed inland by freight forwarders are consolidation, deconsolidation and transloading operations. Apart from these basic operations, value could be added on goods through light transformations such as labeling or standardization. As discussed before, warehouses could also be used as a buffer to deliver goods on time or to postpone customs clearance. However, these tasks require a higher level of logistical control due to the variety of goods and shipments involved.

Leverage and conflicts of interest

Different types of relations that can be established for the governance and operation of an inland port, from solely a private initiative, to projects highly influenced by public policies and finance, not forgetting the whole range of public-private partnerships in between. These relations seek a form of leverage, implying that an inland port is a tool to accelerate their goals, notably revenue generation (rent, taxes, income, etc.). For transport and supply chain operators, a common form of leverage can be built through economies of scale (massification) and co-location (terminal / logistic zone). For public actors, leverage commonly takes the form of zoning regulations influencing the availability of real estate assets, the provision of utilities and infrastructure or various taxation regimes. The common expectation is that the costs (or lower incomes) associated with the provision of subsidies will be compensated by higher future incomes once the inland port is operating and generating regional economic benefits. Another form of regulatory setting providing leverage concerns free trade zones (FTZ) or inland custom clearance schemes. These strategies enable cargo to be brought inland without the need to clear customs at the port terminal; the inland port acts as the gateway, at least from a customs perspective. A FTZ confers the additional benefits of being able to perform inspections, quality control or transformations on the cargo, which can be “exported” under another (lower duty) custom category. Payment can even be postponed until the cargo clears the FTZ.

Relations among actors can also lead to conflicts of interest. If these conflicts are not resolved either by market forces or by regulation, several risks can emerge. The most

prevalent is the risk of over-supply where many actors are having the goal of establishing an inland port within their jurisdiction. This is particularly the case for the public actors at the local or regional level where there is a propensity to latch on the latest development / job creation scheme, let them be industrial parks, logistics zones, or inland ports... There is emerging evidence that this could be the case in several parts of the world such as India (Ng and Gujar, 2009) or Western Europe, particularly in the Rhine / Scheldt delta (Notteboom, 2009). In North America, this issue is mitigated because any inland port must include a rail terminal or be within reasonable drayage distance of a rail or port terminal. Rail terminals, and particularly the networks they are part of, are under the control of large private rail operators, which have commercial interests and revenue generation as a priority. They may consider setting up terminals that compete with other rail operators, but if system-wide the outcome is a zero sum game (moving part of the traffic from one terminal to the other), then they are unlikely to move forward with an inland port project. They thus act as a powerful actor filtering geographical and operational conflicts of interest since each inland port project must demonstrate a clear commercial potential for the rail operator. The above underlines a policy discussion on whether governments should include inland ports within a more stringent regulatory framework or, alternatively, whether they should not intervene and leave the market to decide about location, size and function. Both approaches have pros and cons such as the duplication of facilities in a market framework, or non-market (political) based location decisions in a planned framework.

Public interest for inland ports: a tool for planning and sustainability?

The setting up of inland ports (or the labeling of existing facilities) often involves private and public interests. Public intervention is justified by two types of goals related to development objectives and planning objectives. The first public goal is based on the need to attract logistics activities to develop the local economy (employment, income, taxes ...). Local or regional collectivities, public agencies or trade groups all attempt to develop land and infrastructure policies to assist in the implementation of these inland structures. The second public goal is generally based on planning and regulation objectives. Inland ports can contribute to policy objectives related to sustainability, by promoting the use of rail and river transport, reducing traffic congestion and reorganizing freight distribution to fit better local characteristics, such as urban density. These two functions (development / planning) help explain the contributions of public actors at all levels in the establishment of inland ports.

4. European and North American Selected Cases

This section provides six selected case studies discussing representative inland ports, three in Europe and three in North America. They were selected to represent a cross section of actors and functions that tend to be prevalent for their respective settings.

Lyon terminal: an inland port of agglomeration dedicated to modal shift

The inland Port of Lyon illustrates a variety of functions and actors involved in these functions. The term "port avancé" is used officially in the partnership initiated in early 1990

between the port of Marseille and the river port Edouard Herriot in Lyon, 310 km inland. This partnership is based on relations between private and public stakeholders respectively involved in port, river and rail operations. These players came together in 1993 to form a society called "Lyon Terminal", to help coordinate various activities related to intermodal transportation servicing the inland port. Lyon Terminal society is composed of different shareholders with Compagnie Nationale du Rhône being the majority shareholder of a corporation that also includes the port of Marseille, a barge operator and the combined transport rail Naviland Cargo. The company operates two container terminals with the goal to promote the development of river and rail shuttles. The various functions of handling, storage, packing, and inland transportation are provided in partnership with the shipowners and companies in charge of the leasing and repair of containers. From 1993 to 2008, an increase in traffic from 32,000 to 137,000 TEU was observed, as well as for the storage of empty containers, which reached a volume of 100 000 TEU in 2008. Lyon Terminal society, using the concept of « port avancé » in its discourse, offers a typical example of an inland port involving different stakeholders (public and private, institutional and operational) and carrying different port functions (promotion, management, development, operations).

