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FACILITATION OF TRANSPORT AND TRADE IN LATIN AMERICA AND THE CARIBBEAN

Logistics platforms as a pivotal element in competitiveness and sustainability

Introduction

A logistics platform is by definition, a functional system which consists in combining and coordinating the operations of different modes of transport as a fundamental prerequisite for ensuring efficient service. The existence of appropriate infrastructure and information technologies (IT) is essential for facilitating cargo transfer from one mode to another in a timely, competent and cost-efficient manner. In its most basic form, this type of infrastructure is known as the cargo terminal; the introduction of value added logistics services and the operation of at least two modes of transport turn it into a comodal platform. The growing complexity of the environment in which transport systems operate has strongly influenced the development of this type of infrastructure, which has evolved from a strictly functional role to incorporate other dimensions of sustainability, which are reviewed in detail in this Bulletin. The State-run port authority in Spain, Puertos del Estado (Spain, 2002), recognizes that local transport functions developed strictly sectoral functions and have now evolved into fully-fledged platforms that facilitate regional integration through the combined use of different means of transport. Ports are considered to be the infrastructure par excellence for providing this type of service. Authors such as United Nations (2001), Europlatforms (2004), Ruminié and Grundey (2007), Rodrigue and others (2009), and Leal and Pérez (2009) have worked on the definition and classification of this concept and have monitored its development.

Under certain technical and regulatory conditions, the implementation of this type of infrastructure has a major impact in reducing not only the economic cost of transport systems, but also the negative externalities that affect the population, thus contributing to sustainable development. The prerequisites for the implementation of competitive and sustainable comodal platforms are discussed below.

This issue of the *FAL Bulletin* examines the economic, institutional, social and environmental aspects of logistics platforms, which help to support competitive economies in a sustainable and egalitarian environment.
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The author of the *Bulletin* is Erick Leal, consultant in the Infrastructure Services Unit of the Division of International Trade and Integration of ECLAC.
For further information, contact trans@cepal.org

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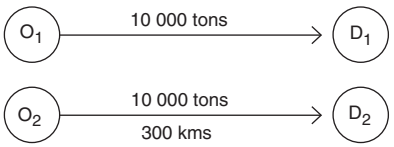
ISU INFRASTRUCTURE SERVICES UNIT
Natural Resources and Infrastructure Division, ECLAC

I. Comodal logistics platforms and sustainability

Figure 1 presents a simplified approach to the assessment of the economic and social impacts of logistics platforms. Taking as a reference the private internal costs and some of the external social costs (accidents and pollution), the study of Gomes and others (2010) shows the advantages of a comodal transport system, that is, one which coordinates and combines at least two modes of transport in such a way as to maximize the efficiency of the service between points of origin O1 and O2 and points of destination D1 and D2. The first option considers two individual shipments of 10,000 tons each, which are transported over a distance of 300 km. Under the comodal alternative, a logistics platform is incorporated whereby two road stretches of 50 km meet and connect with a 200 km railway segment, which ends at a second platform where the shipments are separated and transported over the final segment, once again by road. The exercise shows that the comodal alternative cuts transport costs (that is, not taking into account the investment, transfer and warehousing costs) by 57%, a figure which is added to the 27% reduction in social externalities. These reductions mean that the total cost is 42% lower. Thus, it is clear that in appropriate environments, comodal practices are profitable and sustainable, since they maximize the efficiency of the transport chain and there is scope for all transport modes. Kim and Van Wee (2009) apply a similar logic to the comparison of CO2 emissions between a unimodal system and a multimodal system and conclude that environmental and social sustainability can be compatible with greater economic competitiveness.

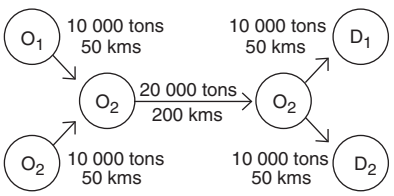
Figure 1
EXAMPLE OF UNIMODAL AND COMODAL TRANSPORT OPTIONS

Option A: Shipment of 20,000 ton cargoes using a unimodal system



Costs Option A	
Internal cost	294 000
External cost	300 000
Total cost	594 000

Option B: Shipment of 20,000 tons using the comodal system



Costs Option B	
Internal cost	126 000
External cost	220 000
Total cost	346 000

Source: Prepared by the author on the basis of Gomes and others (2010).

While the above exercise reveals major advantages from the functional and economic point of view, transport systems are actually much more complex and other important variables that have a significant impact on sustainability must be borne in mind: these include economic and environmental regulations, industrial relations and relations with the community, to name just a few. Table 1 shows how the concept of a logistics platform terminal has evolved and highlights elements linked to different dimensions that have a bearing on sustainability.

