



The Benefits of Logistics Investments: Opportunities for Latin America and the Caribbean

Jean-Paul Rodrigue

April, 2012

**Inter-American
Development Bank**

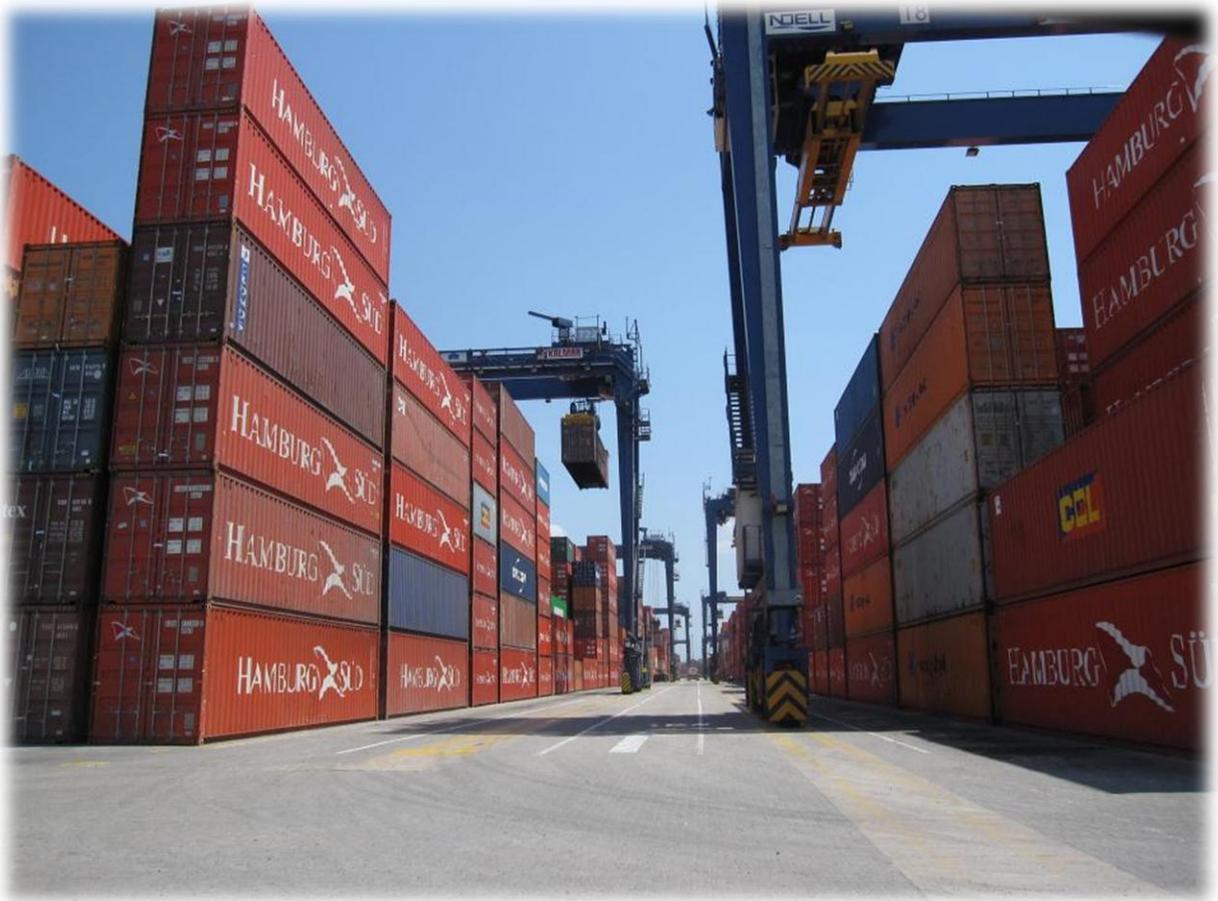
Infrastructure and
Environment Sector

TECHNICAL NOTES

IDB-TN-395

The Benefits of Logistics Investments: Opportunities for Latin America and the Caribbean

Jean-Paul Rodrigue, Professor, Department of Global Studies & Geography, Hofstra University, New York, United States



© Inter-American Development Bank, 2012

www.iadb.org

The “Technical Notes” include a wide range of optimal practices, project evaluations, lessons learned, study cases, methodological notes, and other documents with technical input, that are not official Bank documents. The views expressed are those of the authors and do not necessarily represent the official position of the Inter-American Development Bank, its Executive Director or the countries represented.

We would like to express special acknowledgement to Pablo Guerrero Team Leader and main driver for this research. Esteban Diez-Roux, Rene Cortes and Reinaldo Fiovaranti from the Transport Division, and Agustina Calatayud from the Integration and Trade Department, who contributed with valuable comments and critical revisions. This version also benefited from the comments made by Transport specialists in Headquarters and country offices during the meeting held at the Inter-American Development Bank on February 22nd, 2012, to discuss the main issues of this paper.

1300 New York Ave, NW, Washington DC, USA

IDB contact: Pablo Guerrero (pablogu@iadb.org)

Preface

Transportation is an inherently crucial factor in supporting economic activities as well as providing opportunities for economic development. As such, the provision of transport infrastructures is a common priority in capital investment, particularly in Latin America and the Caribbean where infrastructural capabilities are often lacking. Yet, this focus can be perceived as a bias as it overlooks the complex structure and organization of freight flows that characterize global supply chains. While transport infrastructures remain a fundamental component of economic development strategies, the approach must be expanded to consider the freight distribution requirements for both domestic commercial activities and the global economy. This means that transport infrastructure capacity may have limited value if not supported by a proportional level of reliability and timeliness in freight distribution supported by transport services.

Latin American and Caribbean ports have seen a remarkable growth of the containerized traffic handled with the development and expansion of port infrastructure. The conventional role of a resource exporter, such as agricultural and mining products, is being expanded through an increasing sophistication of imports and exports. Port facilities and their hinterland have responded with infrastructure investments with a well-founded anticipation of additional traffic growth. Within this new environment where Latin American and Caribbean economies are expanding their horizon, freight transport and logistics investment must be seen as a joint and interdependent endeavor. Transport infrastructure capacity must be accompanied with freight logistics reliability, effectiveness and resilience.

The purpose of this report is thus to underline the key dimensions behind the benefits of logistics investments. It particularly focuses on port / hinterland supply chains in which the setting of logistics zones, transport and logistics corridors and inland ports provide a salient example of the multiplying effects of transport infrastructure and freight logistics investments.

Néstor Roa

Transport Division Chief
Infrastructure and Environment Sector

Table of Contents

Preface	4
Table of Contents	5
Executive Summary.....	6
The importance of logistics investments	11
International trade, transport, and logistics	13
Global trade	13
Ports and maritime transport systems	15
The concept of supply-chain integration	23
Improving logistics performance and competitiveness.....	25
Logistics performance	25
Infrastructure and commercial integration	30
Work practice integration.....	32
Information integration	33
Regulatory integration	34
Planning and funding integration	35
Custom and security integration.....	36
The benefits of logistics projects	38
Gateways and corridors	39
Hinterland accessibility	39
Logistics zones and inland ports development.....	42
Labor development and logistical services	46
Freight portals / port community systems	49
Container assets management and containerized niche markets.....	50
Green logistics.....	53
City logistics	54
Benefits for stakeholders.....	56
Evaluation methodology	57
Assessment criteria	57
Key logistics projects evaluation measures	58
Assessment prospects for port hinterland logistics.....	59
Bibliography	61
Appendix	64

Executive Summary

The growth in international trade and its related freight distribution systems requires the development of logistics capabilities. Logistics investments are the allocation of capital to improve the efficiency of freight distribution through infrastructures (terminals, real estate, and telecommunications); operations (transport modes and equipment); and human resources (labor, management, governance, research, and development). The outcomes of investing in logistics capabilities are numerous and are mainly related to increased integration with global trade, better utilization of national transport assets, more competitive exports, lower costs for imports, and increased employment opportunities.

Physically, international trade requires a “transport chain,” which is a series of logistical activities that organizes modes and terminals, such as railway, maritime, and road transportation systems for continuity along the supply chain. The port, particularly the container terminal, has become an important trade and logistics platform whose level of activity not only reflects the intensity of infrastructure utilization, but also the logistical capabilities to support its operations.

Although North American east and west coast ports remain the most active in the Americas, handling an average of 24.1 and 17.1 million TEU respectively between 2008 and 2010, they have experienced no net growth in traffic between 2005 and 2010. During the same period, Latin American and Caribbean ports accounted for 88 percent of the net container growth of the Americas. This growth is putting pressures on Latin and Caribbean freight distribution systems, which need to develop better logistical capabilities.

Decisions made by corporations to outsource and offshore their activities creates challenges for supply-chain management. Internally, companies need to revamp managerial and human resources systems to deal with global supply chains. Several enterprises have had difficulty adapting to the variety of regulatory, political, and cultural complexities linked with a multinational organizational structure. Externally, companies must coordinate in new ways with private and public entities to create an embedded and efficient supply chain.

In light of intense global competition, particularly in retail goods, supply-chain efficiency remains one of the few strategies available to promote competitiveness. Global production networks are enhanced when supported by efficient logistics. Production networks need sufficient transport capacity as well as the ability to manage these flows to insure reliability and timeliness. The increasingly broad scope of supply-chain management now includes customer service, demand forecasting, documentation flow, interfirm movements, inventory management, order processing, packaging, parts and service support, production scheduling, purchasing, returns, scrap disposal, traffic management, warehouse and distribution center management, and transportation. These services must be set up and managed to maintain the efficiency of the production system.

Logistics investments, in addition to improve transport capacity and efficiency, tend to be the most effective when they increase the level of supply-chain integration where the interests of actors, such

as shipping companies, terminal operators, and trucking companies, are aligned. Still, evidence shows that these interests can be difficult to align.

Several developing countries are caught in a vicious cycle in which existing interests use freight distribution as a rent extraction mechanism and in which regulatory burdens, complex procedures (customs, taxation, inspections, etc.), and the lack of market forces limit incentives to invest in new facilities and services. Moving away from this vicious cycle often requires reforms, such as market liberalization, to transform to a virtuous cycle, which leads to more open markets, incentives for capital investment, building scale economies, higher-quality services, and more efficient supply chain management. Inertia is difficult to break, but the national benefits of moving to a virtuous cycle can be worth the effort.

The Logistics Performance Index (LPI), developed by the World Bank, reveals that the efficiency of freight distribution is not only an issue of infrastructure – although infrastructure is particularly important in developing countries – but also of a whole range of issues related to the management of freight flows:

- **Infrastructure integration** is the physical connectedness and interoperability of hard infrastructure, such as the ability to move containers efficiently from ship to truck to rail. The transport terminal – port, rail, or airport – is the key infrastructure where physical flows of goods are reconciled with the requirements of supply-chain management.
- **Commercial integration** is the development of commercial arrangements to promote a better integrated logistics system, including service-level agreements and performance targets and penalties as well as management processes, for example, between main-line railways and short lines, or between railways and ports (or terminal operators). It includes the elements of cost, time, and reliability as commercial goals that are benchmarked and included in commercial supply-chain decisions.
- **Work practices integration** implies the integration of labor force work practices required to move cargo most efficiently through a supply chain, including at ports and intermodal/transload facilities. It concerns organizational (managing labor as a group) and management skills (managing individual workers) competencies.
- **Information technologies** are the information support for supply-chain management. **Information integration** interconnects information systems to allow for improved management of supply chains. Systems that provide electronic data interchange are included.
- **Regulatory integration** is the structuring of regulations to promote a better-integrated freight distribution system. Regulations should promote efficient modal choice, avoid subsidized modal preferences, and favor the harmonization of regulation across jurisdictions. Since supply-chain management involves modes and processes across several nations, regulatory integration becomes increasingly important as it transcends modes and jurisdictions.

- **Planning and funding integration** refers to the planning and funding of infrastructure from an integrated multimodal, total logistics chain perspective. Freight transportation bottlenecks are a potentially significant hindrance to economic growth and the integration of transport chains. It also recognizes the concerns in government and industry that established institutional and financial arrangements have not adequately responded in recent decades to the demands imposed by growing volumes of freight and passenger traffic and to fundamental shifts in regional and global patterns of trade.
- **Customs integration** aims at moving goods more efficiently across country borders, including prescreening and inspections.
- **Security integration** is the interconnectedness or harmonization of security procedures that protect cargo from theft or damage and protect the public from risks posed by dangerous cargo or threats posed by illicit cargo.

The growth of trade flows, the complexity of supply-chain management and increasing levels of congestion at main gateways have incited the public sector to play a role as a mediator and facilitator to coordinate infrastructure projects related to logistics. The main realms of public engagement involve:

- The development of **gateways and corridors** as a fundamental component of supply-chain integration. From an economic perspective, the function of a corridor is to promote both internal and external trade by providing more efficient transport and logistics services. The main reason for designating a corridor is to focus attention on improving not only the capacity of the routes, but also the quality of the transport and other logistic services along the corridor. Quality is measured in terms of the transit time and costs for shipments along the corridor and the reliability and flexibility of the transport services offered on multimodal routes.
- Changing the role of port authorities to become a manager and catalyst of regional development within their hinterland. The conventional port authority, which traditionally functioned as a landlord, regulator, and operator, is becoming the “**expanded port authority**,” which takes an active role in coordinating freight distribution in the hinterland.
- The growth of **logistics zones**, physical groupings of activities dealing with freight transportation (freight forwarders, shippers, transport operators, customs) and related services (storage, maintenance and repair). These zones support the consolidation, deconsolidation, transloading and light transformation of international shipments. The growth of these functions has increased the demand for land. Logistic zones come in four major forms, each fitting a specific role and function within a national transportation and freight distribution system:
 - **Port-centric logistics zones** are logistic zones that have been planned in co-location or in proximity to a port terminal facility. They support freight distribution activities

directly related to maritime shipping and thus have a dominant international trade orientation.

- **Inland ports** are intermodal terminals (commonly rail) built or updated concomitantly with the development of adjacent logistical and service activities.
- **Logistics parks** are planned zones comprised of distribution centers and light manufacturing activities. They provide geographical advantages in terms of accessibility, land availability, and infrastructures, as well as operational advantages in terms of favorable regulations and economies of agglomeration.
- **Freight villages** are integrated clusters of support activities for freight distribution such as office space, hotels, and restaurants.
- Support for **employment opportunities** stemming from logistic activities which range from the low to the high skilled jobs to support the operations of logistics activities. A diversified **logistics service market** strengthens local expertise and improves the performance of freight distribution. Greater efforts should thus be made by governments and industry to contribute to skill formation as well as to raise the profile of logistics as a career path.
- Support of **information technologies**, which play an important function in the analysis and transfer of information between the main stakeholders in a supply chain and are thus a crucial investment in supporting the development of logistics capabilities. Investment in information technologies usually results in efficiency and reliability improvements because complex supply-chain management strategies require a high level of information availability.
- **Management of container assets** is a growing problem. As global container trade increases. The container is a transport unit as well as a logistics unit and efforts are made to insure that containerized assets are used as efficiently as possible, which commonly involve maximizing the level of container utilization and mitigating empty container flows. Empty container flows remain an enduring challenge in global freight distribution. Although this is mainly an issue addressed by the private sector, the availability of containers is fundamental for a regional export market and economic development.
- **Commodities**, such as grains, chemical products, and wood products, are several of a number of bulk goods that represent a niche for containerization in some places. The development of containerized niche markets is particularly suitable where there is a significant backhaul movement of empty containers and thus represents an opportunity for small and medium-sized companies to access the global market. Since the promotion of exports is often a government policy, the containerization potential of several commodity groups requires greater emphasis.
- The emergence of greenness (**green logistics**) as a strategy favoring supply chain integration should be emphasized. Sustainability is an objective shared by many actors along the supply chain and can help improve various processes behind supply-chain management, particularly

product design (sourcing), materials management (packaging and recycling) and physical distribution (energy efficient modes). In many cases, greenness is required to become a supplier to manufacturers and retailers, such as in the food sector (e.g. organic and fair trade food). Greenness is also linked with better quality of life and is thus a social goal to be pursued by the public sector.

- **City logistics** *is an often-neglected dimension of freight distribution, which concerns the array of goods moving within metropolitan areas. Cities are often the last mile in freight distribution and, therefore, represent a unique set of challenges in supply-chain management that are often disregarded since they involve short distances and local carriers. The growth in the amount of freight circulating within urban areas thus requires a concerted effort from different levels of governments for a wide range of issues related to traffic management and zoning.*

The importance of logistics investments

In many developing economies, including Latin America and the Caribbean, the development of transport infrastructure has been an enduring focus for economic development. The recent surge of international trade and its related freight distribution systems now requires the development of **logistics capabilities**, which are supported by both physical (infrastructures) and managerial assets. Globalization has imposed more complex, geographically dispersed, and flexible supply chains that require advanced logistics. Logistics involves a wide set of activities dedicated to the **transformation and distribution** of goods, from raw material sourcing to final market distribution, including related information flows.¹ **Logistics investments** include the allocation of capital to improve the efficiency of freight distribution through:

- **Infrastructures**, such as terminals, real estate, and telecommunications;
- **Operations**, including transport modes and equipment, and;
- **Human resources** related to labor, management, and governance, as well as research and development.

The outcomes of investing in logistics capabilities are numerous, but are mainly increased **integration with global trade and supply chains**, **better utilization of national transport assets**, more **competitive exports**, and **lower costs for imports**, as well as increased **employment opportunities**. For freight distribution, the conventional approach of investing in infrastructure alone is now perceived to be **insufficient**; rather investment should be made in a **wider framework** that includes the supporting activities of logistics (Figure 1).

This report's objective is to raise awareness among the public sectors in Latin America and the Caribbean of the **benefits of investing in logistics-related projects** in addition to the traditionally prioritized investments in physical infrastructure. It aims to provide a framework for policy makers by identifying key logistics areas for the **investment of public resources**; the **benefits** of such investments as well as the possible **beneficiaries**; and the **data**, sources of data, relevant variables, and methodologies/approaches needed to estimate such benefits.

The report is structured into four sections:

- The first section underlines the close **interdependencies** and integration among **international trade, transportation, and logistics**. It focuses on maritime transportation and ports since they support international trade and are key to the commercial relations of Latin America and the Caribbean with the rest of the world.
- The second section focuses on the several **dimensions of logistics performance**, from improved intermodal and work practices to regulatory and customs integration. It underlines the multidimensional character of the concept of performance applied to logistics, which involves a wide array of potential measures for public / private partnerships.

¹ Hesse, M. and J-P Rodrigue, (2004) "The Transport Geography of Logistics and Freight Distribution", *Journal of Transport Geography*, 12 (3): 171–184.

- The third section discusses the **benefits of logistics projects** over the dimensions of employment, services, the integration of gateways and corridors, the setting of logistics zones and inland port facilities, information systems, and the management of container assets, as well as sustainable strategies for logistics.
- The fourth section proposes an **evaluation methodology** to assess the benefits of logistics projects, including criteria for successful projects, performance drivers and measures, and potential data sources.