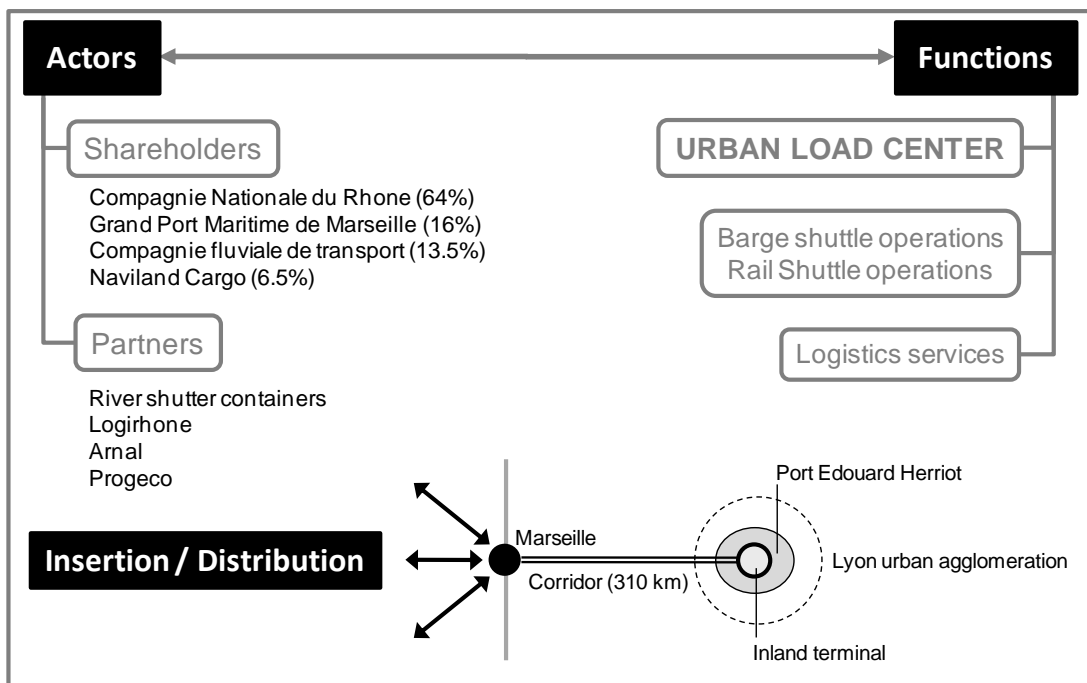


Figure 3 Inland port of agglomeration: Lyon terminal

Two important functions can characterize this type of inland port. First (and typically), the society promotes intermodal integration through rail and fluvial transport corridors. Additional services (container leasing, packing, storage, etc.) correspond to the traditional functions of inland ports. But secondly, the inland port of Lyon is also developing more original urban services and planning objectives. The inland port is in close proximity to

downtown, which is a rather unique situation compared with other inland ports that tend to occupy more peripheral locations within large metropolitan areas. Therefore, to justify its position and its consumption of contested centrally located land the port of Lyon must provide a service to the urban agglomeration. Also, the main shareholder of the port (Compagnie Nationale du Rhone; CNR) has an obligation to develop services of general interest¹, by providing investments each year. To meet this obligation, the development of a more sustainable freight mobility strategy is being pursued. The 2007 funding saw the development of a second container terminal at the port of Lyon, an investment being advertised as a way to provide sustainable freight options for the commercial activities of the metropolitan area. Thus, the mix of actors places the inland port in a unique role of fulfilling a conventional intermodal function, but the hinterland of this function focuses on the nearby agglomeration. It does not really function like a standard inland port to capture market shares in a competition between other inland ports, even if it provides for the consolidation of traffic in the agglomeration of Lyon for the port of Marseille. Admittedly, the second terminal that opened in 2007 aims to develop partnerships with other inland ports and seaports by developing rail and river shuttles. But for now, the port of Lyon is an inland port of agglomeration (serving a local market) servicing the port of Marseille by offering additional intermodal options for the hinterland.

