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### ► To cite this version:

Laurent Lévêque, Arnaud Serry. Maritime interface and Metropolitan interface: questions about the logistic integration of the Seine Axis. TRA2014 Transport Research Arena 2014, Apr 2014, Paris, France. hal-01724144

**HAL Id: hal-01724144**

**<https://hal.science/hal-01724144>**

Submitted on 6 Mar 2018

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## Maritime interface and Metropolitan interface: questions about the logistic integration of the Seine Axis

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### Abstract

The port community fulfils two functions in freight flow conversions: converting high-volume maritime traffic that is random in nature into fragmented yet regulated flows in order to meet the requirements of the industry or large-scale distribution. The paper therefore analyses the possibilities of integration in a singular location: the Seine Axis. This area combines a maritime interface structured around the ports of the River Seine estuary and a metropolitan interface which supplies a market of more than 11 million inhabitants in the Ile-de-France region. The latter is also a logistics platform not only for the whole of France but Europe as well. There remains a slight connection between these two interfaces. However, signs of better integration have appeared with the growth of container traffic on the River Seine and the governance shared between the port authorities (HAROPA). The issues raised today concern the performance of the port cluster and its potential extension to the whole of the Seine Axis.

*Keywords:* Port cluster, maritime flows, metropolitan logistics, port governance, territorial integration, multimodality

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### Résumé

La place portuaire a une double fonction de conversion de flux : convertir des trafics maritimes massifiés ayant un caractère aléatoire en flux atomisés, mais régulés pour répondre aux exigences de l'industrie ou de la grande distribution. De ce fait, la communication analyse les possibilités d'intégration d'un espace singulier ; l'Axe Seine. Cet espace combine une interface maritime structurée autour des ports de l'estuaire de la Seine et une interface métropolitaine qui approvisionne un marché de plus de 11 millions d'habitants en Île-de-France. Cette dernière sert également de plate-forme logistique pour l'ensemble de la France et même de l'Europe. Ces deux interfaces sont encore faiblement connectées. Cependant, des signes d'une meilleure intégration apparaissent avec la croissance du trafic de conteneurs sur la Seine ou la gouvernance entre les autorités portuaires (HAROPA). La question posée aujourd'hui est de savoir si la performance du cluster portuaire peut être étendue à l'ensemble de l'axe Seine.

*Mots-clé:* cluster portuaire, flux maritimes, logistique métropolitaine, gouvernance portuaire, intégration territoriale, multimodalité.

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## 1. Introduction

The term "Seine Axis" refers to the paradoxical context of a relationship between a metropolis and a major traffic corridor in the form of a river but where most of the traffic goes by road.

The explanatory model of the Seine Axis is the coexistence of two interfaces with a global movement of goods. Evidence of the metropolitan interface can be seen in the 10 million square metres of recently built warehouses in Ile de France and that of the maritime interface, represented by its port facilities and cluster in the Seine estuary. These two interfaces correspond to a different operating logic. Thus, the maritime interface must convert high-volume flows that are random in nature into fragmented flows which should be regulated in order to integrate industrial logistics and retail logistics.

The paper will examine the organization of transport systems, the coordination between economic players and the invention of modes of governance by public authorities. It is based firstly on a Geographic Information System designed at regional level to achieve spatial modelling and operational research and secondly on a series of interviews with freight forwarders involved in international supply chains.

The geographic definition of the axis adopted here is based on the presence of a metropolitan area, international in scope, corresponding to the Île-de-France region, and a maritime gateway with ports situated in Haute-Normandie: Le Havre is a global port, Paris a global city. There are also spill-over areas for these two functions: the departments of Calvados, Eure et Loir, Loiret and the Oise. Having redress at the administrative level is justified due to the extent of territorial governance involved in the integration of both metropolitan and maritime interfaces.

The Seine Estuary, the third region in the Le Havre-Hamburg range, suffered a gradual decline in its market share from 5.5% in 1989 to 2.8% in 2011. Port 2000 terminals in Le Havre, the HAROPA cooperation on the Seine Axis (Le Havre, Rouen, Paris) and the port reform all back new opportunities for the Seine Axis (Noteboom, 2012).

## 2. The Seine Axis, a European logistic axis

The term "Seine Axis" is used increasingly by developers, logistics professionals, politicians and academics, and it is often used to highlight the paradox between potential and reality in terms of circulation of goods. .