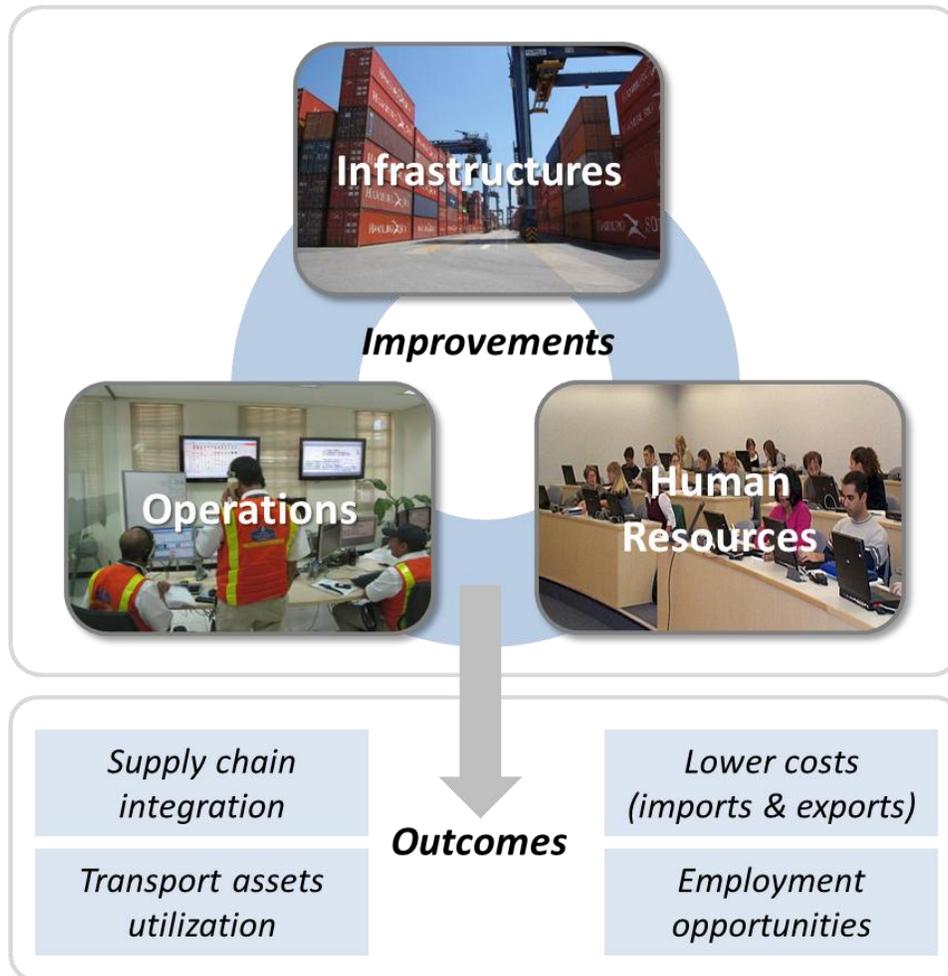


Figure 1 - The Benefits of Logistics Investments

International trade, transport, and logistics

Global trade

International trade is based on the notion of exchange, which involves **what is being traded**, the **partners involved**, and the **transactional environment** in which trade takes place, including custom procedures and tariff and nontariff barriers. The benefits of international trade have been well documented² and include **expanded markets** for exporters with **better economies of scale; lower prices** for importing goods (e.g. retail); higher **quality and choices** of goods and services; and **job creation** in the industrial, distribution, and transportation sectors.

Commonly, international trade is viewed as a series of commercial transactions among trade partners that tracks the nature and value of what is being traded. Its extent, either in value or volume, is an abstract expression of the quantity of goods being exchanged, as opposed to the actual physical flows supporting trade. The physical realization of international trade requires a **transport chain**, a series of logistical activities that organize modes and terminals, such as railway, maritime, and road transportation systems that provide **continuity along the supply chain** through a set of stages. The most common stages are listed below and illustrated in Figure 2:

- The first stage in the transport chain is **composition** in which loads are assembled at the origin, often on pallets and/or containers. Composition enables economies of scale over a transport chain by providing larger and easier-to-handle load units.
- The cargo then moves along a national transport chain using a transport mode, commonly rail or road, to reach a terminal where it is **transshipped** at an international transport mode (port or airport). Additional economies of scale become possible as several load units can be consolidated into a single large shipment, such as a container on a containership.
- Once cargo enters another country through a **gateway** (point of entry) customs inspection takes place and the cargo is transshipped over the inland transport system. Custom procedures and delays are among the most constraining factors in global freight distribution.
- The final stage of the transport chain, **decomposition** (the last mile), takes place in the proximity of the final destination. Loads are broken down into units corresponding to demand, such as store orders. If the demand concerns retail goods, urban freight distribution strategies may be required.

² Fujita, M., P. Krugman, and A.J. Venables (1999) *The Spatial Economy: Cities, Regions and International Trade*, Cambridge: MIT Press.

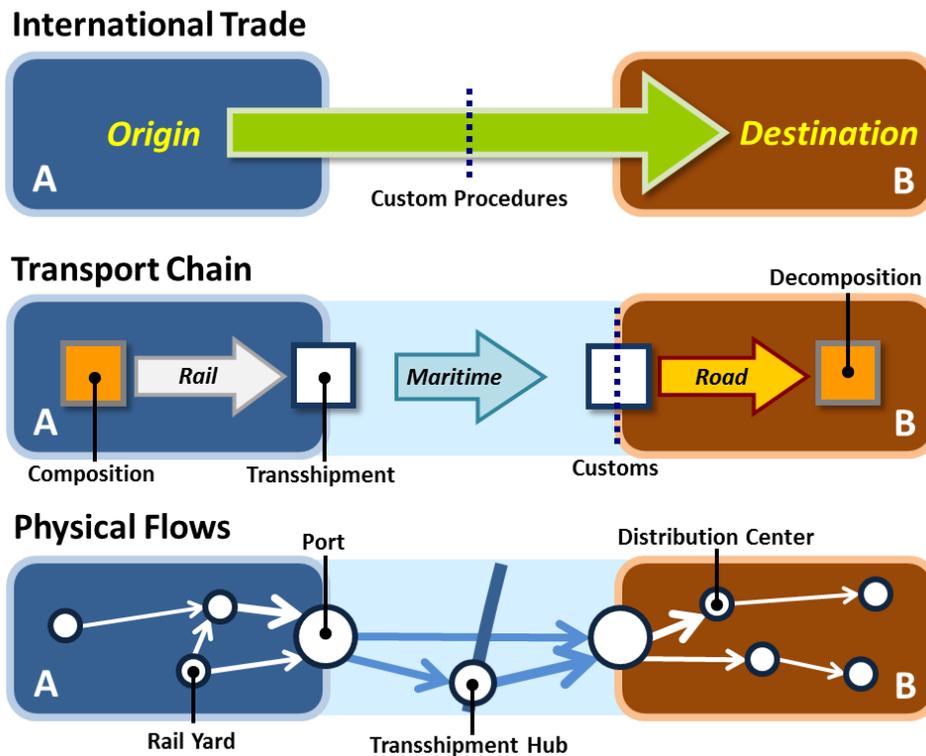


Figure 2 - International trade: Transportation chains and flows³

In the operational reality of modes and terminals, international trade is a series of physical flows that may not use the most direct path, but rather the path of **least resistance**, which is often the least costly. The existence of **inland corridors**, where economies of scale are more effective, shapes the structure of freight flows and well as the selection of the port of exit. These corridors are often the result of substantial investment in transport infrastructure, coordinated by public policy. On the maritime side, **transshipments hubs** have become strategic intermediary locations helping consolidate maritime flows and connecting different maritime systems of circulation. In such a setting, the **container** has become the fundamental element to facilitate transfers between modes. **Distribution centers** play an important role in physical flows since they can act as a buffer to help reconcile the temporal and spatial requirements of demand.

The role of developing countries in international trade has increased recently, partly because of improved trade facilitation measures.⁴ Still, several constraints related to transport chains and their physical flows remain to be improved in Latin American logistics. This improvement requires efforts in the private sector, the development and strengthening of public sector institutional capacity, and the availability of data and benchmarking systems to effectively monitor performance. Freight distribution capabilities, intermodal infrastructure, and trade facilitation measures have become increasingly

³ Rodrigue, J-P (2012) "Supply Chain Management, Logistics Changes and the Concept of Friction", in P.V. Hall and M. Hesse (eds) *Cities, Regions and Flows*, London: Routledge.

⁴ Guerrero, P., K. Lucenti, and S. Galarza (2010) *Trade Logistics and Regional Integration in Latin America and the Caribbean*. ADBI Working Paper 233. Tokyo: Asian Development Bank Institute.

important in reducing nontariff barriers and transportation costs to provide added value to national economies through increased integration. For instance, it has been assessed that at the macroeconomic level a 10 percent decrease in freight costs and tariffs would increase bilateral imports of Latin America and the Caribbean by about 45 percent and intraregional exports by about 60 percent.⁵

Ports and maritime transport systems

The port, particularly the container terminal, has become an important trade and logistics platform whose level of activity reflects not only the intensity of the use of its infrastructure, but also the logistical capabilities set in place to support its operations. The maritime freight market is divided into **bulk cargo and containerized cargo**. Bulk operations, which mostly concern raw materials, are structured as point-to-point services between a port of loading and a port of unloading. In Latin America and some Caribbean islands (e.g. Jamaica) bulk shipping trade logistics are relatively simple and assumed by large conglomerates that often own and operate the facilities and terminals. It is in containerized cargo that **most of the developments in logistics** are taking place, mainly because it involves a wide range of goods, many of high added value. Also, several important trade commodities, such as coffee and wood products, are now being containerized, which offers opportunities for backhaul movements (such as finding cargo for empty containers accumulated at a port) out of Latin American and Caribbean ports.

Freight distribution operates over markets defined by **maritime ranges and port hinterlands**. The maritime system of the Americas is composed of six major maritime ranges, each with its distinct freight distribution system and logistics as outlined below and in Figure 3:

- **East, West, and Gulf Coasts of North America.** This subsystem has three coasts (Pacific, Atlantic and Gulf of Mexico) which are well integrated with their hinterlands through long distance rail corridors (land bridges). Most of the gateways are within four port clusters such as Los Angeles / Long Beach, Vancouver / Seattle - Tacoma, Charleston / Savannah, or New York / Hampton Roads. These clusters provide shipping options to importers and exporters and act as logistics platforms for continental freight distribution. Although hinterland access depends on port proximity, the efficiency and capacity of rail transportation (e.g. double stacking) can provide higher levels of hinterland competition. With the operationalization of NAFTA and the integration of its rail system (e.g. the acquisition by Kansas City Southern Railways of a rail corridor between Kansas City and Lazaro Cardenas), Mexico is increasingly integrated with the North American West and Gulf Coasts.
- **Caribbean.** This subsystem has small and commonly uncontested hinterlands, implying limited growth potential, with a few exceptions (e.g. Cuba, Venezuela, and Colombia). The nature and extent of freight traffic is related to the level of economic activities on each island. The tourism sector, which is generally well developed on most Caribbean islands, requires a varied and significant volume of imports, which need distribution and logistical capabilities. Distribution

⁵ Inter-American Development Bank (2003) *Iniciativa para la Integración de la Infraestructura Sudamericana (IIRSA)*. Informe de Trabajo. Departamento Regional de Operaciones 1. Washington, DC: Inter-American Development Bank.

tends to be port centric and the small economies of scale due the limited market size of most islands are challenging. The main growth driver is transshipment through the Panama Canal a fundamental driver of this business.

- **East and West Coasts of South America.** This subsystem has two coasts that are not integrated because they fall into different jurisdictions (cross-border traffic) and because there are physical difficulties to servicing the hinterland. Inland rail connections tend to be poor or nonexistent; when present they simply link a gateway and a few inland load centers. Each coast is a different market and each port usually asserts dominance over its hinterland (captive hinterland) since competition is limited. Most ports are not directly connected to deep-sea shipping lines but rather through coastal services to main transshipment hubs such as Santos, Buenos Aires, or Callao.

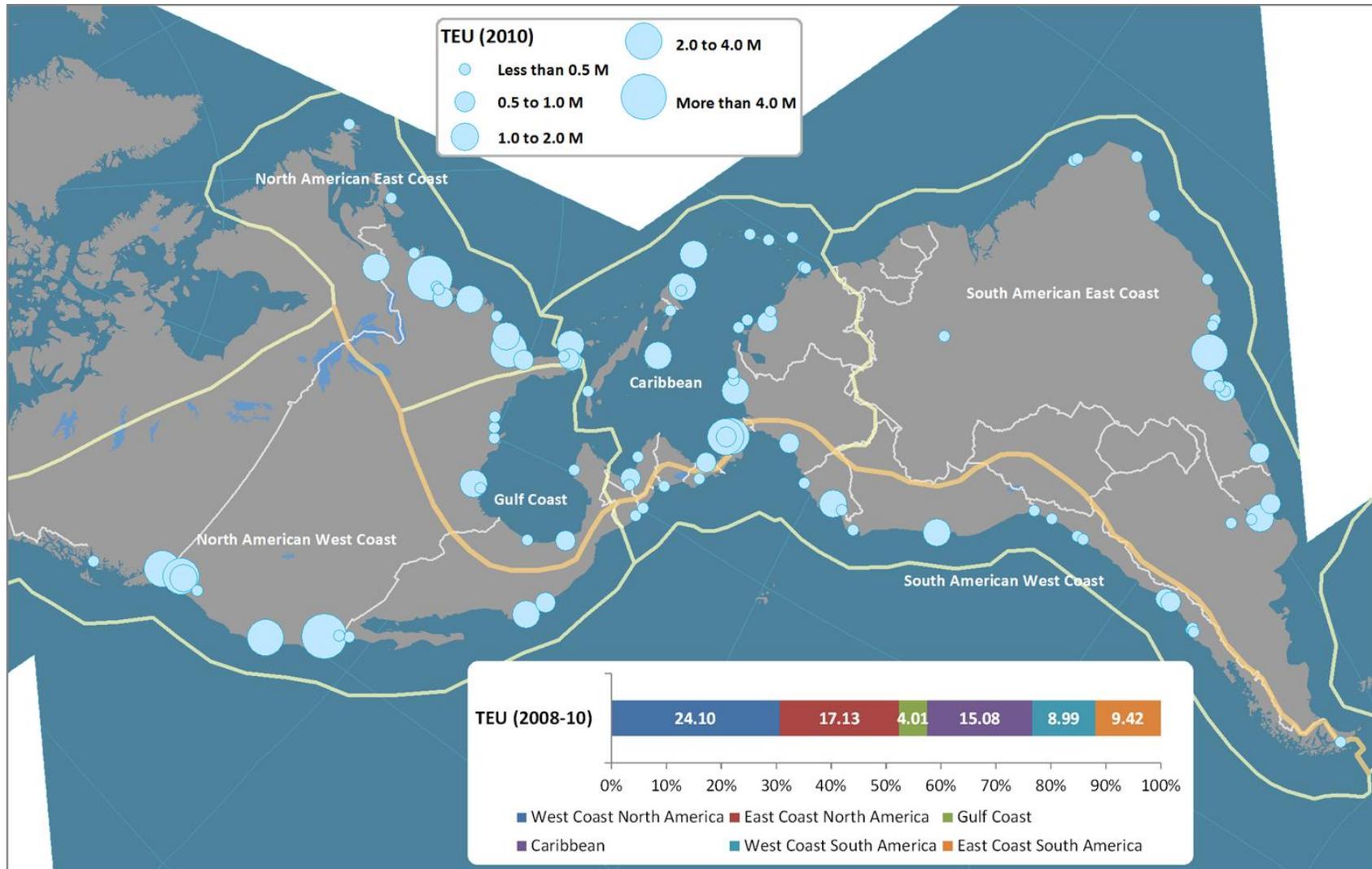


Figure 3 - Container ports and main maritime ranges of the Americas, 2010

A look at the net growth of containerized traffic at the maritime range and port levels (Figure 4) reveals significant changes in port dynamics in recent years. While the North American East and West Coasts remain the most salient ports, handling an average of 24.1 and 17.1 million TEU respectively over the 2008-10 period, they have experienced no net growth in traffic between 2005 and 2010. **Latin American and Caribbean ports accounted for 88 percent of the net container growth of the Americas** during that period. This growth is putting pressure on freight distribution systems, which **need to develop better logistical capabilities**. It also supports the development of economies of scale in maritime shipping since a growth in traffic handled by Latin American ports can attract services by bigger, and thus more cost-effective, ships. The outcome would be a **reduction in transportation costs** and better **trade facilitation**.

However, growth is far from uniform and has mostly benefited the **largest ports in Latin America** (Figure 4). In Mexico, for example, notable growth took place on the Pacific Coast, particularly at the ports of Manzanillo and Lazaro Cardenas. This growth was partly due to a growing level of consumption in the Mexican economy, but also to the growing use of **Mexican West Coast ports to access the North American hinterland**. The Mexican ports offer lower labor costs and less congestion, plus their depths of up to 18 meters accommodate the largest containership classes.⁶ Mexico has established more free-trade agreements with other Latin American countries than any other country, paving the way to greater commerce. In 2012 **APM Terminals**, an international container terminal-operating company headquartered in The Hague, Netherlands, committed to build a new 100-hectare terminal facility at Lazaro Cardenas to take advantage of these factors.

⁶ Cushman and Wakefield (2009) *New Age of Trade: The Americas*, Industrial white paper for NAIOP Research Foundation, January 2009.