Zaragoza: An inland port in a competitive hinterland

The Zaragoza Maritime Terminal (tmZ; terminal marítima Zaragoza) is a strategic initiative of the Port of Barcelona. It is part of the port's development plan that aims at expanding the port hinterland, namely through the setting up of inland ports. In this line, tmZ was set up in 2001 as a partnership between the port of Barcelona and the Logistics Activities Area of Mercazaragoza (founded by the Municipality of Zaragoza and the Mercasa National Company). This is not a new terminal, but the implementation on existing infrastructure into a service labeled « port of Barcelona » which includes road shuttle services, freight handling, consolidation and deconsolidation, warehousing, and other value added logistic services. The port of Barcelona takes on the role of terminal promoter and the logistics activities are assumed by operators in the area of Mercazaragoza. Therefore, it is a strategy aiming at the promotion and organization of inland freight distribution, but without significant investments. The Port of Barcelona participated mainly in the funding of a new rail terminal in partnership with the national rail infrastructure manager (RENFE) and the company Acciona logística, allowing rail shuttle services between the port and the inland port.

¹ CNR holds the concession for the river. It is a society with private and public capital in charge of the operation (electricity, industry ...) and the planning of activities directly dependant on the river. In exchange for the concession, the State asked CNR to invest annually in services of general interest.

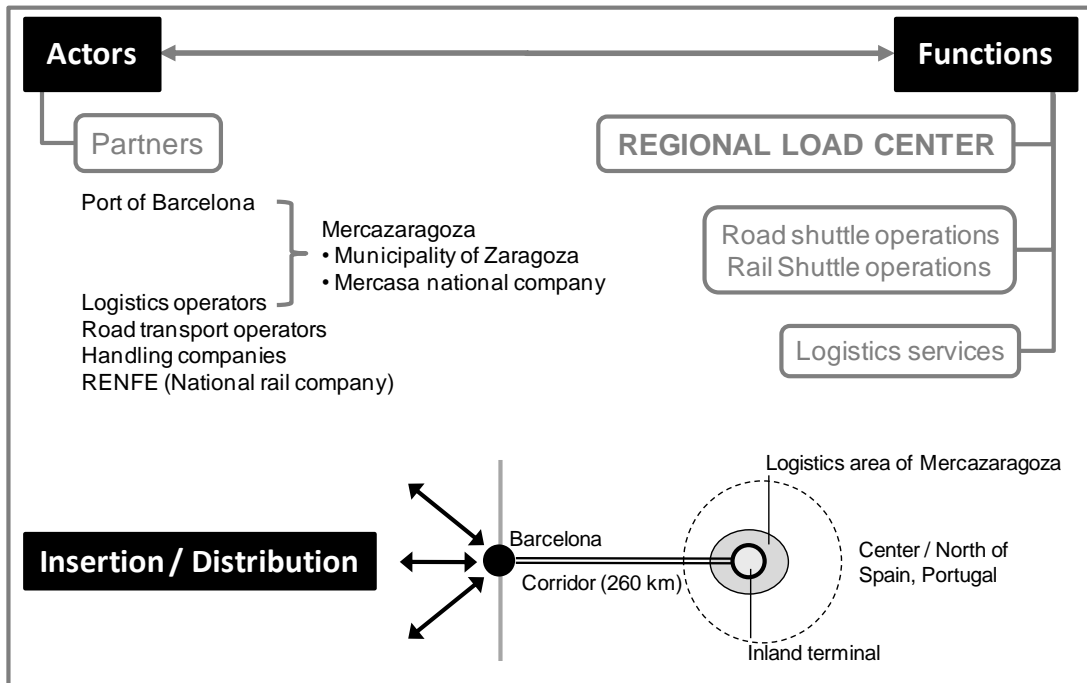


Figure 4 Inland port in a competitive market area: Zaragoza Maritime Terminal

The Zaragoza Maritime Terminal is a nodal point in the center of two strategic corridors: the Ebro Corridor (Barcelona-Zaragoza-North of Spain) and the transversal Iberian corridor (Barcelona-Zaragoza-Madrid-Lisbon). The inland port is roughly at the center of an area delimited by Barcelona, Madrid, and Bilbao that account for 70 % of the Spanish GDP. This inland terminal mainly competes with the port of Valencia for services to the region of Madrid. Through a similar strategy, the port of Barcelona is developing two inland ports in the south of France and west of Spain. The Zaragoza Maritime Terminal illustrates a specific inland port role; the capture or retention of traffic in areas of market competition with a strategy involving a minimal level of investment.