Table 1
DIMENSIONS OF COMODAL INFRASTRUCTURE AND THEIR IMPACT ON SUSTAINABILITY

Dimension / Infrastructure	Functional	Economic	Organizational	Institutional (Public sector)
Terminal	Infrastructure: transfer and warehousing Technology: transport mode and transfer	More competitive transport costs (economic sustainability): Mode of transport and economies of scale. Specialization in cargo transfer. Lower congestion costs and fewer accidents (social sustainability): Mode of transport Appropriate infrastructure Pollution costs (environmental sustainability): Less polluting modes Concentration in terminal facilitates better control of pollutants.	Management and control come under one organization. Advantage: organization under the central business enhances specialization (economic sustainability) and better management of environmental issues (environmental sustainability).	Opportunity to coordinate investments directly or through concessions, both in nodal infrastructure and in each mode of transport. It corrects market failure (economic, social and environmental sustainability).

(continues)

Table 1 (concluded)

Dimension / Infrastructure	Functional	Economic	Organizational	Institutional (Public sector)
Comodal logistics platform (elements that are added to the results of the terminal)	Infrastructure: Manufacturing, assembly, distribution, logistics and other support services. Technology: data sharing, data storage, security, assembly, manufacturing, distribution and control.	Concentration of services (economic sustainability) Lower research and transaction costs. Diversification of income via complementary business Externalities associated with the dissemination of knowledge. Geographical, cognitive and institutional proximity facilitate the generation of more and better capacities both within each company and within the cluster. Greater and better control and physical monitoring of sources of emissions (environmental sustainability)	Management and control under organizations dedicated to their respective functions (economic sustainability) When conditions allow, facilitates investment coordination especially between public and private entities (economic and institutional sustainability). Reduction of inventory levels throughout the supply chain, hence better use of resources (economic and environmental sustainability). Promotes efficiency and governance that responds to the objectives of the cluster, with emphasis on competition and long-term development. (economic sustainability)	Opportunity to coordinate public and private development: marketing (economic sustainability), carbon footprint (environmental sustainability) Opportunity to implement integrated transport, infrastructure and logistics policies. Lower coordination costs, trust and public and private "culture", stronger consensus on long-term vision and objectives (institutional, economic and environmental sustainability)

Source: Prepared by the author.

II. Considerations for effective and sustainable implementation

Functional dimension

In terms of functions, the infrastructure services of a cargo terminal dedicated to transfer and warehousing can be supplemented with services in manufacturing, assembly, labelling, distribution and other value-added logistics services. In addition to warehouse and transfer equipment, technology will be used for security, data sharing and storage, as well as for assembly, packaging, control and other related functions.

Economic dimension

The most basic of terminals takes advantage of each transport mode, coordinating shipments and achieving economies of scale and modal specialization. The progression to a logistics platform increases the levels of services using more flexible means with traceable and reliable delivery. In terms of social advantages, rail, maritime and air transport are the safest with the lowest accident rates, hence their combination with the road mode helps to reduce the costs associated with motor accidents. In the same way, a lower volume/vehicle ratio (such as the ratio for road transport) results in high operating costs and an increase in social costs due to congestion in the system, whereas comodal alternatives make for maximum efficiency in the transport system, which, in this case, is reflected in high rates of use per vehicle, greater energy efficiency (economic benefits), less congestion and fewer road accidents (social impacts) as well as lower emissions. Indeed, emissions are much lower when modes with a higher volume/vehicle ratio are used. This advantage is illustrated in tables 2 and 3, which shows the transport costs per mode for passengers and cargo; the data are valid for Portugal for 2000.

Comodal logistics platforms provide the advantages of concentration or clustering, usually referred to as economies of agglomeration, for clients and suppliers as well as for strategic partners; these include lower research and transaction costs (prices, quality, reputation, risk). Also included here are positive externalities associated with knowledge dissemination and competitive development, which arise from geographical proximity and from shared knowledge and private or public institutions generated in this context. As regards environmental sustainability, concentration is more economical since transport costs, hence energy requirements, are lower; concentration also promotes collaboration and the implementation of cheaper mechanisms for tackling environmental projects.

Table 2
PORTUGAL: BREAKDOWN OF PASSENGER TRANSPORT COSTS, 2000 (€/PASSENGER-KM)

Mode of transport	Internal costs					Total internal costs	External costs				Total external costs	Total
	Investment	Inspection	Insurance	Energy	Maintenance		Accidents	Noise	Air	Climate change		
Automobile	0.039	0.001	0.010	0.020	0.007	0.077	0.008	0.002	0.008	0.009	0.027	0.104
Buses	0.010	0.000	0.001	0.013	0.008	0.032	0.001	0.001	0.012	0.009	0.023	0.055
Trains	0.016	0.000	0.000	0.008	0.012	0.036	0.004	0.007	0.008	0.010	0.029	0.065

Source: Gomes and others, 2010. CITTA 3rd ANNUAL CONFERENCE ON PLANNING RESEARCH.