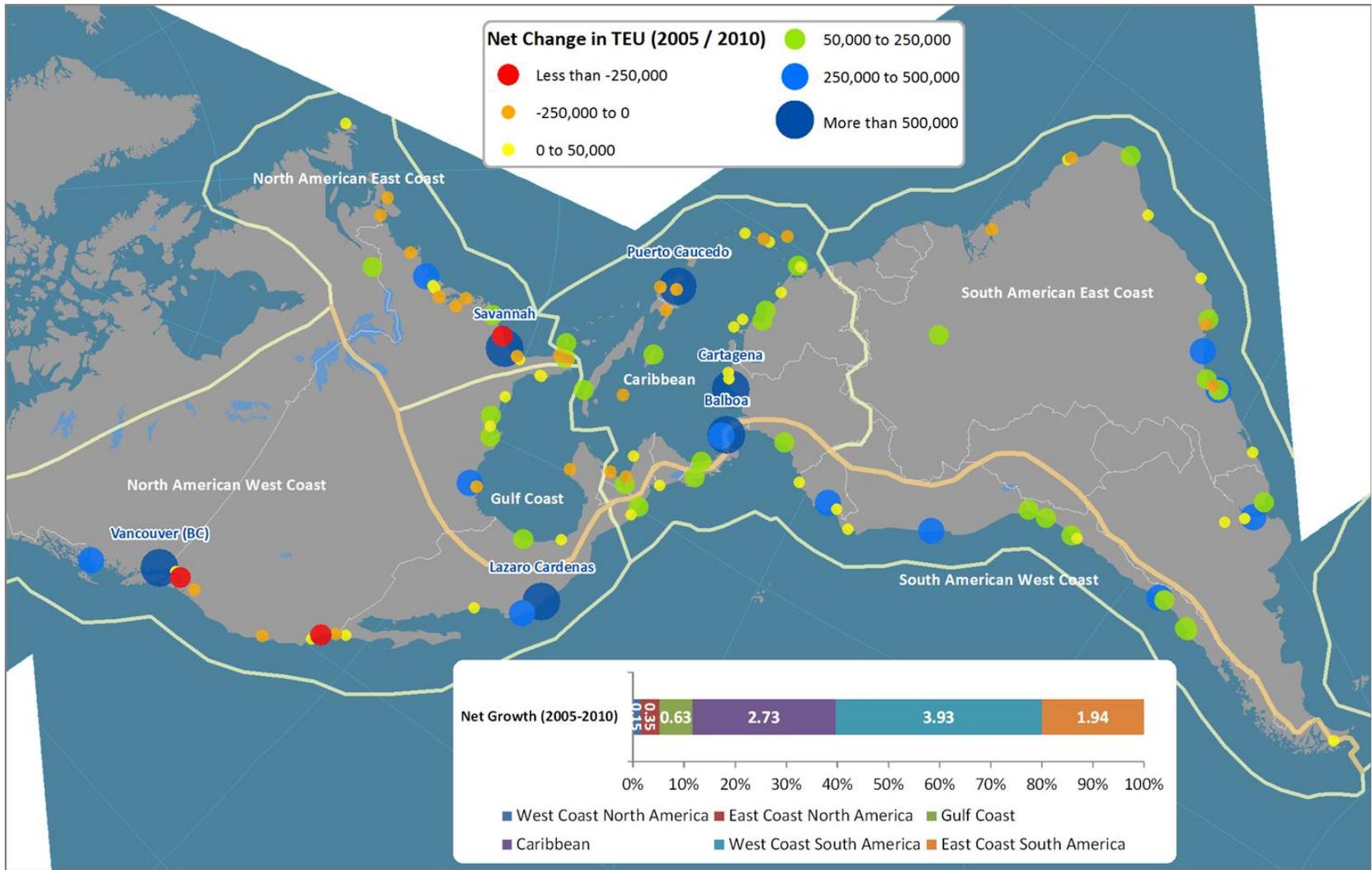


Figure 4 - Net Traffic Change (in TEU), Container Ports of the Americas, 2004-06 to 2008-10

At the global level, only 16 percent of commercial relations involve direct connections between ports, thus **transshipment is a fundamental aspect of maritime shipping networks**. In recent years, an active transshipment market has emerged in the Caribbean, particularly within what has been dubbed the “**Caribbean transshipment triangle**” (Figure 5). Outside this triangle, the growth of transshipment remains limited. The growth in the Caribbean transshipment activities is linked to issues such as **economic growth in Latin America**, being at the **crossroads** of transatlantic and north-south trade flows, and the need of **shippers** to reconcile numerous inbound and outbound trade flows within their shipping networks. Transshipment activities are thus a mix of hub-and-spoke network configurations as well as interlining between long-distance shipping routes. The advantages gained in terms of network interconnectivity and better use of ship assets outweigh the additional handling costs that transshipment entails.



Figure 5 Latin American container port traffic and transshipment

The expansion of the Panama Canal is opening a new phase for Caribbean transshipment and Latin American trade. A likely response from several transshipment hubs would be the development of logistical activities to better anchor traffic. If this response is coupled with agreements with the American customs office to pre-clear some of the cargo at the transshipment hub, the containers could be moved directly inland from an American East or Gulf Coast port. This arrangement could advantage ports such as Kingston, Caucedo, and Freeport that are highly linked with the United States. Several ports are already anticipating this trend. For instance, in 2011 the Jamaican Port Authority announced plans to expand the Port of Kingston, doubling its capacity to about 4 million TEU and developing port-centric logistics zones.

Another important factor behind the use of a transshipment hub is the availability of gateway-related traffic as it enables more **stable and diversified traffic**. This situation could advantage ports such as Cartagena, Santos, and Callao, which are likely to become significant transshipment hubs within their respective maritime ranges. Still, transshipment traffic remains **footloose** since a shipping company can switch hubs overnight if conditions are judged suitable.

There are indications that Panama will gain the most from the growth of transshipment. The growth of Panama's maritime commerce, specifically of manufactured or semimanufactured goods originating in East Asia, has been one of the main drivers of the expansion of the Panama Canal. In addition, this growth has compelled both Panama's Caribbean ports (Manzanillo International Terminal, Cristobal, and Colon Container Terminal) and Balboa, on the Pacific, to continue adding capacity to guarantee the service level and terminal productivity required for the profitability of these cargos.

Logistics and the organization of global production

The emerging global economy is eminently complex and substantial efforts have been made to support a global division of production, distribution, and consumption that is increasingly fragmented. Higher fragmentation levels involve a higher level of intensity of freight distribution (e.g. ton-km).⁷ Decisions made by corporations to **outsource** their outputs can result in substantial challenges for supply chain management, including:⁸

- **Internal and organizational challenges.** There are many managerial and human resources concerns in dealing with global supply chains. Several enterprises have had difficulties adapting to the variety of regulatory, political, and cultural complexities of a multinational organizational structure.
- **Supplier and supply chain challenges.** Suppliers must develop the capacity to meet globally recognized standards.
- **Market and broader challenges.** Corporations must assess growth potential in light of various legal and regulatory contexts. One major challenge is to identify opportunities in mature and growing markets.

⁷ World Bank (2009) *World Development Report 2009: Reshaping Economic Geography*, Washington DC: The World Bank.

⁸ Jennings, R.J. (2010) *Globalization: A Smarter Supply Chain for the Future*, CAPS Research, Critical Issues Report, September.

Many Latin American and Caribbean countries are challenged in these three areas to abide by and comply with globally recognized standards in supply chain management.

The concept of a “**global production network**” has emerged as a dominant paradigm that describes the complex spatial and functional structure that globalization imposes on supply chains. The paradigm focuses on how different segments and locations add value throughout the process and describes the array of manufacturing capabilities – from simple to complex – required to do so.⁹ Many locations are trying to improve upon these capabilities, which involve a shift in how added value is created, captured, expanded, or retained:¹⁰

- **Value creation.** Concerns new activities within a supply chain and is linked with a paradigm shift such as a new terminal, lower distribution costs, a new technology, or a new market. It often takes place in developing countries that are connecting to global economic processes.
- **Value capture.** Commonly linked with value creation, value capture implies the accumulation of related activities at a specific location, such as a terminal or within a logistics zone. Value capture involves getting a higher return in terms of added value because new activities are created.
- **Value expansion.** The growth of existing strengths, mainly in relation to the growth of traffic along a supply chain expands the value of a product. Therefore, the more traffic, the more value generated for the local economy.
- **Value retention.** Value is retained by keeping desirable added-value activities that might otherwise have ceased or be relocated elsewhere (value capture by another location). It is a difficult process to mitigate since it is linked with changes in economic fundamentals such as comparative advantages related to labor, land, and even exchange rates. However, value capture and expansion could have a significant impact on value retention.

Global production networks are supported by efficient logistics since they require **sufficient transport capacity** as well as **management of these flows to insure reliability and timeliness**. Global production networks were made possible by innovations in containerization, intermodal transport, and the application of information technology in physical distribution and materials management. An outcome has been an increasingly **broad scope of supply-chain management** to include customer service, demand forecasting, documentation flow, interfirm movements, inventory management, order processing, packaging, parts and service support, production scheduling, purchasing, returns, scrap disposal, traffic management, warehouse and distribution center management, and transportation. These services must be developed and managed to maintain the efficiency of the production system. It can even be argued that, in light of intense global competition, particularly in retail goods, supply chain efficiency remains one of the few strategies available to **promote competitiveness**. Therefore, improving logistics performance is of strategic national interest in a globalizing economy.

⁹ Hausmann, R., Hidalgo, C.A. et al. (2011) *The Atlas of Economic Complexity: Mapping Paths to Prosperity*, New Hampshire: Puritan Press.

¹⁰ Rodrigue, J-P (2006) "Transportation and the Geographical and Functional Integration of Global Production Networks", *Growth and Change* 37 (4): 510-25.

The concept of supply-chain integration

Logistics investments, in addition to improving transport capacity and efficiency, tend to be most effective when they **increase the level of supply-chain integration (SCI)**. Supply-chain integration is the **alignment** of supply-chain goals and objectives along with the related information and physical **linkages**.¹¹

- **Alignment.** Shared goals among the elements of the supply chain, often aimed at reducing their costs and improving their performance. Alignment insures a consistency in the strategy pursued by the actors involved.
- **Linkages.** Concerns the information and physical flows among the elements of the supply chains, such as orders, tracking, and the modes and terminals involved.

SCI leads to a better use of the hard (**infrastructure**) and soft (**management and skills**) assets supporting supply-chain management. SCI poses 14 challenges:

- a) Assessment of the potential improvements from a higher level of SCI across the supply chain.
- b) Development of human resources and managerial strategies supporting SCI.
- c) Development of customer-centric metrics.
- d) The segmentation of supply chains according to customer and market preferences.
- e) Allocation of functions and labor along the supply chain.
- f) Including supply-chain considerations in the design and outsourcing of products and services.
- g) The fundamental importance of sourcing.
- h) Consistency in the relationships between suppliers and customers.
- i) Comprehensive sales and operations process for managers and customers.
- j) Development of a database system to store, analyze, and share information.
- k) Development of analytical tools to support supply-chain decisions such as routing.
- l) Building trust among the actors of the supply chain.
- m) Sharing risks among the actors based upon their respective levels.
- n) Sharing benefits among the actors based upon their respective contributions.

A prevalent drawback of SCI strategies is emphasizing the information and managerial dimensions too much over the physical processes; an overemphasis on process can lead to diseconomies. Totally integrated supply chains should be replaced by more loosely coupled processes and planning systems run by companies who preserve their autonomy and use competition as an incentive system.¹² These companies should interconnect bilaterally to exchange information about updated demand forecasts and the availability of capacities. However, they should not develop strongly integrated networks, which can lead to a lack of flexibility and resiliency.

¹¹ CAPS Research (2009) *Supply Chain Integration: Challenges and Good Practices*, Institute for Supply Management and W. P. Carey School of Business at Arizona State University.

¹² Bretzke, W. R. (2009) "Supply Chain Management: Notes on the Capability and the Limitations of a Modern Logistic Paradigm", *Logistics Research* 1(2): 71– 82.

SCI tends to be more rhetorical than practical: true collaboration remains uncommon, particularly since many players would be collaborating over one supply chain while competing over another.¹³ The business model of several corporations views SCI practically, as a **punctual and temporary endeavor**. In Latin America, the silos mentality in supply-chain management remains prevalent, particularly in developing countries where intermodalism is less dominant.

¹³ Fawcett, S.S. and G.M. Magnan (2002) "The Rhetoric and Reality of Supply Chain Integration", *International Journal of Physical Distribution & Logistics Management* 32 (5): 339–61.

Improving logistics performance and competitiveness

Logistics performance

Integration into the global economy remains a challenge for several Latin American countries; improving their logistics performance is a **salient policy objective** with significant economic and social consequences. Customs clearance, transport infrastructure (ports, airports, and hinterland transportation), information systems, and the availability of transport and logistics services are important component of logistics performance. An improved logistics sector is likely to attract economic development opportunities as well as employment and wealth accumulation. Improving logistics performance can be seen as shifting from a **vicious to a virtuous cycle** (Figure 6). Trade facilitation strategies, including infrastructure investments, mostly promote the development of logistics capabilities whereas protectionism is commonly associated with commercial inertia and difficulties ensuring efficient freight distribution. The distinctiveness between trade facilitation and transport infrastructure development remains unclear. In some countries infrastructure is adequate, but the coordination among institutions is deficient.

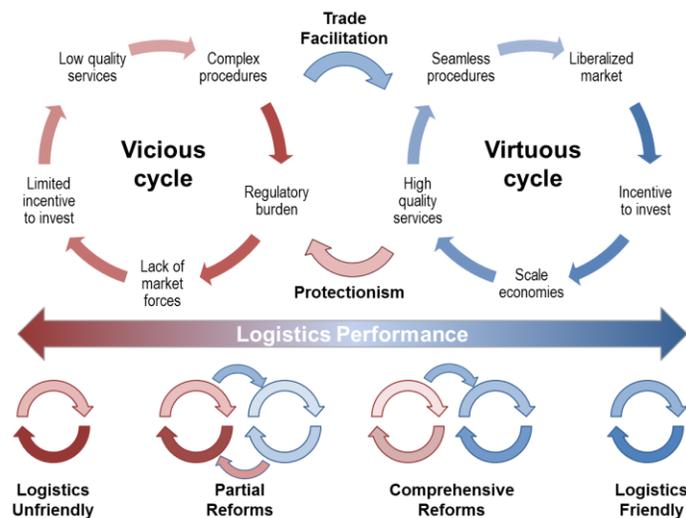


Figure 6 - The logistics virtuous and vicious cycles¹⁴

Several developing countries are caught in a vicious cycle in which existing interests are using **freight distribution as a rent-extraction mechanism**, regulatory burden is heavy, the lack of market forces are associated with limited incentive to invest in additional facilities, services are low-quality, and complex procedures (customs, taxation, inspections, etc.) hinder trade. Moving away from this vicious cycle and toward a virtuous cycle often requires trade facilitation reforms, such as market liberalization. Inertia is difficult to break, but national benefits can be substantial since the virtuous cycle leads to more open markets, incentives for capital investment, the building of scale economies (and the associated

¹⁴ Source: adapted from Arvis, J-F, G. Raballand, and J-F Marteau (2007) *The Cost of Being Landlocked: Logistics Costs and Supply Chain Reliability*, Policy Research Working Paper 4258. Washington, DC: World Bank.

reduction in transport costs), higher-quality services, and more efficient supply-chain management. There is also the challenge of building institutional capacity and coordination among agencies to ensure that transport and logistics projects, particularly those of large scale, are identified, developed, and managed.

The development and provision of advanced logistics services varies from country to country. In the developed world, these services are extensive, competitive, and have grown substantially. In most developing countries, the market for logistics services is small, which can be a major deterrent for companies wishing to establish a market presence. Four main classes of logistical performance can be defined:

- **Logistics-friendly locations.** These locations benefit from the dynamics of a virtuous cycle in logistics performance by offering seamless procedures and high-quality infrastructure. The logistics industry is integrated globally implying that many firms are operating in several countries and are thus able to provide multinational services. Most of the advanced economies of Western Europe, North America, and East Asia (Japan, South Korea, Taiwan, and Hong Kong) are within this category.
- **Locations under comprehensive reforms.** Here, the logistics industry has experienced substantial changes with reforms across several sectors of activity (customs, infrastructure, services). Although there are still elements of the vicious cycle (e.g. regulations), reforms, such as lowering barriers of entry and promoting competition, which attracts global logistics firms, are consistently been applied. The logistics sector in these locations is growing rapidly with the establishments of new supply chains and facilities. They are found in the developing economies of Latin America, East and Southeast Asia, South Africa, and India.
- **Locations under partial reforms.** These locations have implemented some of the core reforms, but there is a strong inertia, which creates uncertainties. The most salient problems are related to difficulties in working across sectors (e.g. different modes), resistance to change (delays for reforms), governance problems (lack of clear ownership), and barriers to entry (protected activities). Logistics is operating in a complex and often arbitrary environment, but global demand, local market potential, and the possibility of additional reforms are inciting global logistics firms to establish services over niche markets. African, South Asian countries other than India, and the Middle Eastern countries are generally in this category.
- **Logistics-unfriendly locations.** These countries are caught in the vicious cycle and there is limited indication that their situation will change. Most of the transport sector and logistics are controlled by national interests using these activities for rent extraction. Basic reforms in customs or key infrastructure are difficult to design and implement because there is limited support from the public and private sectors. There is limited incentive to invest in infrastructure or services, in part because governance is highly problematic. Less developed economies and most landlocked countries are in this category.

One of the most salient benchmarks in supply-chain management is the World Bank's **Logistics Performance Index (LPI)**,¹⁵ which has received wide acceptance and coverage. Its goal is to assess how countries rank in the managerial and physical effectiveness of their logistics. The LPI is a composite index based on proxy measures for transport and information infrastructure, supply chain management (SCM), and trade facilitation capabilities, which are calculated based on a world survey of international freight forwarders and express carriers. The LPI is based on seven underlying factors of logistics performance:

1. Efficiency of the clearance process by customs and other border agencies.
2. Quality of transport and information technology infrastructure for logistics.
3. Ease and affordability of arranging international shipments.
4. Competence of the local logistics industry.
5. Ability to track and trace international shipments.
6. Domestic logistics costs.
7. Timeliness of shipments in reaching destination.

At the global level, a gradual **convergence of the LPI** is observed, even if significant differences remain (Figure 7). This convergence is mostly the outcome of the diffusion of transport infrastructures, and services, a process favored by the growing presence of **global freight carriers**, such as maritime shipping companies, global terminal operators, air freight and even third-party logistics providers. The LPI rankings show that building the capacity to connect firms, suppliers, and consumers is key in a world where **predictability and reliability** are becoming even more important than costs in supply-chain management. Although it is assessed at the national level, LPI has emerged as a framework to establish more localized (port or region) assessments of logistics performance. Ports have been the most significant elements subject to this emerging benchmarking.

¹⁵ World Bank (2010) *Connecting to Compete: Trade Logistics in the Global Economy, The Logistics Performance Index and Its Indicators*, Washington DC: The World Bank.