Venlo: A satellite terminal for Rotterdam and the Rhine / Scheldt delta

Located only a couple of kilometers from the German border, Venlo, Netherlands was initially linked to Rotterdam by the Betuweline rail link in the 19th century. This link was shut down in 1991, but a new high capacity rail line labeled Betuweroute was completed in 2007 at great costs by the Dutch Government. The double track high capacity rail corridor goes up to Venlo and it is expected that improvements will be made on the German side to extend the corridor up to Duisburg; Europe’s largest inland port. European Container Terminals (ECT), the main terminal operator in the port of Rotterdam and an element of Hutchinson Port Holdings (HPH), has been actively involved in the setting up of three inland ports to mitigate truck volumes at the port of Rotterdam, which was creating serious

congestion issues. They are Venlo in the Netherlands, Duisburg in Germany and Willebroek in Belgium, all of which entered in operation in 1999.

The main function of Venlo is to consolidate or deconsolidate rail traffic bound to or coming from the port of Rotterdam's on dock or near dock rail facilities. ECT acts both as a handling company to transload containers from rail to trucks and as a rail operator. Shuttle trains, managed by Keyrail and with DB Schenker as the main carrier, offer shuttle services several times per day for containers between Venlo and the terminals on the River Maas, including Delta (APM) and Home (HPH) terminals in Rotterdam. It is expected that by 2009, 300 train services per week would be using the Betuweroute. As a handling operator ECT has the opportunity to consolidate flows for many shipping lines, a task performed by similar companies at other locations (Gouvernal and Daydou, 2005). Gradually, other services have been added like the storage of empty containers, a function to which Venlo is particularly well suited for due to its inland location and proximity to major importers and exporters along the Ruhr.

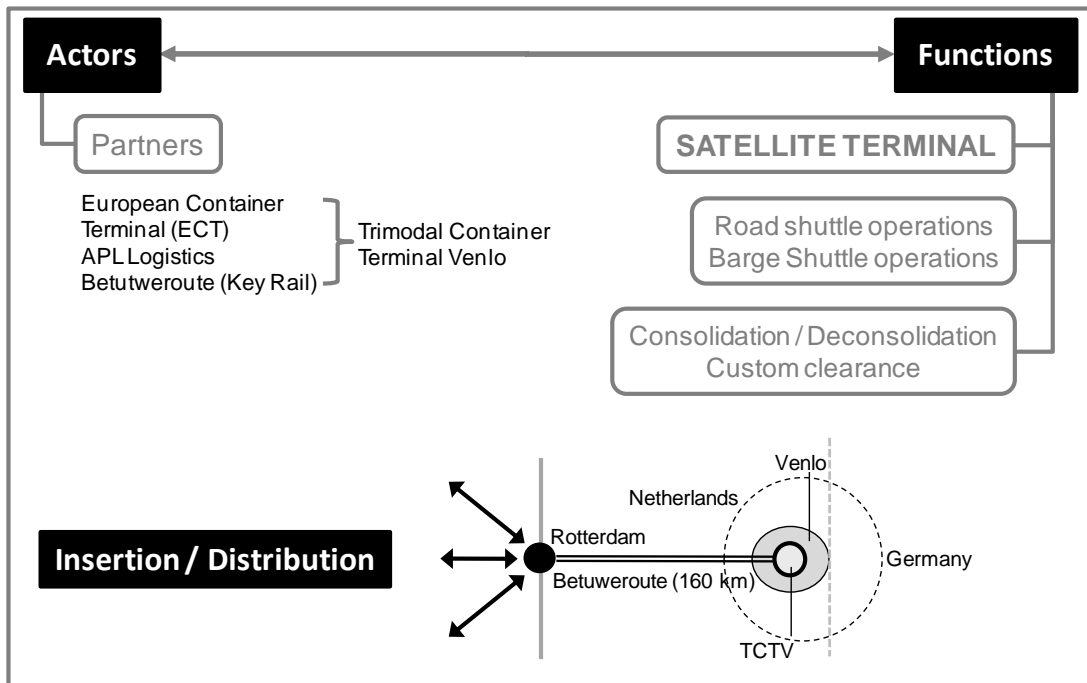


Figure 5 Crossborder satellite terminal: Venlo

Trimodal Container Terminal Venlo (TCTV) organizes for its customers on demand and door to door pick-up and delivery of containers by truck. Short and long term containers storage services have been developed, as well as container maintenance, repair and cleaning. In late 2007, Venlo became an extended gate for ECT Delta Terminal in partnership with APL Logistics (Rodrigue and Notteboom, 2009). Customs clearance can be done at Venlo in a bonded warehouse, which tends to accelerate deliveries inland. These services are not

related to the goods, but concern more transportation functions and are rendered by a terminal operator. TCTV, owned by HPH, is a gateway for the Dutch market and the industrialized German Rhine / Ruhr area. With the expected opening of an inland barge terminal in the second half of 2009, TCTV will become a trimodal option, reinforcing the inland port as a satellite terminal for Rotterdam and even Antwerp.