Table 3
PORTUGAL: BREAKDOWN OF CARGO TRANSPORT COSTS, 2000 (€/TON-KM)

Mode of transport	Internal costs					Total internal costs	External costs				Total external costs	Total
	Investment	Inspection	Insurance	Energy	Maintenance		Accidents	Noise	Air	Climate change		
Light freight vehicles	0.081	0.002	0.021	0.052	0.021	0.177	0.023	0.014	0.055	0.081	0.173	0.350
Heavy freight vehicles	0.014	0.000	0.002	0.038	0.009	0.063	0.000	0.005	0.027	0.018	0.050	0.113
Freight train	0.006	0.000	0.000	0.003	0.004	0.013	0.000	0.008	0.010	0.012	0.030	0.043

Source: Gomes and others, 2010. CITTA 3rd ANNUAL CONFERENCE ON PLANNING RESEARCH.

Organizational dimension

With respect to organization, comodal terminals have a strong influence on economic sustainability, especially when they are part of the organization's core business. Given the need for substantial volumes to cover the high cost of the fixed investment component, firms whose main business is not logistics and which specialize in a high-tech area are very likely to have their own terminal.

The logic is different in the case of comodal logistics platforms, since, given the variety of functions, it would be almost impossible to manage, implement and control all the services and businesses. Moreover, the competitiveness of these structures depends on the specialization of each of the organizations that operate within them. Hence, it is increasingly probable that these platforms will coordinate specific strategic investments in telecommunications, recycling, reduction of waste or emissions, which cannot normally be done if there is geographical disaggregation. Logistics platforms are also a physical option where if not the majority, at least many supply chain operators come together; this enhances the organizational and physical integration of the logistics chain and streamlines inventory levels and transport requirements. This streamlining has an economic impact insofar as total logistics costs tend to diminish; furthermore, the better use of resources implies lower negative social and environmental externalities. Lastly, an important outcome of organizational efficiency, aided by the specialization of organizations within the logistical platforms, is institutional sustainability. Although this concept is usually associated with public entities, the presence of a platform management authority rallies the different companies and sectors around the objectives, activities, resources and long-term plans; civil society and the public sector must also be brought into the equation, especially when the territorial impact or market structure and characteristics warrant it.

Public institutional dimension

Logistical investments whether in terminals or comodal platforms are usually private, and may take the form of direct investment or other mechanisms such as concessions. Nevertheless, public sector intervention is also necessary for coordinating and regulating specific complementary (risk-reduction) investments or for ensuring optimum prices or quality services where the market power exists. Port terminals are a good example of this, since it is the port authority (or other relevant authority) that can spearhead initiatives relating to investment, or generate the necessary incentives for achieving competitive prices and services. In terms of sustainability, the existence of this institutional framework is crucial for leading or regulating activity by generating an environment that is safe (accident-free), uncongested and clean (environmentally sustainable). The institutional dimension is important for overcoming market failures in the provision of

infrastructure. Thus the economic sustainability of a terminal or of comodal logistics platforms depends largely on the existence of appropriate institutions conducive to efficient and sustainable transport.

Public institutions afford a great opportunity for business development, since joint public-private activities can be much more effective for dealing with issues of security, public health and foreign trade. Joint marketing or the implementation of systems that measure the carbon footprint can be much more sustainable in the long term if they are conducted by public-private institutions. All of the foregoing also fosters a public-private culture which leads to lower coordination costs, trust and greater consensus in terms of the long-term perspective and objectives.

III. Operational and regulatory considerations

The arguments presented in the foregoing section show that comodal platforms are a valuable system for achieving a sustainable economy. However, the proper functioning of such platforms calls for timely regulation and coordination by the private and public sector. The specialist literature states that the efficient operation of this type of logistical structure depends on a number of variables, in particular, location, market characteristics, the presence of complementary infrastructure and a favourable and dedicated public environment.[1]

Intermediacy and centrality are useful concepts in assessing location. Although these concepts are used to understand how economic activity relating to the port industry impacts on local economic activity in a coastal city, usually referred to as the city-port relationship, the principles discussed here are also valid for smaller geographical areas and also in the case of passenger transport. In practical terms, an intermediate location is one where there is a relatively high concentration of maritime traffic in relation to the urban concentration of the city, whereas a central location is one with a high relative concentration of the urban population in relation to maritime traffic, which means that the size of other economic sectors overshadows that of the port or local logistics. Depending on the scale, the concentration of traffic can generate a substantial demand for cargo and other services, thereby favouring the development of comodal logistics platforms.