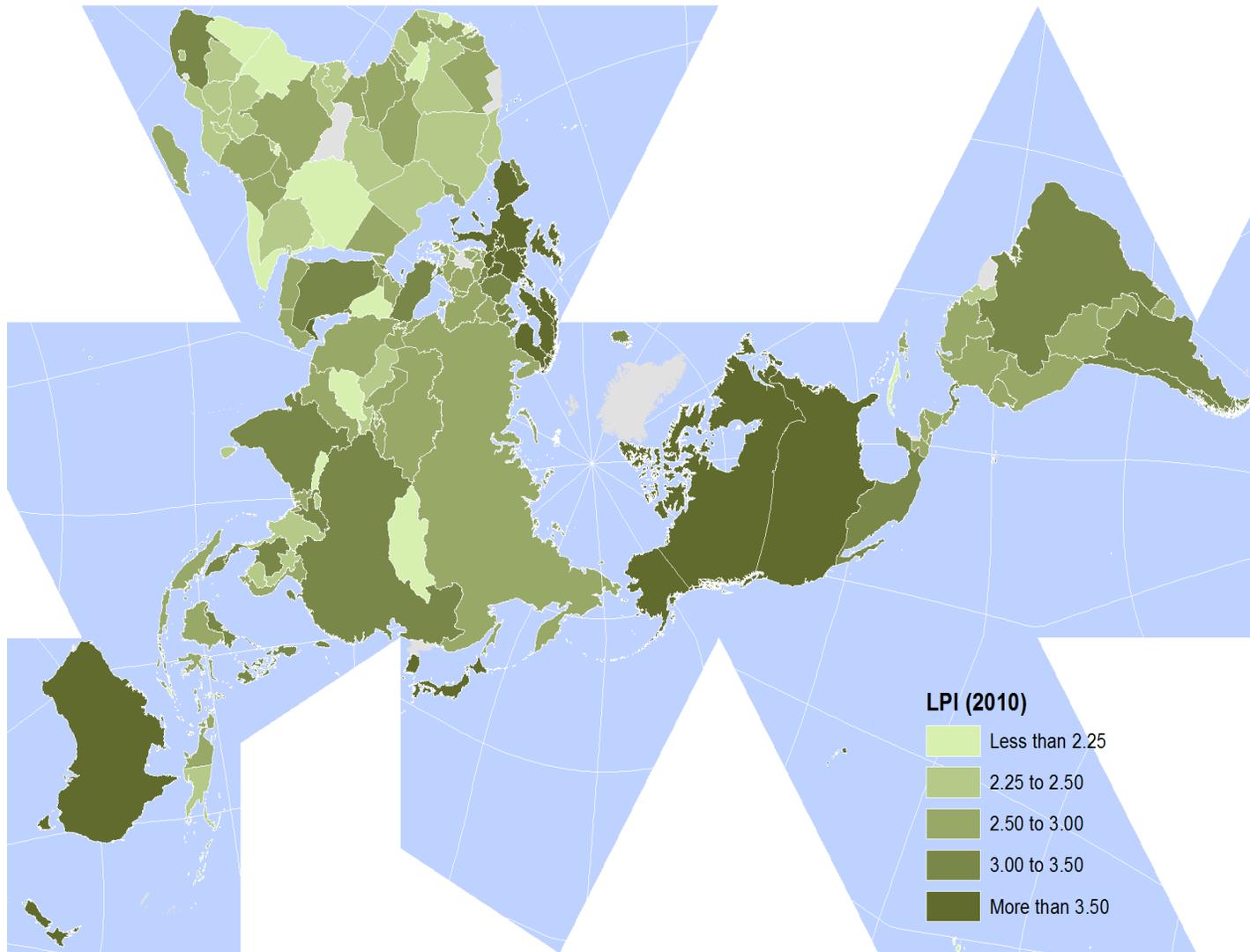


Figure 7 - Logistics Performance Index, 2010.

The LPI shows that the efficiency of freight distribution is not only an issue of adequate infrastructure, although infrastructures are particularly important in developing countries, but also of a range of issues related to the **management of freight flows**. Customs is one of the most constraining factors in managing international supply chains, as shown by a comparison of the components of the LPI for Latin American and Caribbean countries (Figure 8). Infrastructure commonly came in second

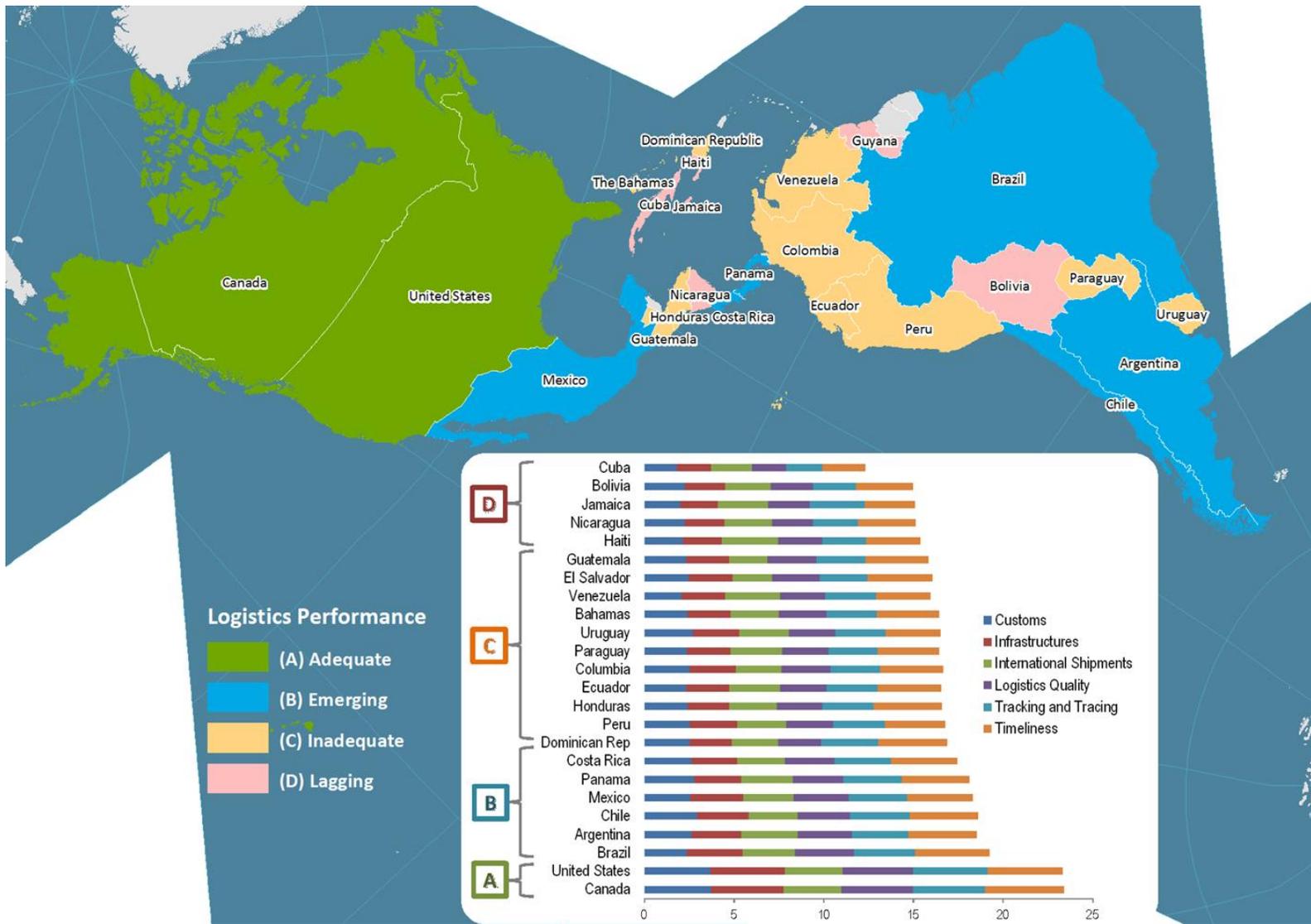


Figure 8 - Components of the Logistics Performance Index, selected Latin American countries, 2010

Infrastructure and commercial integration

Infrastructure integration is the **physical connectedness and interoperability** of hard infrastructure, such as the ability to move containers efficiently from ship to truck to rail. The transport terminal – port, rail or airport – is the key infrastructure where the physical flows are reconciled with the requirements of supply-chain management. Facilities such as distribution centers often play a significant role in supply-chain management when they act as more than buffers (warehousing), but as active elements in the physical flows. For instance, transloading and crossdocking take place in advanced freight distribution systems do mitigate with complex operational constraints. Transloading enables to switch cargo from an international container to a domestic load unit such as a 53 foot container. Among the main advantages are a better utilization of the domestic transport capacity and making the container available for exports. Crossdocking is a common practice in mass retailing where the inbound cargo loads are concomitantly handled so that loads are mixed to the specific demand of a store or a regional distribution center. As commercial integration improves in Latin America, such practices are likely to become more prevalent.

Port terminal productivity measures include three asset classes: terminal real estate, the container yard and its intermodal equipment (e.g. cranes), and the berths and vessels.¹⁶ The sustainable throughput of a terminal is generally around 80 percent of its capacity, after which operational hurdles become a constraint. A better integration between the maritime and inland sides of the terminal are key to productivity improvements. For inland freight distribution, rail remains the fundamental infrastructure to support supply chains, thus efforts to better integrate rail services with container yard operations are important.

Distribution centers play a substantial role in supply-chain management. These facilities serve three functions:¹⁷

- **Fabrication:** assembling goods out of parts or fabricating the parts themselves. Pure fabrication is usually done in a factory but many distribution centers perform light manufacturing activities such as assembly, packaging, and labeling. This function requires that the goods spend some time in the warehouse and that parts are stored before assembly. Due to the perishable nature of the goods, cold chain facilities (mostly refrigerated warehouses) perform both fabrication (e.g. packaging before final delivery) and distribution functions.
- **Storage:** as a buffer to hold inventory within the supply chain and release it on demand. Rack-supported warehouses are pure storage facilities with the rack system being the basic structural support for the building. They offer a high storage density along with a comparatively low land-use footprint.

¹⁶ Tioga Group (2010) *Improving Marine Container Terminal Productivity: Development of Productivity Measures, Proposed Sources of Data, and Initial Collection of Data from Proposed Sources*, Report for Cargo Handling Cooperative Program, Moraga, CA : The Tioga Group, Inc.

¹⁷ Yap, J.L. and M.C. Rene (2003) *Guide to Classifying Industrial Property*, 2nd edition, Washington DC: Urban Land Institute.

- **Distribution:** where loads are consolidated, deconsolidated, or changed. For instance, a regional warehouse temporarily holds the inventory for a group of retail stores. A crossdocking distribution center is a good example of a pure distribution facility.

Instability and unpredictability are related to **higher inventory levels** and the use of **more expensive modes and routing options**. While American firms hold inventories in the range of 15 percent of GDP, Latin America and other developing regions often show figures twice that percentage.¹⁸ These storage costs can be more important than capital and input costs in determining competitiveness.

Commercial integration is the development of commercial arrangements to promote a better integrated logistics system, including **service-level agreements** and **performance targets and penalties** as well as the management process, for example between main-line railways and short lines, or between railways and ports (or terminal operators). Commercial integration regards the elements of **cost, time, and reliability as commercial goals** that are benchmarked and included in commercial supply-chain decisions. Because the actors in the freight distribution sector are numerous, each controlling different assets (Table 1), the potential scale and scope of collaborative efforts becomes a complex matrix.

Table 1 - Major Commercial Actors in Freight Distribution

Transport Sector	Function
Maritime shipping companies	Control long-distance segments of the global freight distribution linking major markets. Highly capital-intensive industry. Set service network configuration (ports of call and routing).
Global port terminal operators	Control important intermodal infrastructures (terminals) within the world's largest container ports. Have strong linkages with maritime shipping companies.
Port authorities	Manage and plan port infrastructures. Tend to lease terminal operations. Important intermediaries for regional distribution (hinterland).
Real estate promoters	Develop logistics zones (build to lease, build to suit), often in coordination with terminals (rail and port). Manage a real estate portfolio of distribution centers (leases).
Maritime lock and canal operators	Operate strategic passages in global and national distribution (e.g. the Panama Canal, the Suez Canal or the St. Lawrence Seaway).
Rail and rail terminal operators	Strategic inland freight carriers transporting a wide array of raw materials and commodities. Responsible for many of the transshipments between rail and road, particularly for containerized freight.
Trucking industry	Controls vast and diverse assets that include critical segments of freight distribution in all economic sectors. Short and medium haul transport.
Third party logistics providers	Important managerial and organizational skills within supply chains. Often act as brokers between transport customers and service providers. Some own and operate transport assets.

¹⁸ Guasch, J.L and J. Kogan (2006) *Inventories and Logistic Costs in Developing Countries: Levels and Determinants: A Red Flag for Competitiveness and Growth*. Policy Research Working Paper 2552. Washington DC: World Bank.

Air freight transport companies and air freight terminals	Important assets for the rapid distribution of high value-added freight. Set service network configuration (airports serviced).
Freight forwarders	Perform tasks such as packaging, labeling, consolidating shipments on behalf of their customers. Operate distribution centers. Define how markets are serviced. Can subcontract to third party providers.

Commercial integration involves horizontal and vertical cooperation between the actors. **Vertical cooperation** concerns modes and processes upstream or downstream in the supply chain, such as between a maritime shipping company and a terminal operator. **Horizontal cooperation** concerns modes and processes at the same stage of the supply chain, such as between a terminal operators and a trucking company. In commercial integration, companies can exploit synergies by **outsourcing to a third party, acquiring or merging with another company, or seeking cooperation with other companies**.¹⁹ Which option they choose can be crucial to their success.

Commercial integration takes place over two dimensions:

1. **Agreements between enterprises.** Agreements establish respective services and obligations between the concerned parties including communication protocols and escalation; traffic volumes; key performance metrics; performance standards; consequences of nonperformance (including penalties); dispute resolution; and *force majeure*.²⁰
2. **Mergers and acquisitions.** The conventional process is horizontal mergers or acquisitions, in which logistics firms operating similar modes are combined.²¹ Horizontal mergers are common in the manufacturing and service sectors, but are newer in the logistics sector. Many logistics service providers have developed expertise based on deep national market knowledge and unique regulatory frameworks, and such competencies are not easily combined. A vertical process of integration has also emerged in which a firm operating in one mode acquires a firm involved in another mode. For example, recently, maritime shipping companies, either directly or through parent companies, have developed stakes in port container terminals.

Work practice integration

Integration of **labor-force work practices** can help move cargo more efficiently through a supply chain, including ports and intermodal/transload facilities. Improving work-practice integration involves organizational (managing labor as a group) and supervisory (managing individual workers) competencies. Since supply-chain management relies on the timely processing of physical flows, labor issues play an important role in this process. Some of the issues involved are:

¹⁹ Cruijssen, F., W. Dullaert and H. Fleuren (2007) "Horizontal Cooperation in Transport and Logistics: a Literature Review", *Transportation Journal*, Summer, 22-36.

²⁰ Transport Canada (2010) *Rail Freight Service Review*, Ottawa, TP 15042.

²¹ Häkkinen, L., A. Norrman, O-P Hilmola, L. Ojala, (2004) "Logistics Integration in Horizontal Mergers and Acquisitions", *International Journal of Logistics Management* 15 (1): 27-42.

- **Operational window:** the time period during which a facility is open and has labor available to perform normal operations. For elements of the supply chain handling large quantities of material flows, such as port terminals, rail terminal and distribution centers, the pressure has been to move toward 24/7 operation. Around-the-clock operation enables a continuous flow and, therefore, better integration between the scheduling of different assets since they are no longer constrained by time windows. A particular operational issue concerning terminal gate access arises when there is a morning rush to pick up or drop containers, which creates undue congestion and negative environmental externalities.²²
- **Minimal service level.** Modern supply-chain management requires internationally recognized standards of throughput, quality, and reliability, which cannot be upheld without appropriate labor training and certification.²³
- **Essential services.** Organized labor tends to be prominent in the port and rail sectors. Disruptions due to labor conflicts (e.g. strikes) can be highly damaging for tightly integrated supply chains because inventory levels are minimal. This raises the issue about which supply chains are considered to be essential services.

Information Integration

Information technologies support supply-chain management. Information integration is the interconnectedness of information systems, including electronic data interchange, to **improve management of supply chains**. Three major objectives are salient to information integration in freight distribution:²⁴

1. **Competitiveness.** Pursuit of competitive advantage is likely to be the main trigger for market leaders and innovators as they seek to improve their firm's standing and profitability in the marketplace.
2. **Leadership.** Keeping up with competitors is the apparent catalyst for market followers. Success by market leaders progressively erases skepticism about new solutions and incites other firms to follow.
3. **Compliance.** Compliance may arise from customer demands or government regulations. Commercial compliance comes into play when customers demand innovation as a condition of doing business.

Moreover, there are five categories of IT applications:

- **Asset tracking.** Mobile communications and global positioning systems, bar codes, and radio frequency identification (RFID) tags track the location of trucks, containers, and cargo to improve efficiency and to ensure the safety and security of shipments.

²² Giuliano, G., and T. O'Brien (2007) "Reducing Port-Related Truck Emissions: The Terminal Gate Appointment System at the Ports of Los Angeles and Long Beach", *Transportation Research Part D* 12 (7): 460–73.

²³ CAPS Research (2009) *Supply Chain Integration: Challenges and Good Practices*, Institute for Supply Management and W. P. Carey School of Business at Arizona State University.

²⁴ U.S. Federal Highway Administration (2005) *The Freight Technology Story: Intelligent Freight Technologies and Their Benefits*, Office of Freight Management and Operations.

- **On-board status monitoring.** Sensors record vehicle operating conditions, check the condition of cargo, and detect tampering or intrusion.
- **Customs facilitation.** Nonintrusive inspection technologies, such as scanners and RFID tags, are used at terminals, inspection stations, and border crossings to enhance national security.
- **Freight status information.** Web-based technologies facilitate the exchange of information on freight shipments and improve data flows.
- **Transport network status information.** Cameras, road sensors, and display technologies monitor congestion, weather conditions, and incidents.

Regulatory Integration

Regulatory integration is the structuring of regulations to promote a better integrated freight distribution system. Regulations should promote efficient modal choice, avoid subsidized modal preferences, and favor the harmonization of regulation across jurisdictions.²⁵ Since supply-chain management involves modes and processes across several nations, regulatory integration becomes problematic if it fails to transcend modes and jurisdictions. The major concerns are:

- **Safety.** Safety is a multidimensional issue involving the physical integrity of the cargo and labor. The World Customs Organization underlines the advantages of regulatory improvements in supply chains safety, namely improved security against theft and diversion of cargo with consequent reductions in direct losses and indirect costs such as insurance; improved security against illegal transport of materials, such as narcotics and weapons, and of persons; improved security against the illegal movement of “black market” and “grey market” trade goods; reduced risk of evasion of duties and taxes; and increased confidence in international trading systems by current and potential shippers.²⁶
- **Environment.** Similar modes and processes taking place over different jurisdictions often face different environmental regulatory standards, such as for noise and emissions. Although the trend has been toward more stringent requirements,²⁷ different rates of adoption across modes and jurisdictions make this process far from uniform. For instance, the ports of Los Angeles / Long Beach now impose environmental requirements such as clean trucks for drayage and restrictions on ship engine idling (ships hook their power plants to the local electricity grid in port and shift to cleaner bunker fuels while approaching port) that are significantly more stringent than at other North American ports. The lack of regulatory integration could place environmental innovators at a competitive disadvantage, particularly since environmental externalities for a port city can be difficult to assess.
- **Pricing.** Different transport infrastructures (e.g. roads versus rail) receive different levels of public funding, leaving users of each system with a distorted pricing system. The same supply chain can have a different cost structure depending on the country’s subsidy level of the

²⁵ United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) (2010) *Towards an Appropriate Regulatory Environment for the Multimodal Transport and Logistics Industry*. UNESCAP: Bangkok.