Savannah: Consolidation of a gateway with satellite terminals

The port of Savannah is under the jurisdiction of the Georgia Port Authority and has seen a strong growth of its traffic up to 2008, when it handled about 2.6 million TEU. Such a growth was the outcome of two major trends. The first concerns demographic and commercial changes that have attracted cargo that conventionally transited through the middle or north Atlantic ranges of the east coast. The second concerns investments in port infrastructures to provide additional capacity, shorter transit times through the all-water Panama route, large assets of greenfield real estate and lower labor costs, which have contributed to position the region as a North American gateway.

Savannah's growth has increasingly placed pressures on the setting up of satellite terminal facilities to alleviate the port's terminals and to facilitate inland distribution. The port authority has particularly been active in the setting up of logistic zones in the port's periphery. One such zone is the Savannah Port Authority Industrial Park (SPAIP) which is a site specializing in satellite activities removing pressures from the container terminals, such as container and chassis storage and repair. Nearby are two near dock real terminals, one owned by CSX and the other by NS, which transited 235,000 TEU in 2007, about 9% of the port's traffic. About 10 km from the port terminals are two large logistics zones; the Crossroads Business Park (CBP) owned by the Savannah Economic Development Agency and the Savannah River International Trade Park (SRITP) owned by the Georgia Port Authority. They both replicate the revenue generation landlord model where facilities are leased to tenants for various time periods, but some have purchased land and built their own facilities, such as the major retailer Target that completed in 2007 a 2.1 million square foot distribution center. Although such a speculative strategy can help attract customers since their entry costs are lower, it also comes at a risk that the landlord must bear if the expected customer base does not materialize or if some customers decide to move elsewhere. For instance, in 2008, due to a drop in retail volumes, Wal-Mart decided to break the lease of its 800,000 square foot distribution center in CBP and consolidate its activities in Statesboro, about 70 km inland. For this case, Wal-Mart is a major customer to the port, but no longer for the logistics park.