Market variables are much more specific, above all in terms of the definition of services that can be provided by a logistics platform. Market volume is one of the most important variables, mainly because of high fixed investment costs and maintenance charges. The high volumes help to reduce operating costs and to amortize investment costs; in addition, they help to meet the operating risk of the business, especially those relating to nodal infrastructure and its linkages with other specific modes such as maritime and rail transport. With respect to types of cargo, the concentration of industrial activity is an important element which triggers the demand for specific services such as large-scale storage and public services relating to health and legal issues. At the other extreme, population size and density are critical for concentrating cargoes of goods for mass or intermediate consumption and which also require specific services, such as transport, warehousing and offloading of containers; cargo value added services, such as repacking, cross-docking, labelling and end-processes in manufactures such as assembly; or else, specific services for the logistics industry itself, such as maintenance of equipment, financial services, provision of inputs or even personal services. In the same vein, per capita income is also important, insofar as it has an impact mainly on the demand for consumer goods and high value added.

Infrastructure is another important variable that has a bearing on private participation, since both nodal and complementary infrastructure have significant sunken costs, which private investors may not be prepared to incur; thus preconditions and incentives must be generated to encourage them to participate. The quality of the infrastructure is important as well as availability. Infrastructure must facilitate the provision of services in terms of capacity, speed and reliability. Recent studies demonstrate the importance of a local business base with knowledge and logistical capacities that facilitate the establishment of partnerships and joint ventures between global and local operators.

In the case of the public sector, the physical, financial and spatial scope means that comodal infrastructure projects usually involve three phases: (i) project design; (ii) investment; and (iii) implementation and operation. Each of these stages is determined by the characteristics of the market they serve, so that market failures occur not only as a result of the risk and competitive behaviour but also because of information asymmetries between interest groups in each phase. Hence, an appropriate regulatory market is required, as well as leadership to enable them to address the challenges that each market presents in the different phases.

[1] For a detailed review, see Slack (1990), Fleming and Hayuth (1994), Notteboom (1997), Van Klink and van den Berg (1997), Mc Calla (1999), Hoffmann (2000), De Langen (2002), Puertos del Estado, Spain (2002), Oum and Park (2004), Ducret (2005, 2006), Lu and Yang (2007), Tongzon (2007), Wilmsmeier (2007), Leal and Pérez (2009), Da Silva and others (2011).

Design phase

Comodal logistics platforms are structured around the coexistence of a variety of firms and businesses that cluster together to take advantage of the gains associated with economies of scale and agglomeration. At the same time, business risk structure calls for a high degree of coordination not only among private entities but also between the public and private sectors so as to minimize the risks associated with the business. In addition, the social and environmental impacts that these platforms can generate must be taken into account, which means that in addition to the initial group and interest groups, other social organizations linked to the territory where the activity is being developed become involved. Thus, there may be a broad range of interests within the respective interest groups, which, if not managed properly, can adversely affect the alignment of interests, jeopardizing both the investment and the implementation of this type of infrastructure.

The participation of the public and private sector must be coordinated, failing which this diversity of interests will be an additional risk factor and may cancel out the economic, social or environmental benefits. Public leadership must seek to bring the public and private interests in line with the long-range perspective, while private leadership must uphold a strategic commitment to reducing accidents, congestion and negative externalities arising from its commercial operation, and to satisfying the interests of the other groups (employment, professional development) in a clean environment conducive to intergenerational equity. Leadership must also be based

investment; hence the importance of studies generated by the public sector to allow for well-informed decisions adopted in a transparent manner. Lastly, this support proves useful also at the feasibility stage, which requires a series of preliminary studies by private and public entities in preparation for the subsequent phase: investment.

Investment phase

Investment in this type of infrastructure, as mentioned before, is associated in some respects with certain market failures. While this calls for the intervention of the public sector, insofar as the private sector requires certain conditions to operate, it is also true that the public sector faces an opportunity cost and must set priorities among important issues such as health, education and social spending. This reciprocity between the public and private sectors also underscores the need to establish the degree of involvement that the public sector should have in this type of undertaking.

The first case has to do with vertical linkages, which one or more private entities establish in order to reduce the operating risk, and the specificity of the investments or the need for complementary investments. The public sector must put these mechanisms in place so that the private sector can have a better risk-return profile and avoid opportunistic behaviour by clients or business partners. At the same time, however, it must ensure that these vertical linkages do not give the operator an excessive amount of market power that could be wielded at the expense of the consumer. In other words, the public sector must ensure social efficiency and must adopt mechanisms that encourage competitive prices or high-quality services so as to ensure social and private efficiency.

Another case closely related to the foregoing has to do with the necessary balance between the investor's strategic commitment and the opportunity cost associated with