²⁶ World Customs Organization (2007) *WCO SAFE Framework of Standards*, WCO: Brussels.

²⁷ Barnard, B. (2010) “Environmental Mandates Going Global”, *Journal of Commerce*, December.

infrastructures being used. An emerging consensus about road pricing strategies is in use in a number of cities (e.g. London) and along major highways (e.g. Germany) to cope with haulage issues.²⁸ For freight, the general goals of pricing regulations are to make road transport more neutral in regard to other modes, particularly rail, and thus favor a higher usage level of the alternatives. The fact that roads tend to be more perceived as a public good than rail (particularly if rail is privately owned and operated) is likely to endure and continue to distort pricing.

- **Customs.** The World Customs Organization has established a set of guidelines for the control and inspection of cargo that would improve supply chain management.²⁹ It is the prerogative of individual members to follow these guidelines that involve customs control, cargo risk assessment, controls at departure, sealing (mostly for containers), submission of data, and identification of authorized supply-chain operators (trusted shippers).
- **Crossborder.** Crossborder transportation raises the issue of regulatory integration in the use of assets and labor across different jurisdictions. In North America, the problem is particularly salient between the United States and Mexico concerning trucking, especially the licensing of truckers and the safety inspections of trucks.
- **Customization.** Customization concerns production or post-production adjustments to a product to fit specific market or customer requirements. The most common forms of customization are imposed by different cultures (e.g. languages) and market characteristics (e.g. power supplies). However, different regulations such as safety standards may impose additional forms of country-specific customizations. A higher level of regulatory integration would incite more standard product and packaging design, and thus lower costs. Still, environmental regulations, such as the use of recycled materials, may create additional difficulties for the customization of international supply chains.

Planning and funding integration

Planning and funding integration refers to the planning and funding of infrastructure provisions from an integrated multimodal, total-logistics-chain perspective. **Freight transportation bottlenecks** are a potentially significant hindrance to the integration of transport chains and to economic growth. It also recognizes the concerns of government and industry that established institutional and finance arrangements have not adequately responded in recent decades to the demands imposed by growing volumes of freight and passenger traffic and to fundamental shifts in regional and global patterns of trade. Three points apply particularly well to logistics projects:³⁰

1. Current finance arrangements are inadequate for maintaining and improving the performance of freight transport systems. This inadequacy was a major driver behind **privatization and deregulation** in the freight transport industry worldwide.

²⁸ Hensher, D.A. and S.M. Pucketta (2007) "Congestion and Variable User Charging as an Effective Travel Demand Management Instrument", *Transportation Research Part A: Policy and Practice*, 41(7): 615–26

²⁹ World Customs Organization (2007) *WCO SAFE Framework of Standards*.

³⁰ Transportation Research Board (2009) *Funding Options for Freight Transportation Projects*, Special Report 297, Washington.

2. Finance arrangements should be designed to **promote productivity gains**. Investment projects that are politically rather than commercially driven often fail in this regard.
3. Finance options differ in their **probable impacts on freight system performance**. For instance, a public / private partnership may create a level of subsidy for a transportation project and thus impacting on its utilization level. This difference in finance options underlines the difficulty of establishing multiplying effects linked with specific infrastructure investment projects as the mix of public and private involvement may lead to differences in operational costs and in the fare structure.

It is often a challenge to **identify the respective roles and competencies of the public and private sectors**, which vary substantially depending on the concerned mode. The emergence of logistics zones and inland ports in Latin America has offered an opportunity to find new realms of engagement between the public and private sectors over supply chain management.

Custom and security integration

Customs integration aims at moving goods more efficiently across borders from one country to another, including prescreening and inspections. Security integration is the interconnectedness or harmonization of **security procedures** that protect cargo from theft, tempering or damage and **protect the public** from risks posed by dangerous cargo or threats posed by illicit cargo.

There is an overall consensus on the need to improve the security of supply chains worldwide, but there is no single path to supply chain security.³¹ A variety of programs exist, some with the force of international law, others optional, with an array of intermediary initiatives, including some that will likely become compulsory in practice due to market pressure, and other technology-based programs that are striving to become mandatory. The **layered approach**, which includes regulatory, conceptual, technological, programmatic, and procedural components, enjoys the broadest consensus. An emerging paradigm in managing the security of transport systems, it involves the whole supply chain.³² Its main dimensions are:

- **Cargo contents.** Insuring that the cargo is what is stated on the bill of lading. Inspections by custom agencies are commonly undertaken with a variety of methods ranging from a simple direct visual inspection, a random check of cargo elements, or a remote inspection involving scanning (e.g. gamma rays) or probing (air sample analysis). Discrepancies are likely to trigger additional inspections and further delays. Another quick method is cross-referencing the stated cargo contents to identify unusual cargos based upon the origin, carrier, and destination, which requires a rules-based expert system.
- **Cargo integrity.** Insuring that the contents of the cargo remain unchanged between the origin and the destination, which involves ways to detect unauthorized access. Through the use of locks, alarms, or probes, unauthorized access is prevented or recorded if it takes place.

³¹ World Bank (2009) *Supply Chain Security Guide*, Washington DC: The World Bank.

³² van de Voort, M. and A. Rahman (2004) "Securing Global Supply Chains", *Port Technology International*, 24th Edition: 67–70.

- **Route integrity.** Insuring that the cargo follows its scheduled route and that it remains within secure modes and locations, such as terminals and distribution centers.
- **Information integrity.** Insuring that the information about the cargo is authenticated and verifiable.

More specifically, the main supply-chain security elements are:

1. Advance (electronic) Cargo Information (ACI).
2. Risk management, which includes macroeconomic risks (wage rates, interest rates, exchange rates, and prices); policy risks (unexpected actions of national governments); competitive risks (uncertainty in foreign markets); and resource risks (unanticipated differences in resource requirements).³³
3. Non-intrusive inspections (NII).
4. Operator's certification (e.g. as an Authorized Economic Operator – AEO, which is a trusted carrier).

³³ Manuj, I. and J.T. Mentzer, (2008) "Global Supply Chain Risk Management Strategies", *International Journal of Physical Distribution & Logistics Management* 38 (3): 192–223.

The benefits of logistics projects

In previous decades, the majority of logistics investments were done by private firms and mostly concerned the establishment of warehouses and distribution centers to suit their customers' needs. The locational and operational logic was **punctual** implying that decisions were made by individual firms but with a rational outcome at the aggregate level. The public sector generally provided road infrastructure and utilities. **Accessibility** to a terminal facility and the **availability of land** were common factors behind locational decisions. These conditions led to the creation of more or less organized clusters of logistics activities at locations in proximity to terminals or with good road accessibility. The growth of trade flows, the complexity of supply-chain management, and increasing levels of congestion at main gateways have incited a more **concerted approach** in which the public sector can play a larger role as a mediator and facilitator in the coordination of infrastructure projects related to logistics (Figure 9).

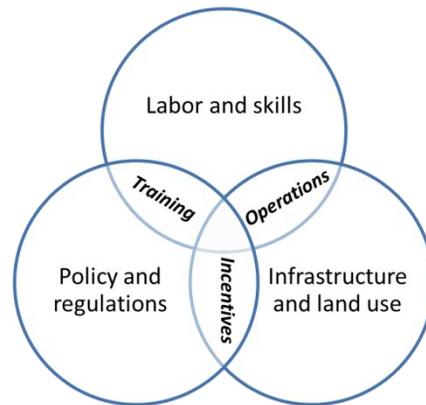


Figure 9 - Key public intervention areas in logistics projects

- **Infrastructure and land use.** The key intervention concerns incentives for the capture, expansion, or retention of logistics activities.
- **Labor and skills.** The key intervention concerns the training of the labor force to promote skills, as well as the expansion of national research capabilities.
- **Policy and regulations.** The key intervention concerns setting a clear context for the construction of infrastructure, including the zoning of land for logistics.

Addressing the improvement of each logistics performance criteria (e.g. infrastructure, information, and regulation) individually can be counterproductive. A more suitable approach to logistics investment projects is to **mitigate critical bottlenecks** of the transport and logistics chains that need to be jointly addressed from policy, management, investment, and technology perspectives. Because bottlenecks occur at a specific locations or jurisdictions (such as a port authority), they can be considered at a scale that is achievable for promoting logistics performance. They represent key areas of investment and policy intervention, which is multidimensional since it involves different stakeholders and levels of government.

Gateways and corridors

The **development of gateways and corridors** is a fundamental component of supply-chain integration.³⁴ From an economic perspective, the function of a corridor is to promote both internal and external trade by providing more efficient transport and logistics services from at least one gateway that acts as the main interface between the corridor and the international transport system. The reason for designating these routes as part of a corridor is to focus attention on improving not only the routes in terms of capacity but also the **quality of the transport and other logistic services along the corridor**. Quality is measured in terms of the **transit time, cost for shipment** of goods along the corridor, and the **reliability** and **flexibility** of the transport services offered on multimodal routes.

The corridor is neither temporally nor spatially immutable, but rather dynamic, contingent on such key factors as the economic and regulatory context (e.g. trade liberalization), investments in infrastructures, and technological changes. Corridors fall into two categories:

- **Formal corridors**, which tend to expand the planning and investment framework of public and private actors along them. On many occasions a form of governance, or at least a forum (coalition), has been set in place.
- **Functional corridors**, which represent an existing flow structure along an infrastructure. The corridor is thus an operational reality even though it may not have a formal designation.

It is important to create a single point of coordination given the diversity of stakeholders and the large number of government agencies that oversee different activities within a corridor. This coordination requires a public-private partnership to address problems including investment in infrastructure, regulation of transport and trade, facilitating improvements in private sector transport, and logistics. In recent years, several **corridor-based organizations** have emerged to help coordinate development projects and to gather support from major stakeholders.³⁵

Hinterland accessibility

As the main agent of the maritime (and sometimes air) / land interface at a gateway, the **port authority** is at the forefront of these challenges. A port authority conventionally acts as a landlord, a regulator, and an operator:

- As a **landlord**, a port authority manages the port assets under its jurisdiction, which can involve a substantial amount of real estate in centrally located areas. As a landlord, it provides infrastructures, such as piers, and the dredges waterways. The provision of infrastructure financed by public funds has been a common endeavor undertaken by port authorities.
- As a **regulator**, a port authority sets the planning framework including tariffs, customs, and safety, and also enforces national and port-related rules and regulations.

³⁴ World Bank (2005) *Best Practices in Corridor Management*, Trade Logistics Group, Washington DC: World Bank.

³⁵ In Canada, the setting of transport corridors is an official Federal Government policy (e.g. Canada's Asia-Pacific Gateway and Corridor Initiative). In Europe, the Trans-European Transport Networks (TEN-T) is a European Union policy to help set and coordinate transport infrastructure investments to strengthen pan-European interactions.

- As an **operator**, a port authority provides the day-to-day services to ships (e.g. pilotage and towage) and to merchandise (e.g. loading / unloading in terminal operations).

With globalization and deregulation, the role of port authorities is changing to become a manager and catalyst of regional development within their hinterland. The conventional role of the port authority as landlord, regulator, and operator is shifting toward the “**expanded port authority**,” a process that has two dimensions described below and illustrated in Figure 10:

- **Concessioning** has reduced the role of the port authority as an operator, since this role is increasingly assumed by specialized terminal operators that rent terminal facilities over long periods (up to 30 years). Operations are often turned over to private concessions because many port authorities have performed poorly in operating terminal. Many concessionaires are global terminal operators with assets in a variety of markets. In Latin America, the concessioning of terminal operations to private operators came later than in Europe, North America, and Asia, but has been catching on in recent years. This process coincides with the surge in use of containers. For the Caribbean, concessioning is mainly related to major transshipment hubs (e.g. Kingston, Freeport, and Panama).
- **Cluster governance** is an emerging and extensive trend in which the port authority assumes leadership in activities previously outside its jurisdiction, including setting up inland terminals and logistics zones (directly or in partnership), developing strategies to monitor and improve port and supply-chain performance, establishing port community systems, promoting environmental and social initiatives, being involved in training and education for port related employees, and facilitating relations with its surrounding urban areas.

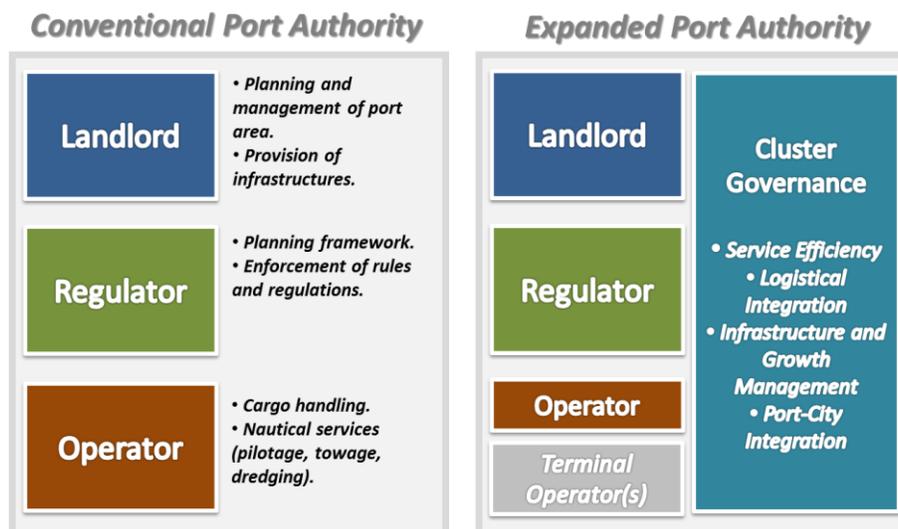


Figure 10 - Emerging paradigm in the role of port authorities within their port regions³⁶

³⁶ Source: adapted from Monfort, A. (2010) “Port Evolution: Must or Need? Can Port Authorities Do It in an Isolated Way?” Terminal Operators Conference Europe, Valencia, Spain, June.

Thus, globalization and the growing complexity of supply chains are inciting port authorities to undertake strategies aimed at **coordinating their hinterland**. These strategies can have four dimensions:³⁷

- **Use of incentives.** Coordinate operations of freight actors to improve their use of transport chains and their underlying assets by using a preferential rate structure for the users of a facility (e.g. a logistics company) that provides a minimum volume or that meet a level of reliability. Other users will be incited to follow since the reward is a lower-cost access to the infrastructures.
- **Inter-firm alliances.** There are two types of alliances. The first is vertical integration (along transport chains) in which, for instance, a maritime shipping company and a terminal operator can agree to better coordinate their services. The second is horizontal integration (between competitors) in which, for instance an equipment or container pool can be established to improve the level of asset utilization (see next section).
- **Organizational scope.** Concerns an integration process in which an actor decides to invest in new transport assets in order to expand or add value to its activities. For instance, a maritime shipping company might be involved in port terminal operations, or a port authority might be involved in the development an inland port as a strategy to alleviate congestion and expand the market potential of its hinterland.
- **Collective actions.** The port authority can develop a series of strategies, such as setting of public/private partnerships to create logistic zones. Each actor contributes within its realm of expertise. Development of port community systems is a collective action that is receiving increased attention.

Table 2 - Expected benefits of gateways, corridors, and hinterland accessibility projects

Project	Expected Benefits
National gateways and corridors initiative	Consider national transport systems in a comprehensive manner. Recognize gateways as locations of national strategic interest. Identify and coordinate transport infrastructure investment. Facilitate modal shift and effective inland freight distribution.
Corridor coalitions	Coordinate the operations and investments of stakeholders. Create an innovative planning framework (the corridor). Improve hinterland transport capacity, efficiency, and reliability. Facilitate better asset utilization (trucks) or modal shift (rail).
Expanded port authorities	Improve port productivity (e.g. concessioning). Reduce congestion near port facilities. Improve utilization and coordination of regional transportation.

³⁷ Van der Horst, M.R. and P.W. de Langen (2008) "Coordination in Hinterland Transport Chains: A Major Challenge for the Seaport Community", *Journal of Maritime Economics & Logistics* 10: 108–129.

Logistics zones and inland ports development

Freight distribution, like all economic activities, **consumes space** and is, therefore, an element of regional and urban land use. The development of **logistics zones** has been an important component of globalization because the growth in international trade and the related material flows requires activities supporting their consolidation, deconsolidation, transloading, and light transformation. The growth of these functions has proportionally increased the demand for land. Logistics zones are places that group activities dealing with freight transportation (freight forwarders, shippers, transport operators, customs) and related services (storage, maintenance and repair) within a **defined, and often planned, area**.

The range of functions of logistics zones ranges from **simple cargo consolidation** to **advanced logistics services**. Many locations not only have assumed a significant number of traditional cargo-handling functions and services, but also have attracted many related services, such as distribution centers, shipping agents, trucking companies, forwarders, container repair facilities, and packing firms. Two drivers have been particularly prevalent in the emergence of logistics zones:

- **Complexity of freight distribution.** Due to the long distances over which supply-chain management is being conducted, intermodal and distribution strategies must be accommodated at strategic locations, such as gateways. Also, due to complex supply-chain practices, additional operations need to be performed on the cargo and the loads in transit.
- **Massification.** The quantity of cargo being handled, as well as its concentration at specific gateways and along corridors, has favored the emergence of large logistic-zone complexes at strategic locations.

A typology of logistic zones suggests **four major forms**: port-centric logistics zones, inland ports, logistics parks, and freight villages (Figure 11). Each fits a specific role and function within a national transportation and freight distribution system.