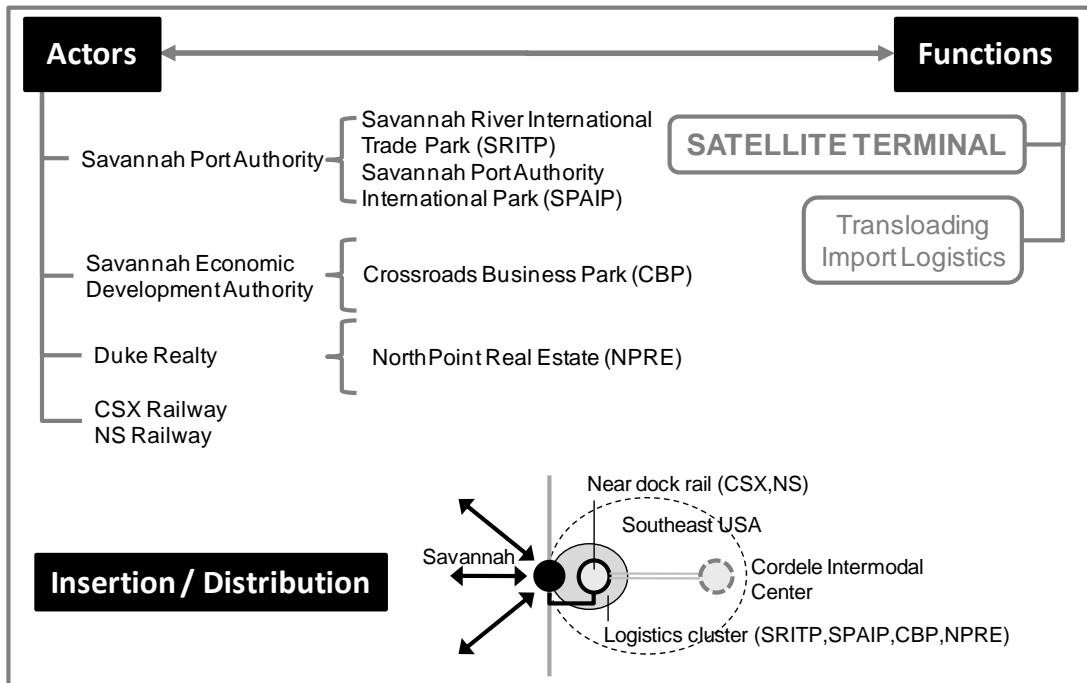


Figure 6 Gateway logistics: Savannah

The usage of Free Trade Zones (FTZ) is also a common postponement and added value strategy in American inland ports. For the logistic cluster of Savannah, SPAIP and CBP are both entirely considered as FTZ. Retailers are using this advantage to delay payments on their imports until they are leaving the FTZ to their stores or regional distribution centers. On another front, a project to establish an inland port 275 km west of Savannah is gaining momentum. The main promoter of the Cordele Intermodal Center (CIC) is a county industrial council that follows the conventional strategy of landlord revenue generation and economic development by securing land in proximity to a rail terminal (CSX) and making it available for the development of logistic activities. Another goal is to improve the hinterland of the port of Savannah in southwestern Georgia, in the Florida panhandle and in western Alabama, competing more effectively with the port of Mobile. While in terms of traffic it could be a zero-sum game, lower inland distribution costs could lead to indirect economic benefits. The rail link mainly belongs to two short line operators, which confers the advantage of having a rail shuttle service that does not impair the existing CSX network. The satellite terminal activities and the possible development of an inland port underline a set of strategies spearheaded by the port authority to cope with the import oriented functions generated by the freight distribution activities of North America's largest "big box" retailers (Walter and Poist, 2004).

BNSF Logistics Park Chicago: an inland port at the hub of North America

This inland port began operations in 2002 and is entirely a private initiative spearheaded by the rail operator BNSF who spent close to one billion USD to build North America's largest intermodal rail terminal 60 km southwest of Chicago. The Joliet terminal, along with many others around Chicago, is at the end of a transcontinental rail corridor serviced by BNSF and UP that links the Los Angeles / Long Beach ports to the Chicago hub (Giuliano and O'Brien, 2008). Chicago is a particularly important location within the North American rail system with seven major rail operators interconnecting. Co-located with this project is a 2,200 acres logistics zone that fulfills a wide array of functions, including a FTZ. A good share of the real estate is the outcome of a reconversion of a munitions depot that was owned by the US Army (Arsenal), which was developed by CenterPoint, one of the world's largest promoters and manager of logistical parks. The promoter ProLogis is also involved in the development of warehousing space in a section of the park. Co-location is an important aspect of such inland port ventures as it minimizes drayage between tier one and tier two activities.

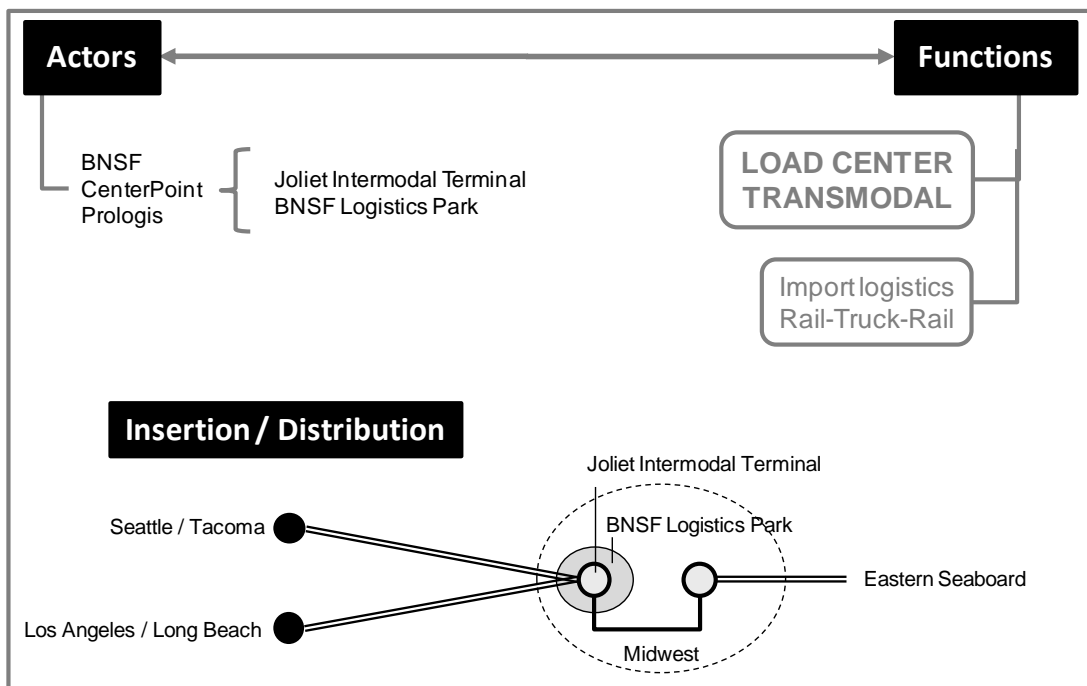


Figure 7 BNSF Logistics Park

A large share of the warehousing assets is rented, underlining the standard inland port landlord model where a promoter develops facilities with the expectation of revenue generation. The tenants are major "big box" retailers, third party logistics providers dominantly linked with Pacific Asian supply chains transiting through California as well as Georgia-Pacific which is a major manufacturer of paper and wood products. Another notable tenant is Maersk Logistics that has a 350,000 square foot warehouse, securing a better presence in the hinterland as well as providing a better management of its containerized assets (e.g. backhaul cargo). The BNSF Logistics Park Chicago thus leverages the interests