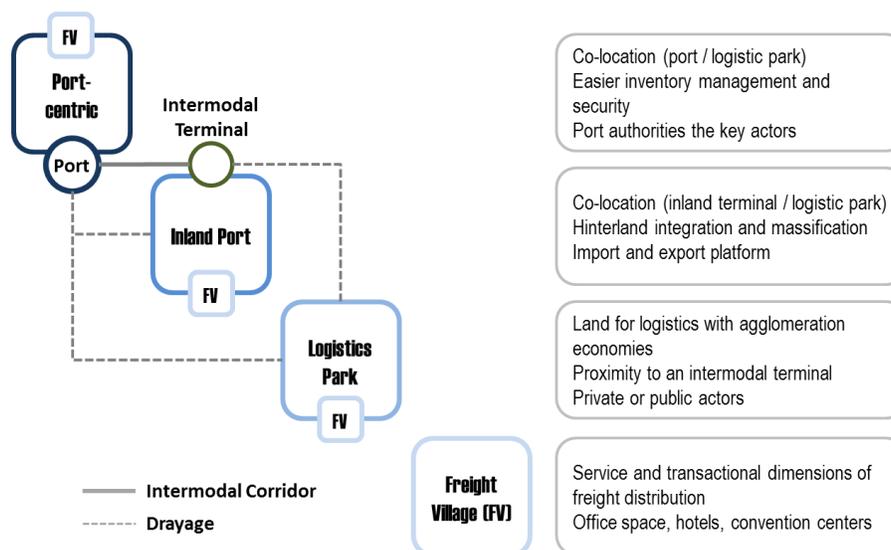


Figure 11 - A typology of logistics zones

A **port-centric logistics zone** is a logistic zone that has been planned in co-location or in proximity to a port terminal facility. It supports freight distribution activities directly related to maritime shipping and thus has a dominant international trade orientation. The common value proposition of port-centric logistics zones is the availability of land next to a port terminal and the availability of labor, which is generally available in a port city. The availability of land near the port facilitates freight distribution and inventory management since the containers can be easily picked up or dropped at the terminal facility. Empties can immediately be brought back from the terminal, improving their utilization. Container weights are not bound to national road restrictions, allowing for higher container load factors and related shipping economies. The added security at port-centric logistics zones is also a positive factor, particularly in developing countries. With growing traffic levels, port terminals and port-centric logistics zones are often complemented by **satellite terminals** such as inland ports and logistics parks. These facilities assume functions that either have become too expensive at the port, such as warehousing and empty container depots, or that are less bound to a location near a deep-sea quay.

An **inland port** is an intermodal facility typically located some distance from a seaport gateway and designed to facilitate international trade by providing multimodal transportation assets and value-added services at a single site. Strategically located inland ports could contribute to increasing container flow and solving port-related congestion and pollution problems.³⁸ Three fundamental characteristics related to an inland node are listed below³⁹ and shown in Figure 12:

- An **intermodal terminal**, either rail or barge that has been built or expanded.
- A **connection** with a port terminal through rail, barge, or truck services, often through a high-capacity corridor. The connection promotes the development of scale economies in inland freight distribution.
- An array of **logistical activities** that support and organize the freight transited, often co-located with the intermodal terminal into **logistics parks**. These activities complement international and domestic transport services by providing intermodal connectivity and a wide range of services related to cargo processing, storage, consolidation, distribution, and customs brokerage.

³⁸ Rahimi, M., A. Asef-Vaziri and R. Harrison (2008) *Integrating Inland Ports into the Intermodal Goods Movement System for Ports of Los Angeles and Long Beach*, Los Angeles: METRANS Transportation Center, Project 07-01.

³⁹ Rodrigue, J-P, J. Debie, A. Fremont and E. Gouveral (2010) "Functions and Actors of Inland Ports: European and North American Dynamics", *Journal of Transport Geography* 18 (4): 519–29.

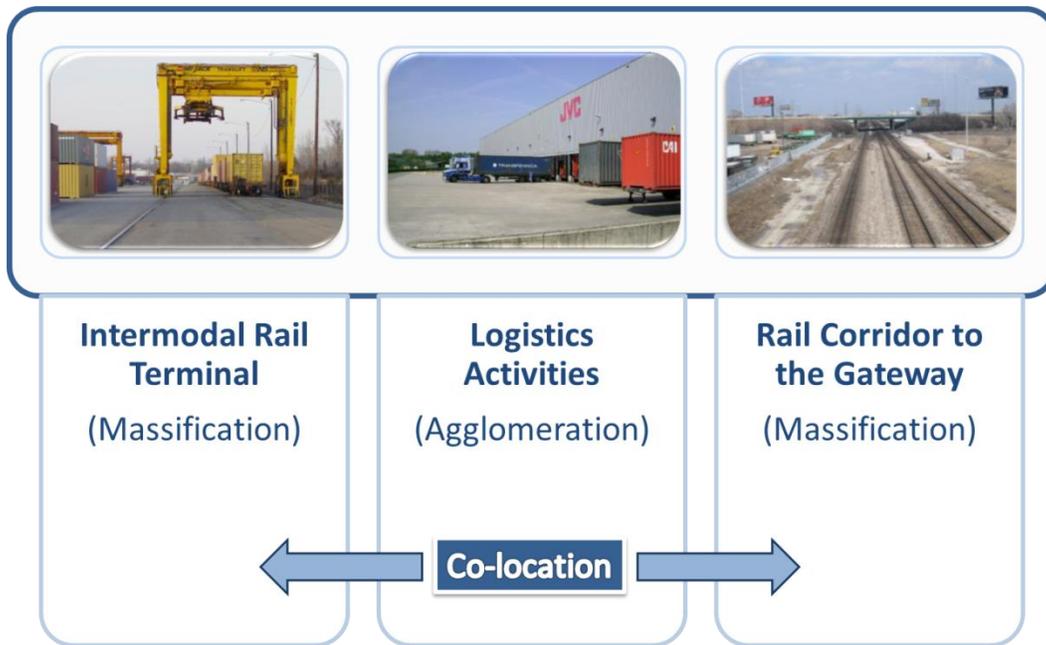


Figure 12 - Basic requirements for inland ports

A **logistics park** is a planned zone composed of distribution centers and light manufacturing activities, commonly located near an intermodal terminal. It provides geographical advantages in terms of accessibility, land availability, and infrastructure, as well as operational advantages in terms of favorable regulations and economies of agglomeration. It is common to see this type of logistic zone emerge after the construction of an intermodal terminal as a promoter seizes an opportunity to provide land for logistics. A **freight village** is an integrated logistic zone that includes distribution centers and supports activities such as office space, hotels, and restaurants. A freight village focuses on the service and transactional dimensions of freight distribution and could exist in a context where limited freight distribution is taking place. It does not require an adjacent intermodal terminal, but a terminal is commonly in vicinity. A freight village can also be linked with an airport terminal since high-value air freight is intensive in transactions. The definition of a freight village is subject to interpretation and, in some cases, logistics parks are labeled as freight villages, but the term should be reserved for cases in which a high intensity of freight-related services are clustered within a logistics zone.

The development of inland ports and logistical zones is an emerging paradigm. The growing focus on inland ports indicates that transport development strategies are gradually **shifting inland to address capacity and efficiency issues** in the light of the establishment of global supply chains. The complexity of modern freight distribution, the increased focus on intermodal transport solutions, and capacity issues appear to be the main drivers. The larger volumes of flows in networks, through a concentration of

cargo at a limited set of ports of call and associated trunk lines to the hinterland, have also created the right conditions for nodes to appear along, and at the end of, these trunk lines.⁴⁰

Inland ports may **promote port competition** by offering access to new freight corridors. Thus, they can challenge the domination of a port over its hinterland and its related cargo. However, there is an increasing level of coordination between port authorities and inland ports, particularly among the largest ports. Large congested ports have the motivation, as well as the volume and the financial and technical capabilities, to develop inland ports. In Europe, the dominant strategy is developing dedicated rail or barge services from sea ports to inland ports,⁴¹ whereas in North America, port authorities tend to set up logistical zones within their adjacent areas to better anchor traffic.

In most Latin American countries, **rail corridors are embryonic** and geared toward transporting raw material flows. There is limited capacity for intermodal transport development. Most inland ports are serviced by trucks, creating **challenges in accessibility and road capacity**. For instance, in Brazil, a bias toward road transportation has been observed even with the privatization of the rail system since rail remains dedicated to transporting raw materials⁴² with limited opportunities for the development of containerized rail services. Consequently, inland ports are set around trucking services, which are less economically and environmentally efficient than rail. There is also a trend toward the duplication of inland port facilities, leading to smaller, dispersed facilities conferring limited potential for economies of scale. In the Caribbean, more efficient logistics would lower the input costs for tourism and improve its marketability. The port-centric approach appears a good option in Latin America because of the lack of competitiveness among ports due to well-defined hinterlands.

Table 3 - Expected benefits of logistics zone and inland port projects

Project	Expected Benefits
Port-centric logistics zone	Improves use of port real estate. Facilitates imports and exports (direct access to port terminal). Reduces local congestion.
Inland port	Promotes modal shift (if connected by rail). Reduces port congestion (relocation of some port activities; e.g. container depots). Facilitates economies of scale in inland distribution (corridors). Lowers last-mile transport costs (co-location).
Logistics park	Creates economies of agglomeration for freight activities. Lowers operational costs (e.g. joint infrastructures and utilities).
Freight village	Promotes the development of logistics services firms.

⁴⁰ United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) (2009) "Development of Dry Ports", *Transport and Communications Bulletin for Asia and the Pacific*, No. 78.

⁴¹ Ferrari, C., F. Parola and E. Morchio (2006) "Southern European Ports and the Spatial Distribution of EDCs", *Maritime Economics & Logistics* 8 (1) 60–81

⁴² Ng, A.K.Y. and F. Padilha (2012) "The Spatial Evolution of Dry Ports in Developing Economies: The Brazilian Experience", *Maritime Economics & Logistics* 14: 99–121.

Labor development and logistical services

Logistic activities involve an impressive array of **employment opportunities** from **low** to **high skilled**. A diversified logistics service market strengthens local expertise and improves the performance of freight distribution. This market is related to three main categories of services described below and shown in Table 4:

- **Freight services.** Specialized services that are rarely found outside the freight distribution industry, including freight transportation, warehousing, and light fabrication services. They also include an array of freight operations taking place in a distribution center that can be subcontracted. Since the majority of freight shipments are containerized, logistical activities servicing containerization are particularly significant.
- **Corporate services.** General services that focus on the operation of enterprises. Several of these services can be specialized since logistics enterprises have specific needs. Many of these services are performed within the corporation, but a growing share are being subcontracted (for lower costs and higher quality through specialization). A logistics zone thus offers the possibility of developing a specialized service market.
- **Personal services.** An array of services for the concentration of workers in a logistics zone. Although unrelated to freight distribution, they are complementary because they contribute qualitatively to the performance of a logistics zone.

Table 4 - Types of services associated with logistics activities⁴³

Freight Services	
Rail services	Long-distance rail transportation for suppliers and customers. Usually at a co-located intermodal terminal.
Trucking services	Drayage and long distance truck services for suppliers and customers. Shuttles to nearby rail and maritime terminals.
Loading / consolidation	Packing, palletizing, and stuffing cargo into containers or trailers. Cargo consolidation from multiple suppliers. Mostly linked to exports.
Unloading / deconsolidation	Unpacking, de-palletizing, and de-stuffing cargo in distribution centers. Mostly linked to imports.
Transloading / crossdocking	Transfer from one cargo unit to another, such as a maritime container into a domestic container (or vice-versa). Crossdocking implies the transfer of truckloads, including changes in the composition of loads of each transport unit with minimal and short-duration warehousing.
Warehousing	Protects the integrity of cargo units (e.g. damage, theft) while waiting to be released to customers.
Bonded warehousing	Cargo waiting to be released by customs. In a free trade zone, cargo can be transformed for re-export.
Container and chassis depot	Storage of empty containers waiting to be reused. Transfer custody of containers between shippers. Consolidation center for containers used by maritime and rail terminals. Chassis pools.

⁴³ Source: adapted from CPCS, DAMF Consulting, and J-P Rodrigue (2010) Aménagement d'un pôle logistique au Québec, Volet 4.2 : Évaluation des services requis par un pôle logistique. (The planning of a logistic park in Quebec. Part 4.2: Evaluation of required services of a logistic park), Rhe International Institute of Logistics of Montreal.

Container and chassis maintenance	Container preparation and inspection before usage. Container cleaning and repair. Chassis inspection and repair. Important for the container and chassis location industry.
Equipment maintenance	Maintenance of vehicles and intermodal equipment.
Fabrication	Light manufacturing activities often undertaken at the distribution center. Include labeling, assembly, testing, and quality control. Can also include the bagging of bulk cargo. Provides added value.
Cold chain	Activities maintaining the thermal integrity of cargo. Includes temperature-controlled warehousing but also preparation, transformation, and inspection.
Recycling	“Green logistics” activities (reverse distribution). Returns of defective or discarded merchandises. Recycling of components, such as boxes, used in freight distribution.
Corporate Services	
Office space	Space and services for managers involved in logistics activities.
Customs clearance	Services supporting compliance with customs -clearance procedures for imports and exports.
Security	Site integrity (e.g. access). Important if there is a free-trade zone or custom activities.
Site maintenance	General activities related to cleaning and garbage collection as well as technical maintenance such as utilities.
Parcel services	Support the high transactional level of logistical activities.
Certification and quality control	Certifying and benchmarking agencies to insure that users meet recognized criteria.
Cargo inspection	Expert assessment in cargo losses and damages. Specialized laboratories.
Logistics equipment location	Sale and location of logistical equipment, such as racks, fork lifts, conveyors, etc. Maintenance of this equipment.
Container and chassis location	Availability of maritime and domestic containers for export and import activities. Availability of chassis.
Export facilitation	Activities promoting exports such as certification, financing, and marketing.
Work supplies	Uniforms, work equipment (e.g. gloves), wraps, labels, boxes, security equipment (fire extinguishers), etc.
Temporary workers agencies	Supplying temporary workers to cope with fluctuations in demand.
Office supplies	Sale and rental of office equipment and supplies.
IT equipment	Sale and rental of computers, telecommunication equipment, and software. IT network setting and management.
Human resources	Personnel management from recruiting to payroll. Labor training and certification.
Accounting	Management of transactions and finances.
Insurance and financial services	Variety of insurance products for people and merchandises. Activities facilitating commercial transactions at the national and international levels (e.g. letters of credit).
Legal services	Expertise for contract redaction and commercial dispute resolution.
Hospitality	Availability of hotel and meeting facilities to support the transactional intensity of logistics zones. Extended-stay facilities. Overnight facilities for truckers.
Restoration	Availability of restaurants for workers and truckers. Lounges for short-term relaxation and informal meetings.
Personal services	Array of services for workers (e.g. convenience store, hair salon, sports club, daycare, clinic, postal services, etc.)

Logistics services are becoming **complex and time-sensitive** to the point that many firms are now subcontracting parts of their supply chain management to **third-party logistics providers (3PL)**. Many have emerged from traditional intermediaries such as freight forwarders, or from the transport providers such as maritime shipping lines. The customer is no longer aware or necessarily concerned with how a shipment gets to its destination such as the modes used or the routing selected. The customer's preoccupation is with **cost, reliability, and level of service**. In addition to offering standard transportation services, such as transportation and warehousing, third-party logistics providers are delving into an increasingly complex range of **value-added activities** (Table 5). More advanced services involve performing added-value functions on the cargo itself, such as packaging and labeling. A step further would involve complete management of a supply chain, including financial transactions and information and communication technologies. **Fourth-party logistics providers (4PL)** focus on an integrated view of the supply chain, including how changes in production planning, sourcing, and routing (the use of a series of 3PL) can help reduce costs and improve the reliability of the supply chains of their customers.

Table 5 - Range of services offered by third (3PL) and fourth party logistics providers (4PL)⁴⁴

3PL ▶		◀ 4PL	
Standard	Advanced	Complete	Integrated
Transportation services	Vendor- managed inventories	Order planning and processing	Production planning
Carrier selection	Stock accounting	Information and communications Technologies (ICT) management	Sourcing
Rate negotiation	Customs clearance and documentation	Single invoice	Routing transit times (air vs. ocean)
Fleet management	Assembly	Landed duty paid cost (per piece)	Supply chain consulting
Warehousing	Packaging	Payment collection	Complete real-time supply-chain monitoring and adjustment
Cross docking	Labeling	Real time inventory updates	
Pick and pack	Managing product returns	Just-in-time (JIT) inventory management	
Distribution (direct to store/home)	Financing		
Dispatching	Retail delivery, set up, and on-site training		
Delivery documentation	Inventory tracking		
Shipment consolidation			

Labor issues in logistics projects are challenging because there is a recognized **shortage of labor and skills** at almost every dimension of logistics tasks, particularly at the managerial level. This shortage is particularly salient in developing countries. Greater efforts should be made by governments and

⁴⁴ Source: adapted from OECD (2000) Trilog Asia-Pacific Task Force, Logistics Integration in the Asia-Pacific Region, Institute of Highway Economics.

industry to contribute to skill formation as well as to raise the profile of logistics as a career path.⁴⁵ Table 6 shows the expected benefits of logistics employment and services projects.

Table 6 - Expected benefits of logistics employment and services projects

Project	Expected Benefits
Labor training	<ul style="list-style-type: none"> Advertises logistics as a career path. Increases labor productivity. Develops diversified skills. Attracts logistics firms (foreign and domestic).
Research centers	<ul style="list-style-type: none"> Develop a brain trust to address supply chain challenges. Identify trends and opportunities. Train managers. Collaborate with logistics firms.
Firms incubator	<ul style="list-style-type: none"> Supports the development of small and medium-sized firms. Develops specialized logistics services, such as 3PLs and 4PLs.

Freight portals / port community systems

Information technologies (IT) are important in the analysis and transfer of information among the main stakeholders in a supply chain and are, therefore, an investment supporting the development of logistics capabilities. Good IT commonly results in efficiency and reliability improvements in emerging supply-chain management strategies, which require a high level of information availability. There are five main areas of application of information technologies in freight distribution:

- **Freight visibility.** Ability to track the status and location of shipments (vehicles, rail cars, containers and individual loads), which improves the reliability of supply-chain management. Mobile communications, global positioning systems (GPS), radio-frequency identification (RFID) tags, and bar codes are commonly used.
- **Asset management.** Ability to manage transportation assets such as vehicles and containers, maximize equipment utilization, locate equipment location (tractors, trailers, rail cars, containers, ships), and monitor the status monitoring of vehicle and cargo conditions. Real time locating systems (RTLS) use GPS and RFID tags.
- **Efficiency.** Ability to improve the quality of freight information being exchanged; improve productivity and reduce errors in data transmission; verify and exchange shipment information; and conduct nonintrusive inspections. Information technologies such as optical character readers (OCR), RFID tags, and biometrics (to identify drivers) are used.
- **Freight information exchange.** Real-time terminal information systems provide easily accessible and real-time freight information systems using web-based technologies and electronic data interchange (EDI).
- **Regulatory compliance.** Ability to comply with regulations, such as customs requirements, in an efficient and cost-effective manner.

⁴⁵ World Economic Forum (2011) Logistics & Supply Chain Industry Agenda Council, Final Report 2010-11, Geneva: World Economic Forum.

There is an emerging trend for port authorities to manage the regional freight transport system. One example is the development of **Port Community Systems (PCS)**, information entities that provide logistical information among the actors involved in port-related freight distribution.⁴⁶ The main actors are freight forwarders, who are intermediaries for importers (consignees) or exporters (consignors) and terminal operators, who are the interface between the port foreland and hinterland, customs, ocean carriers, inland carriers, and the port authority itself. Conventionally, the transactional relations between these actors are very complex, with some being unilateral and proprietary.

The purpose of a PCS is not to create new information systems to manage freight activities, but rather to effectively link existing databases and management systems through a web portal, which standardizes different electronic formats. Web portals are particularly suitable as an interface because web access is close to ubiquitous.⁴⁷ The outcome is an improvement in the transactional efficiency and quality of transactions among the logistical chain and, thus, in the efficiency of the regional freight distribution system. Opportunities to improve performance (costs and reliability) can be used as marketing strategies by the users of a PCS. A PCS can take different forms in different ports based on their different physical, modal, jurisdictional, and operational characteristics.

Table 7 - Expected benefits of freight portals projects

Project	Expected Benefits
Port Community System	<ul style="list-style-type: none"> Promotes a better use of transport assets and facilities. Improves the tracking of freight. Links existing databases and management systems. Promotes competitiveness in port-related services. Promotes interactions and coordination among freight actors (upstream and downstream the supply chain).
Communication systems (WiFi / 3G)	<ul style="list-style-type: none"> Provide faster terminal gate access. Support communication between management systems, operators, and truck drivers. Synchronize drivers with work flow (fewer delays and errors). Shorten time operators spend collecting information.

Container assets management and containerized niche markets

Because containerization supports a growing share of global trade, attention is being given to the management of container assets. The container is a **transport unit as well as a logistics unit**. Efforts are made to insure that containerized assets are used as efficiently as possible. Empty container flows remain an enduring challenge in global freight distribution as they account for about 10 percent of existing container assets and 20.5 percent of global port handling.⁴⁸ In 2005, Latin America had one of

⁴⁶ Srour, F.J. et al. (2008) "Port Community System Implementation: Lessons Learned from International Scan", Paper #08-2041, Transportation Research Board Annual Meeting 2008.

⁴⁷ Garcia de la Guia, J. (2010) "Technology for the Port Cluster Efficiency: valenciaportpcs.net", Terminal Operators Conference Europe, Valencia, Spain, June.

⁴⁸ Theofanis, S. and M. Boile (2009) "Empty Marine Container Logistics: Facts, Issues and Management Strategies", *Geojournal* 74: 51–65.

the world's highest shares of empty container flows, about 25 percent.⁴⁹ An increasing number of containers are **repositioned empty** because cargo cannot be found for a return leg. The outcome has been a growth in the repositioning costs as shippers attempt to manage the level of utilization of their containerized assets, including chassis. The positioning of empty containers is thus one of the most complex problems concerning global freight distribution. The major causes of this problem include:

- **Trade imbalances.** A region that imports more than it exports will face the systematic accumulation of empty containers, whereas a region that exports more than it imports will face a shortage of containers. If either situation endures, a repositioning of a large number of containers will be required between the two trade partners, involving high transportation costs and tying up existing distribution capacities.
- **Repositioning costs.** If it is small, a trade imbalance could endure without much of an impact as some containers get repositioned without much of a burden on the shipping industry.
- **Revenue generation.** Ship owners allocate their containers to maximize their revenue, not necessarily the economic opportunities of their customers. In view of trade imbalances and of the higher container rates they impose on the inbound trip for transpacific pendulum routes, ship owners often opt to reposition their containers back to Asian export markets instead of waiting for the availability of an export load.
- **Manufacturing and leasing costs.** If the costs of manufacturing new containers, or leasing existing units, are cheaper than repositioning them, especially over long distances, an accumulation can occur.
- **Usage preferences.** Many shipping lines use containers to brand their company name and to offer readily available capacity to customers.
- **Slow steaming.** Excess capacity and rising bunker fuel prices have caused maritime shipping companies to reduce the operational speed of containerships from 21 knots to 19 knots, a practice known as slow steaming. The resulting longer transoceanic journeys tie more container inventory in transit, incite transloading in the proximity of port terminals, and reduce the availability of containers inland.

Commodities, such as grains, chemical products, and wood products, are among a large array of globally traded goods that represent a niche for containerization.⁵⁰ Each transport system – bulk and containerized – has its own advantages, thus the containerization of commodity chains is more likely to be based on a complementarity rather than on competition. For several commodities, such as grain, iron ore, and coal, containerization will, at best, perform a niche role in the total volume handled. Containerization offers speed and flexibility, while bulk shipment offers the lowest transport cost. The movement of some bulk cargo to container shipment is supported by several factors.⁵¹

⁴⁹ Dewry Annual Container Market Review and Forecast, 2006-07. London: Drewry Shipping Consultants.

⁵⁰ Notteboom, T. and J-P Rodrigue (2009) "The Future of Containerization: Perspectives from Maritime and Inland Freight Distribution", *Geojournal* 74 (1): 7-22.

⁵¹ Rodrigue, J-P and T. Notteboom (2012) "Looking Inside the Box: Evidence from the Containerization of Commodities and the Cold Chain", submitted for publication in *Maritime Policy and Management*.

- A general rise in commodity prices and growing demand in new markets have made many commodities more prone to be containerized from a value proposition standpoint.
- Fluctuations and rises in bulk shipping rates have incited a search for alternatives to bulk shipping. Volatility also makes long-term planning for bulk shipping complex and subject to risks.
- Relatively stable, and even declining, container shipping costs, particularly in light of rising commodity prices, render the container attractive.
- Global trade imbalances are transcribed in imbalanced container shipping rates, which represent a notable export subsidy for return cargo. For markets with notable imbalances, such as China (exports) and the United States (imports), incentives are acute.
- Empty container repositioning has created opportunities where pools of empty containers can be filled for backhauls.

The development of **containerized niche markets** is particularly suitable where there is a significant backhaul movement of empty containers, which tends to be the case at transshipment hubs. Since the inbound flows relate to a very different supply chain (mostly retail), an effective use of backhaul containerized assets requires concerted efforts between major commodity producers, rail and truck operators, container owners (shipping and container leasing companies), and terminal operators. In developing countries, container stuffing tends to take place within the terminal facility since it confers additional security and minimizes the risk of use for illicit trade.

Perishable goods, particularly food, suffers from degraded quality over time from chemical reactions that can be mostly mitigated by lower temperatures. Every delay can have negative consequences for a perishable cargo. To ensure that perishable cargo does not become damaged or compromised throughout transport, businesses in the pharmaceutical, medical, and food industries increasingly rely on **cold-chain technology**. The cold chain refers to the transportation of temperature-sensitive products along a supply chain using thermal and refrigerated packaging methods and the logistical planning to **protect the integrity** of these shipments.

Table 8 - Expected benefits of container management projects

Project	Expected Benefits
Empty container depot	Makes containers available for exporters. Reduces port congestion. Lowers drayage costs.
Transloading facility	Rotates containers more quickly. Promotes specialized commodity exports (small and medium-sized producers).
Cold-chain logistics	Promotes high-value export of perishables on global markets (fish, meat, fruits, vegetables, flowers, etc.) in reefers. Ensures higher-quality exports and less waste.

Green logistics

Environmental sustainability is an objective shared by many actors along the supply chain. The emergence of greenness as a strategy favoring supply-chain integration can help improve various processes behind supply chain management.⁵² In many cases, “greenness” has become a requirement for suppliers of manufacturers and retailers, such as in the food sector (e.g. organic and fair trade food). The numerous green applications of logistics fall into three main dimensions as described below and illustrated in Table 9:

- **Product design and production planning.** Developing products that have a lower environmental footprint in their production process, use, and disposal.
- **Physical distribution.** Insuring that the mobility of freight related to logistics operations is performed in a sustainable and environmentally friendly manner.
- **Materials management.** Moving toward more efficient materials use, including packaging and recycling.

Table 9 - Logistic activities and their green dimensions

Product Design and Production Planning	Physical Distribution	Materials Management
Product design	Certified distribution facilities	Packaging
Near sourcing	Certified carriers	Recycled inputs
Sustainable sourcing	Load consolidation	Recyclable outputs (waste management)
	Alternative modes and fuels	

All these dimensions can be individually or jointly applied. Since they involve different actors, concerted efforts are uncommon as each element of the supply chain pursues strategies judged to be the most effective in its area. From a supply-chain management perspective, green logistics can be summarized through five objectives, each requiring specific strategies that cannot be achieved without a concerted supply chain management effort:⁵³

- **Shipping less.** The setting of demand-responsive systems where supply chains are tightly integrated so that the goods being delivered are the outcome of an expressed demand. A better level of order fulfillment tends to reduce returns.
- **Changing suppliers.** Reassessing sourcing both at the global and domestic levels. This is best done when the full array of logistics costs are considered. Although a supplier may appear to offer a lower cost, if factors such as higher transport costs, more inventory in transit, longer response times, and a lower reliability are considered, other closer suppliers could be more advantageous.

⁵² Rodrigue, J-P, B. Slack and C. Comtois (2001) "Green Logistics", in A.M. Brewer, K.J. Button, and D.A. Hensher (eds) *The Handbook of Logistics and Supply-Chain Management*, Handbooks in Transport #2, London: Pergamon/Elsevier.

⁵³ Taniguchi, E., R. Thompson and T. Yamada (2003) *Visions for City Logistics*, Proceedings of the 3rd International Conference on City Logistics, Madeira, Portugal, June, 1-16.

- **Shipping scheduling.** Adapt the scheduling of flows to insure greater use of existing assets. Allow longer shipping time and consider the option of shipping outside rush periods.
- **Efficient packaging.** Reduce the shipment size (volume) of a load by using less packaging or by changing how it is packed.
- **Modal shift.** Use a mode or a route that is more energy and environmentally efficient, which can involve a change in the routing of cargo.

Table 10 - Expected benefits of green logistics projects

Project	Expected Benefits
Certification programs to green logistics standards	International and national recognition and improved supplying opportunities. Certified carriers (less emissions; energy efficiency). Certified distribution facilities (energy efficiency; lower footprint). Less material losses.
Reverse logistics	More efficient recovery of recycled materials. Development and expansion of the national recycling industry.

City logistics

An often-neglected dimension of freight distribution concerns the array of **goods moving within metropolitan areas**, either to the point of final consumption, from a factory to a transport terminal, or through a city on their way to another location. Cities are often the **last mile in freight distribution** and, therefore, represent a unique set of challenges in supply-chain management that are often disregarded since they involve short distances and local carriers. Inversely, they are often the first mile in freight distribution since many production facilities are located within metropolitan areas, particularly in developing economies. Simplistically, city logistics is about the means to achieve freight distribution in urban areas by improving the **efficiency of urban freight transportation**, reducing **traffic congestion**, and mitigating **environmental impacts**.⁵⁴

All urban freight distribution systems depend on the urban setting and its level of development, but in two main functional classes. The first class is **consumer-related distribution**, including:

- **Independent retailing**, which concerns a variety of retailing activities, often of small scale (single store) as well as more informal activities such as street stalls (prevalent in developing countries).
- **Chain retailing**, including larger stores (such as "big box" stores) that tend to be located in the suburbs where they can offer parking space for customers as well as dedicated delivery bays accommodating larger trucks.
- **Food deliveries**, concern specialized supply chains supplying outlets (grocery stores and restaurants) with goods that are often perishable. In developing countries, outdoor (or central) markets are a major source of fresh food for the urban population.

⁵⁴ Dablanc, L. (2009) *Freight Transport, A Key for the New Urban Economy*. World Bank, Freight Transport for Development: a Policy Toolkit, July.

- **Parcel and home deliveries**, have increased due to the significant growth of transactional activities (e.g. trade, finance). Several companies are specialized in these services including UPS, DHL, TNT, and FedEx. Deliveries to homes have increased because of the growth of web-based retail transactions.

The second functional class of city logistics is **producer-related distribution**:

- **Construction sites**. The constant renewal and repair of urban infrastructures (e.g. housing, offices, roads) requires a supply of materials to construction sites.
- **Waste collection and disposal**. The collection and disposal of the variety of wastes generated by daily urban activities is a form of reverse logistics since the waste being discarded was previously goods being delivered. To this can be added recycling activities, which use specialized vehicles.
- **Industrial and terminal haulage**. Industrial activities and transportation terminals such as ports, airports, and rail yards generate a substantial amount of goods movements within cities. Gate access at intermodal terminals, particularly ports, can lead to congestion (queuing) and local disruptions. Logistics zones and industrial parks also generate substantial freight movements.

The urban infrastructure is overused during rush hours but tends to be underused during the evening and the night.⁵⁵ Using urban roads more effectively outside normal periods requires specifically designed urban freight modes and urban consolidation facilities. A better consolidation of loads would also benefit city logistics.

Table 11 - Expected benefits of city logistics projects

Project	Expected Benefits
Rationalization of deliveries	Better use of existing transport assets. Better matching of trip sequences (deliveries & pickups). Less congestion.
Freight facilities	Facilities better adapted to urban freight distribution. More efficient (time and energy) urban deliveries.
Modal adaptation	Vehicles better suited for urban deliveries. Less congestion and energy consumption.

Because of their size, their reliance on road transport, their congestion, and their lower than average level of retail organization, Latin American cities have particular city logistics challenges. Since large metropolitan areas commonly act as gateways to global trade, the development of trade-oriented infrastructure, such as intermodal terminals, will exacerbate urban freight distribution if they are not accompanied with mitigation measures (Table 11).

⁵⁵ OECD (2003) *Delivering the Goods: 21st Century Challenges to Urban Goods Transport*, Paris: OECD.

Benefits for stakeholders

Logistics projects are mainly collaborative efforts between public and private stakeholders. Since each stakeholder has its own objectives, each derives a different set of benefits, but may also have issues that need to be pondered and mitigated (Table 12).

Table 12 - Potential benefits of logistics projects by stakeholder⁵⁶

Stakeholder	Potential Benefit of a Logistics Project	Relevant Issues
Government and society	Generation of economic development, employment and added value. More coherent utilization of the territory. Fiscal income (taxes, rent). Lower levels of congestion and environmental impacts. Lower road maintenance costs. Fewer accidents.	Infringement on agricultural or natural land. Will the level of economic impacts be acceptable? Level of required public investment in infrastructure, equipment, and labor. Level of relevance to and acceptance by society.
Maritime shipping lines	Lower intermodal freight distribution costs. Better utilization of container assets. Higher level of service to customers.	Level of additional maritime services required. Level of improvement in the utilization of container assets.
Port authorities and port terminal operators	Generation of additional traffic. Development of freight services. Higher level of equipment utilization. Anchoring of existing traffic. Attraction of additional maritime services.	Additional investments required both at terminals and inland. Types and terms of concession agreements.
Logistics real estate developers	Opportunity to develop new distribution centers and new logistics parks. Opportunity to manage logistics parks.	Level of required investment. Level of commercial potential of new logistics activities.
Railways and rail terminal operators	Generation of additional traffic. Construction or expansion of terminals. Expansion of intermodal services and equipment. Access to freight services at lower costs. Better asset utilization.	Additional investments required for equipment and terminals. Impacts of logistics activities on the service network.
Trucking industry	Generation of additional traffic. Development of freight services. Higher level of equipment utilization.	Potential modal shift to other modes. Truck operation costs and flexibility.
Logistics services providers (3/4PLs)	Better access to intermodal transport services. Lower transport and warehousing costs. Better quality of services to customers.	Level of cost and reliability of logistics services. Additional investment required and level of risk.
Freight forwarders	Lower transport and warehousing costs. Easier to set transport services. Better access to transport services.	Level of cost and reliability of logistics services. Additional investment required and level of risk.

⁵⁶ Source : adapted from CPCS Transcom Limited, Les Consultants DAMF, and J-P Rodrigue (2010) Aménagement d'un pôle logistique au Québec. Volet 4.2 : Évaluation des services requis par un pôle logistique (The planning of a logistic park in Quebec. Part 4.2: Evaluation of required services of a logistic park), The International Institute of Logistics of Montreal.

Evaluation methodology

Assessment criteria

Although the level of success of a logistics project, like most infrastructure projects, can be evaluated only after implementation, common practice shows that adherence to guidelines improves the likelihood that the project will meet the expectations of its stakeholders.⁵⁷ Some guidelines to use in assessments are:

- **Supply chain requirements.** How does the project fit within the supply chains it hopes to attract, develop, and service? This assessment requires an overview of freight flows such as origins, destinations, intermediary locations, and how the goods are handled and carried.
- **Accessibility.** What are the connections to local, regional, national, and global transport networks (infrastructure and services)? Globally connected supply chains obviously require efficient port or airport facilities, but most supply chains also depend on regional accessibility. Logistics activities located inland commonly require a transport corridor and inland terminal facilities.
- **Competition and complementarity.** How does the project compete with existing supply chains, transport services, and other facilities? Potential complementarity should also be considered, such as between a port terminal and an inland port.
- **Externalities.** What are the potential impacts (e.g. multiplying effects) of the project on economic development, labor, and energy consumption? What negative externalities, such as congestion and environmental impacts (e.g. noise and emissions) might it generate?
- **Land use.** What are the land-use requirements to satisfy the expected demand, operations, and the connectivity to transport infrastructures? The land-use structure should minimize negative externalities.
- **Partnerships and support.** Are there partnerships with the relevant governmental agencies to ensure consistent regulations and their compliance, help secure funding, and build public support for the project?

There is ample evidence that large infrastructure projects tend to have evaluation bias, particularly in underestimating their costs and overestimating their benefits.⁵⁸ Also, *ante* infrastructure project assessments are often significantly different than *post* assessments. A gap between expectations and outcomes may lead to a reassessment of public policy and investment strategies.

⁵⁷ Transportation Research Board (2011) *Freight Facility Location Selection: A Guide for Public Officials*, National Freight Cooperative Research Program Report 13. Washington: Transportation Research Board.

⁵⁸ Flyvbjerg, B. (2009) "Survival of the Unfittest: Why the Worst Infrastructure Gets Built—And What We Can Do about It", *Oxford Review of Economic Policy* 25 (3): 344–67.

Key logistics projects evaluation measures

The methodology to assess the efficiency of freight distribution is well established with criteria such as on-time delivery, delivery of requested orders, and level of delivery asset utilization.⁵⁹ These criteria are **supply-chain specific** and usually collected within a firm to monitor and improve its performance in regard to its customers. There is a direct incentive for logistics firms to assess their efficiency because performance is linked with customer satisfaction and competitiveness. However, such an approach is complex to implement in the assessment of logistics projects because these projects involve several supply chains in which stakeholders are usually reluctant to share proprietary performance information.

There is also the issue of **differential impacts**. The same project may improve the metrics of a specific supply chain while having little, if any, impact on another because different supply chains view input costs related to location, real estate, inventory carrying, labor, and accessibility differently. Whereas, for passengers, the utility of transport infrastructures varies little for movements such as commuting, the utility of freight transport infrastructures varies greatly depending on the type of cargo (e.g. bulk versus containerized). Without an accurate assessment of the concerned supply chains, the evaluation of a logistic investment project is subject to much uncertainty, particularly since freight distribution is commonly ill-covered by concepts and methods about the impacts of transport infrastructure investments.⁶⁰ To improve on this shortcoming, Table 13 suggests a series of criteria that may be used to assess the benefits of logistics investment projects.