of several private actors in transportation and freight distribution. For the rail operator, it provides a modern high capacity intermodal terminal, improving the efficiency of the largest rail corridor in the world and consequently a major source of revenue (long distance rail flows). The traffic of the corridor and of the Joliet terminal is further anchored by a co-located private logistics park. The users of this park benefit from more reliable rail services as well as better rates linked to economies of scale and short drayage distances; the rail terminal becomes part of the inventory management systems of the co-located customers.

CenterPoint-KCS Intermodal Freight Gateway at Kansas City: a new corridor for North American inland distribution

Located two thirds of the distance along the Los Angeles – Chicago rail corridor, Kansas City is the second most important inland rail hub in North America, servicing a large manufacturing and resource hinterland. At the end of the 1990s a report sponsored by the municipality of Kansas City recommended that a governance and marketing structure should be established to help organize transport and logistics initiatives in the region. Founded in 2001, KC SmartPort is the outcome of this process and is a nonprofit entity covering 18 counties, 50 cities, two states, several rail terminals (KCS UP, BNSF), logistics zones and FTZ (the largest number of FTZ in the United States). Its board includes most of the main public and private actors involved in transport and logistics. KC SmartPort is not an inland port, but a governance structure set up to help articulate a system of inland ports around Kansas City. It is likely the most advanced initiative in North America with a broad mandate to favor economic development in the region by attracting firms related to transport and logistics as well as to improve their performance in terms of costs, flexibility and security. It is also spearheading an initiative aiming at linking regional educational institutions with major employers so that an adequate level of labor formation is provided; the perspective about the inland port is thus a comprehensive one.

With the ongoing integration of the North American economy (e.g. NAFTA), Kansas City has seen the emergence of a new corridor towards Mexico, often dubbed the “NAFTA highway”. The rail operator Kansas City Southern (KCS) has been a major proponent of this corridor by establishing a Mexican subsidiary (Kansas City Southern de Mexico; KCSM) with rail terminals at the port of Lazaro Cardenas. The system is labeled KCS International Intermodal Corridor and enters the United States at Laredo, another major inland port. However, the setting of this corridor requires supply chain managers to consider the Lazaro Cardenas option, thus the setting of an inland port at the end of the corridor in Kansas City to help anchor this freight. KCS and CenterPoint Properties began in 2007 building a 1340 acres inland port labeled CenterPoint-KCS Intermodal Freight Gateway² over a reconverted military base (Richards-Gebaur). This reconversion is managed by the Kansas City Port Authority that can sell or lease the land under its jurisdiction. The developer Hunt Midwest is also involved in projects related to underground warehousing facilities.

² CenterPoint-KCS Intermodal Center is also used.