Table 13 - Logistics projects evaluation matrix⁶¹

Evaluation Criteria	Key Logistics Projects
<p>I Development of Intermodal Transport Infrastructure <i>Defined as accessibility of ports and airports by road and rails, adapted to multi-modal transportation. Measured by:</i> Capacity development at seaports and cargo airports. Port terminal capacity, volume, and concession agreements. Turnover time change for container ships and cargo planes. Connectivity improvement to liner shipping and air networks. Modal split change for hinterland transportation. Terminal gate access improvements (delays and throughput). Improvements in cargo-handling costs at intermodal terminals.</p>	<p>Gateways and corridors. Logistics zones and inland port development. Freight portals and port community systems.</p>
<p>II Development of Logistics Zones <i>Defined by the development of areas devoted to logistics activities and connected to transport infrastructure. Measured by:</i> Location and area (land and warehousing) of logistics zones. Number and income of firms with international supply chains. Average distance/time from intermodal terminals.</p>	<p>Logistics zones and inland ports development. City logistics.</p>
<p>III Supply Chain Facilitation <i>Defined as a range of rules, procedures, and mechanisms that can help the</i></p>	<p>Logistics zones and inland ports development.</p>

⁵⁹ Bowersox, D.J., D.J. Closs and M. B. Cooper (2012) *Supply Chain Logistics Management*, 4th Edition, New York: McGraw-Hill.

⁶⁰ OECD (2002) *Impact of Transport Infrastructure Investment on Regional Development*, ITRD E112022.

⁶¹ Source: adapted from Memedovic, O., L. Ojala, J-P Rodrigue and T. Naula (2008) "Fuelling the Global Value Chains: What Role for Logistics Capabilities?", *International Journal of Technological Learning, Innovation and Development* 1 (3): 353–74.

<p><i>simplification, harmonization, automation, and speeding up of goods and information flows within supply chains. The result in improved costs, time, and reliability is measured by:</i></p> <p>Customs clearance time improvements. Transport costs as percentage of import value. Inventories held at ports and terminals. Daily costs of inventory holding. Container road / rail transport costs. Improvements in delivery times and reliability (supply chain specific). Standardization of material handling (packaging, labeling, etc.).</p>	<p>Freight portals and port community systems. Container asset management. Green logistics. City logistics.</p>
<p>IV Development of Logistic Services</p> <p><i>Defined as availability and quality of intermodal transport services, freight forwarding, 3PL/4PL logistics. Measured by:</i></p> <p>Number of companies offering 3PL/4PL services. Change in employment structure and income per worker. Development of technical and academic logistics training programs.</p>	<p>Logistics zones and inland ports development. Labor development and logistics services. Green logistics. City logistics.</p>

Assessment prospects for port hinterland logistics

The capacity and efficiency of the **maritime / land interface** remains a fundamental bottleneck in the development of freight distribution systems, particularly in Latin America and the Caribbean. The maritime / land interface focuses on the relationships between maritime and inland freight distribution, particularly the logistics supporting their interactions. Maritime shipping is highly dependent on the performance of inland freight distribution, which insures continuity in global supply chains. While activities such as production and retailing are built on the concept of interdependency, distribution is a derived outcome of this interdependency. The maritime / land interface is particularly important for the expanding long-distance trade brought by globalization. The growing distances that freight is being carried and the surge in freight volumes have created challenges for the maritime / land interface. The port as an element of supply-chain management becomes even more salient.⁶²

Evaluating the benefits of logistics projects is a challenging task, particularly in light of the complexities of contemporary freight distribution and logistics. The multiplicity and the heterogeneity of supply chains, such as the import / export logistics dichotomy, complicate the assessment for an investment project of its multiplying effects on economic activity and employment. Under such circumstances there is a need to substantiate the findings of this report with additional **empirical evidence** dealing with quantitative as well as qualitative information from representative case studies supporting Latin American and Caribbean logistics. The following four dimensions need to be investigated in more detail:

- **Gateways.** An assessment of key Latin American maritime freight gateways with criteria related to their volume and composition of commercial activities, as well as their accessibility and connectivity to the global maritime transport system. This assessment would emphasize their relative importance to national economies as well as critical bottleneck issues impairing trade facilitation and logistical integration to global supply chains. What are the main terminal

⁶² Robinson R, (2002) "Ports as Elements in Value-Driven Chain Systems: The New Paradigm", *Maritime Policy and Management* 29 (3): 241–55.

facilities involved? Who are their stakeholders (e.g. port authorities and terminal operators)? What are their capabilities to meet freight distribution requirements?

- **Corridors.** An assessment for the selected Latin American gateways of their existing corridors and their capacity to support interactions between the national economy and the global transport system. This is particularly important because inland transport costs account for 40–80 percent of the total costs of container shipping, depending on the transport chain. The functional characteristics of corridors (infrastructures and flows) need to be supported by formal characteristics, namely a level of governance. What kind of public and private institutional setting is needed to provide adequate capacity (functional corridor) and management (formal corridor)? How do different stakeholders interact to develop a corridor and deal with the complexity of multiple jurisdictions and government levels involved?
- **Hinterland logistics.** Each hinterland is characterized by different functional characteristics associated with specific freight flows and their logistics. In many Latin American countries, the differences between import and export freight flows are salient. These characteristics need to be identified so that effective strategies (and investments) can be undertaken by port authorities (and related stakeholders) to face hinterland accessibility and service challenges. What is the potential for modal shift (e.g. to rail) to improve economies of scale in inland freight distribution while keeping up with reliability requirements of logistics? The setting of containerized transport chains requires a higher management level of container assets, such as repositioning empties and forwarding containers to the facilities of beneficial cargo owners for unloading or stuffing. With the growing importance of reefer (cold chain) trade in Latin America, how ready are infrastructures to be upgraded to cold-chain logistics?
- **Logistics zones.** The development of freight distribution requires the development of dedicated areas commonly called logistics zones. These logistics zones can be port centric or at inland ports, depending on their integration with transport terminals, infrastructure, and the markets they service. Logistics zones need to be identified in terms of existing capabilities, their function (e.g. import or export based). For each case, what is the range of logistics activities and their relations with gateways and corridors? What is considered to be an effective logistics zone project and the required investments?

A more accurate overview of these dimensions will provide additional evidence to help define a **suitable methodology as well as available metrics** to assess the benefits of logistics investments in Latin America and the Caribbean.

Bibliography

- Arvis, J-F, G. Raballand, and J-F Marteau (2007) *The Cost of Being Landlocked: Logistics Costs and Supply Chain Reliability*, Policy Research Working Paper 4258. Washington, DC: World Bank.
- Barnard, B. (2010) "Environmental Mandates Going Global", *Journal of Commerce*, December.
- Bowersox, D.J., D.J. Closs and M. B. Cooper (2012) *Supply Chain Logistics Management*, 4th Edition, New York: McGraw-Hill.
- Bretzke, W. R. (2009) "Supply Chain Management: Notes on the Capability and the Limitations of a Modern Logistic Paradigm", *Logistics Research* 1(2): 71– 82.
- CAPS Research (2009) *Supply Chain Integration: Challenges and Good Practices*, Institute for Supply Management and W. P. Carey School of Business at Arizona State University.
- Crujssen, F., W. Dullaert and H. Fleuren (2007) "Horizontal Cooperation in Transport and Logistics: a Literature Review", *Transportation Journal*, Summer, 22-36.
- Cushman and Wakefield (2009) *New Age of Trade: The Americas*, Industrial white paper for NAIOP Research Foundation, January 2009.
- Dablanc, L. (2009) *Freight Transport, A Key for the New Urban Economy*. World Bank, Freight Transport for Development: a Policy Toolkit, July.
- Dewry Annual Container Market Review and Forecast, 2006-07. London: Drewry Shipping Consultants.
- Fawcett, S.S. and G.M. Magnan (2002) "The Rhetoric and Reality of Supply Chain Integration", *International Journal of Physical Distribution & Logistics Management* 32 (5): 339–61.
- Ferrari, C., F. Parola and E. Morchio (2006) "Southern European Ports and the Spatial Distribution of EDCs", *Maritime Economics & Logistics* 8 (1) 60–81
- Flyvbjerg, B. (2009) "Survival of the Unfittest: Why the Worst Infrastructure Gets Built—And What We Can Do about It", *Oxford Review of Economic Policy* 25 (3): 344–67.
- Fujita, M., P. Krugman, and A.J. Venables (1999) *The Spatial Economy: Cities, Regions and International Trade*, Cambridge: MIT Press.
- Giuliano, G., and T. O'Brien (2007) "Reducing Port-Related Truck Emissions: The Terminal Gate Appointment System at the Ports of Los Angeles and Long Beach", *Transportation Research Part D* 12 (7): 460–73.
- Guasch, J.L and J. Kogan (2006) *Inventories and Logistic Costs in Developing Countries: Levels and Determinants: A Red Flag for Competitiveness and Growth*. Policy Research Working Paper 2552. Washington DC: World Bank.
- Guerrero, P., K. Lucenti, and S. Galarza (2010) *Trade Logistics and Regional Integration in Latin America and the Caribbean*. ADBI Working Paper 233. Tokyo: Asian Development Bank Institute.
- Hausmann, R., Hidalgo, C.A. et al. (2011) *The Atlas of Economic Complexity: Mapping Paths to Prosperity*, New Hampshire: Puritan Press.
- Häkkinen, L., A. Norrman, O-P Hilmola, L. Ojala, (2004) "Logistics Integration in Horizontal Mergers and Acquisitions", *International Journal of Logistics Management* 15 (1): 27–42.
- Hensher, D.A. and S.M. Pucketta (2007) "Congestion and Variable User Charging as an Effective Travel Demand Management Instrument", *Transportation Research Part A: Policy and Practice*, 41(7): 615–26.
- Hesse, M. and J-P Rodrigue, (2004) "The Transport Geography of Logistics and Freight Distribution", *Journal of Transport Geography*, 12 (3): 171–184.
- Inter-American Development Bank (2003) *Iniciativa para la Integración de la Infraestructura Sudamericana (IIRSA)*. Informe de Trabajo. Departamento Regional de Operaciones 1. Washington, DC: Inter-American Development Bank.
- Jennings, R.J. (2010) *Globalization: A Smarter Supply Chain for the Future*, CAPS Research, Critical Issues Report, September.
- Manuj, I. and J.T. Mentzer, (2008) "Global Supply Chain Risk Management Strategies", *International Journal of Physical Distribution & Logistics Management* 38 (3): 192–223.

- Memedovic, O., L. Ojala, J-P Rodrigue and T. Naula (2008) "Fuelling the Global Value Chains: What Role for Logistics Capabilities?", *International Journal of Technological Learning, Innovation and Development* 1 (3): 353–74.
- Ng, A.K.Y. and F. Padilha (2012) "The Spatial Evolution of Dry Ports in Developing Economies: The Brazilian Experience", *Maritime Economics & Logistics* 14: 99–121.
- Notteboom, T. and J-P Rodrigue (2009) "The Future of Containerization: Perspectives from Maritime and Inland Freight Distribution", *Geojournal* 74 (1): 7–22.
- OECD (2000) *Trilog Asia-Pacific Task Force, Logistics Integration in the Asia-Pacific Region*, Institute of Highway Economics.
- OECD (2002) *Impact of Transport Infrastructure Investment on Regional Development*, ITRD E112022.
- OECD (2003) *Delivering the Goods: 21st Century Challenges to Urban Goods Transport*, Paris: OECD.
- Rahimi, M., A. Asef-Vaziri and R. Harrison (2008) *Integrating Inland Ports into the Intermodal Goods Movement System for Ports of Los Angeles and Long Beach*, Los Angeles: METTRANS Transportation Center, Project 07-01.
- Robinson R, (2002) "Ports as Elements in Value-Driven Chain Systems: The New Paradigm", *Maritime Policy and Management* 29 (3): 241–55.
- Rodrigue, J-P (2006) "Transportation and the Geographical and Functional Integration of Global Production Networks", *Growth and Change* 37 (4): 510-25.
- Rodrigue, J-P (2012) "Supply Chain Management, Logistics Changes and the Concept of Friction", in P.V. Hall and M. Hesse (eds) *Cities, Regions and Flows*, London: Routledge.
- Rodrigue, J-P, J. Debie, A. Fremont and E. Gouvernal (2010) "Functions and Actors of Inland Ports: European and North American Dynamics", *Journal of Transport Geography* 18 (4): 519–29.
- Rodrigue, J-P, B. Slack and C. Comtois (2001) "Green Logistics", in A.M. Brewer, K.J. Button, and D.A. Hensher (eds) *The Handbook of Logistics and Supply-Chain Management*, Handbooks in Transport #2, London: Pergamon/Elsevier.
- Srour, F.J. et al. (2008) "Port Community System Implementation: Lessons Learned from International Scan", Paper #08-2041, *Transportation Research Board Annual Meeting 2008*.
- Taniguchi, E., R. Thompson and T. Yamada (2003) *Visions for City Logistics, Proceedings of the 3rd International Conference on City Logistics*, Madeira, Portugal, June, 1-16.
- Theofanis, S. and M. Boile (2009) "Empty Marine Container Logistics: Facts, Issues and Management Strategies", *Geojournal* 74: 51–65.
- Tioga Group (2010) *Improving Marine Container Terminal Productivity: Development of Productivity Measures, Proposed Sources of Data, and Initial Collection of Data from Proposed Sources*, Report for Cargo Handling Cooperative Program, Moraga, CA : The Tioga Group, Inc.
- Transport Canada (2010) *Rail Freight Service Review*, Ottawa, TP 15042.
- Transportation Research Board (2009) *Funding Options for Freight Transportation Projects*, Special Report 297, Washington.
- Transportation Research Board (2011) *Freight Facility Location Selection: A Guide for Public Officials*, National Freight Cooperative Research Program Report 13. Washington: Transportation Research Board.
- United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) (2009) "Development of Dry Ports", *Transport and Communications Bulletin for Asia and the Pacific*, No. 78.
- United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) (2010) *Towards an Appropriate Regulatory Environment for the Multimodal Transport and Logistics Industry*. UNESCAP: Bangkok.
- U.S. Federal Highway Administration (2005) *The Freight Technology Story: Intelligent Freight Technologies and Their Benefits*, Office of Freight Management and Operations.
- Van der Horst, M.R. and P.W. de Langen (2008) "Coordination in Hinterland Transport Chains: A Major Challenge for the Seaport Community", *Journal of Maritime Economics & Logistics* 10: 108–129.
- World Bank (2005) *Best Practices in Corridor Management*, Trade Logistics Group, Washington DC: World Bank.

- World Bank (2009) *World Development Report 2009: Reshaping Economic Geography*, Washington DC: The World Bank.
- World Bank (2009) *Supply Chain Security Guide*, Washington DC: The World Bank.
- World Bank (2010) *Connecting to Compete: Trade Logistics in the Global Economy, The Logistics Performance Index and Its Indicators*, Washington DC: The World Bank.
- World Customs Organization (2007) *WCO SAFE Framework of Standards*, WCO: Brussels.
- World Economic Forum (2011) *Logistics & Supply Chain Industry Agenda Council, Final Report 2010-11*, Geneva: World Economic Forum.
- van de Voort, M. and A. Rahman (2004) "Securing Global Supply Chains", *Port Technology International*, 24th Edition: 67–70.
- Yap, J.L. and M.C. Rene (2003) *Guide to Classifying Industrial Property*, 2nd edition, Washington DC: Urban Land Institute.

Appendix

Table 14 - Expected benefits of logistics projects by category

Project	Expected Benefits
<i>Gateways, Corridors, and Hinterland Accessibility</i>	
National gateways and corridors initiative	Consider the national transport systems in a comprehensive manner. Recognize gateways as locations of national strategic interest. Identify and coordinate transport infrastructure investment. Facilitate modal shift and effective inland freight distribution.
Corridor coalitions	Coordinate the operations and investments of various stakeholders. Create an innovative planning framework (the corridor). Improve hinterland transport capacity, efficiency, and reliability. Facilitate better asset utilization (trucks) or modal shift (rail).
Expanded port authorities	Improve port productivity (e.g. concessioning). Reduce congestion near port facilities. Use and coordinate regional transportation more effectively.
<i>Logistics Zones and Inland Ports</i>	
Port-centric logistics zone	Uses port real estate more effectively. Facilitates imports and exports (direct access to port terminal). Reduces local congestion. Receives support from satellite terminals.
Inland port	Promotes modal shift (if connected by rail). Reduces port congestion (relocation of some port activities; e.g. container depots). Facilitates economies of scale in inland distribution (corridors). Lowers last mile transport costs (co-location).
Logistics park	Achieves economies of agglomeration for freight activities. Lowers operational costs (e.g. joint infrastructures and utilities).
Freight village	Promotes the setting of logistics services firms.
<i>Employment and Logistical Services</i>	
Labor training	Advertises logistics as a career path. Increases labor productivity. Develops diversified skills. Attracts logistics firms.
Research centers	Create brain trust to address supply chain challenges. Identify trends and opportunities. Train managers. Collaborate with logistics firms.
Logistics firms incubator	Supports the development of small and medium-sized firms. Develops specialized logistics services, such as 3PLs and 4PLs.
<i>Freight Portals / Port Community Systems</i>	
Port Community System	Promotes a better usage of transport assets and facilities. Improves the tracking of freight. Links existing databases and management systems. Promotes competitiveness in port-related services. Promotes interactions and coordination between freight actors.
Communication systems (WiFi / 3G)	Supports communication between management systems, operators and truck drivers. Synchronize drivers with work flow (fewer delays and errors). Reduce operators' time spent collecting information.

<i>Container Assets Management and Containerized Niche Markets</i>	
Empty container depot	Ensures availability of containers for exporters. Reduces port congestion. Lowers drayage costs.
Transloading facility	Rotates containers more quickly. Promotes specialized commodity exports (small and medium-sized producers).
Cold chain logistics	Promotes high-value exports of perishables (fish, meat, fruits, vegetables, flowers, etc.) on global markets in reefers. Ensures higher quality exports and less waste.
<i>Green Logistics</i>	
Certification programs to green logistics standards	Achieves international recognition and improve supplying opportunities. Certified carriers (less emissions; energy efficiency). Certified distribution facilities (energy efficiency; lower footprint). Reduces material losses.
Reverse logistics	Improves efficient recovery of recycled materials. Develops and expand the national recycling industry.
<i>City Logistics</i>	
Rationalization of deliveries	Improves use of existing transport assets. Matches trip sequences (deliveries and pickups). Reduces congestion.
Freight facilities	Help facilities adapt to urban freight distribution. Improve efficiency (time and energy) of urban deliveries.
Modal adaptation	Uses vehicles suited for urban deliveries. Reduces congestion and energy consumption.