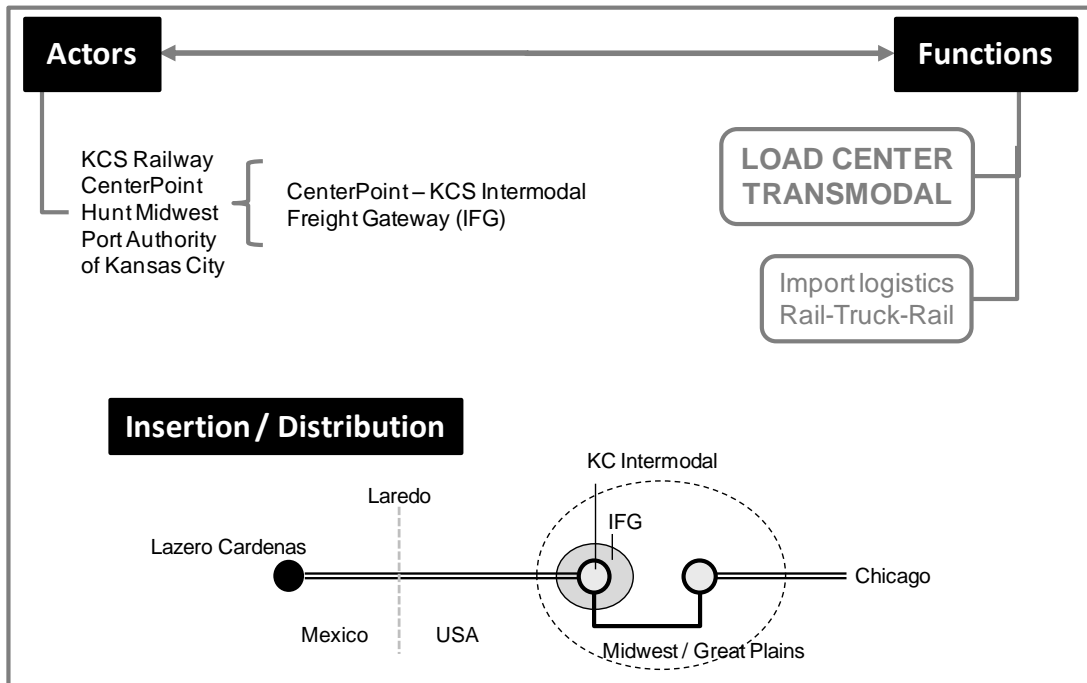


Figure 8 CenterPoint-KCS Intermodal Freight Gateway

Like many inland ports in North America it follows the landlord model where a real estate promoter seeks revenue generation through a partnership with a rail operator, building logistics activities in co-location with the rail terminal. This park is a geographically specialized inland port within the Kansas City cluster with an orientation towards Mexican supply chains or global supply chains going through Mexico. It is thus interesting to note that the complex is labeled as a gateway to underline its status as a point of entry of global trade transiting through Mexico to an inland port deep inside the United States. Like many commercial projects, the development of the inland port is divided in phases (five in this case) where facilities are incrementally provided to the location market. What is also particular to the project is due to its adjacency to a major interstate highway and its proximity to Kansas City (25 km south), a retailing component is planned with the sole purpose of revenue generation.

5. Conclusion

The emergence of inland ports took place in several regions around the world, notably where the growth of inland freight distribution required a massification of flows. Yet, there is no definitive consensus about how such inland facilities should be labeled, with terms such as dry ports being advocated. It was suggested in the article that the generic term inland port is more suitable to label such facilities as it considers the relationships between terminals, the associated logistic activities and their hinterland. They form a three tier system where

functionally an inland port can act as a satellite terminal, a load center or a transmodal center and where several logistic activities, such as consolidation, transloading, postponement or light manufacturing can be performed.

Although the functions performed by inland ports are relatively straightforward, a series of actors are also involved in their establishment, management and operations. Depending on their goals, means and strategies a wide array of inland ports can take shape, particularly in terms of ownership and governances, even if functionally they are similar. Inland ports offer an opportunity for actors, such as port authorities, rail operators, logistic services providers or economic development boards, to leverage their role through a convergence of interests. Increased revenue generation, namely taxation, rent or fares is a common expectation of this leverage. Still, there are also conflicts of interest that can lead to a system of inland ports that does not reflect well the regional freight distribution system in terms of their location, number and mode of operation. For instance, because the development of inland ports became a popular framework to capture revenue and generate employment, various agencies have put forward inland port development projects, with commercial potential and operational practicality being secondary. It is thus likely that there is an oversupply of inland ports in some markets, such as India or the Rhine / Scheldt delta. In North America, this over-supply does not necessarily take shape as too many inland ports, but an over-supply of real estate developed for such a purpose, at least within the foreseeable future. Therefore, in some cases, particularly if coming from private initiatives such as real estate developers, inland ports are dominantly perceived as sources of revenue, while in others, particularly if coming from public interests, the goal is more towards generating added value through vertical integration and job creation for the regional economy. The ideal inland port would obviously reconcile both perspectives.

The European and North American case studies underline that even if they are concerning very different geographical, regulatory and operational settings, the functional outcome of inland ports remains relatively similar; in both cases there is a clear difference between satellite terminals and load centers. The key discerning factor between both is not necessarily distance from the port, even if satellite terminals are by definition located in relative proximity to a port terminal, commonly less than 200 km, but a massification of flows between the port and the inland port. This takes the form of dedicated rail or barge services.

Evidence gathered in the paper underlines that the major actors in the development of inland ports in Europe tend to be port authorities and terminal operators while in North America, rail operators and real estate promoters and managers tend to be more prevalent. The positive point is that many actors, particularly in the public sector, are increasingly aware of the complexity of functions related to inland ports and are setting up corresponding governance and regulatory frameworks. The negative point is that both public and private actors have a tendency to overestimate the benefits and traffic potential and underestimate the costs and externalities of inland port projects. It appears that one important component in the commercial viability of an inland port is the relationship between operators and regulators.

This should be the object of additional research that would more clearly identify the governance options and their associated level of economic and supply chain performance.

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