### 2.1. The Seine Axis

The Seine Axis has its own characteristics, culture and context but also a potential for development:

- Firstly, it is a market of 25 million inhabitants. The Paris Basin, especially the Ile-de-France region, is fourth in the world in terms of GDP (Fig.1). Its commercial flows are partially captured by foreign ports like Antwerp and Zeebrugge: The Haute-Normandie region transports 12 million tons of goods to Ile-de-France compared with the 30 million tons dispatched by Belgium;
- The river remains underused despite a recent increase in traffic, thanks to the need to reduce CO2 production which has encouraged the development of a modal shift from road to waterways;
- Another component of this potential is the position of the port of Le Havre: the first accessible port for goods entering and the last for goods leaving in the northern range, which gives it an advantage in terms of transshipment to ports based on the Atlantic coast of Europe.
- Finally, port reconstruction has developed a new capacity for handling container flows: six million TEUs for Port 2000, adding to the existing capacity of the port (two million TEUs) and the industrial port area.

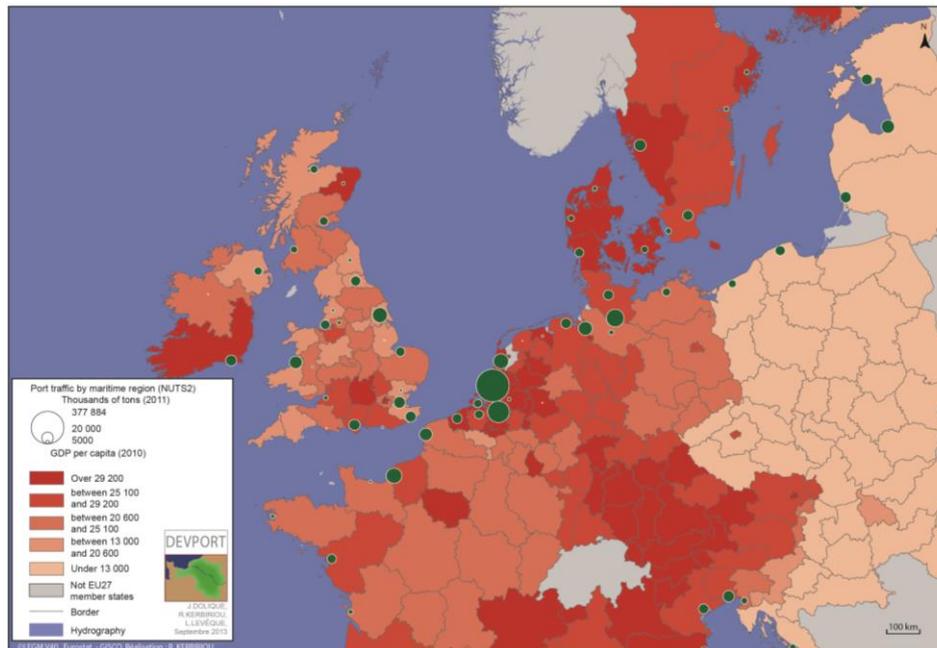


Fig.1. Gross domestic product per capita (2010) and port traffic (2011)

The difference between the potential and the reality, as well as comparison with the location of the other ports in the northern range, makes it possible to measure the possible growth in competitiveness of the Seine Axis:

- The development of high-volume rail and waterway transport systems (Hamburg, a port located at the other end of the range, conveys 40% of its land traffic by rail).
- The re-conquest of markets in the outlying hinterland by offering competitive integrated logistics to shippers from Ile-de-France.
- Governance structures can develop the impact of logistical equipment on the development of the Seine Axis territories.

### 2.1. Port Traffic, demand and hinterland

The importance of the domestic hinterland is primordial because about 89% of land transport flowing out of Le Havre is linked to France (Notteboom, 2012). The presence of a dense market nearby is a condition for the development of the port's supply. Even in the large gateways to Europe, such as Rotterdam and Antwerp, a high proportion of the containers' flow is generated by the region surrounding the port: 40% of the containers that arrive in or leave Antwerp by truck serve markets located within a radius of 50 kilometres around the port.

The concentration of cargo demand in a two-hour radius by road enables the port to offer more diversified and less costly logistical services because of large volumes. It also allows them to install systems of inland terminals for containerized goods, terminals which are served by alternative modes to road: river barges or rail shuttles. This proximity allows economies of scale in the setting up of distribution centres for the entire European market.

According to the port of Le Havre, only 48% of container traffic to and from Greater Paris in 2007 came from or went to the port of Le Havre; these figures were 51% for the west of France (Port du Havre, 2010). The port of Rouen has a market share of 41% in Haute-Normandie and 20% in Basse-Normandie, but marginal shares elsewhere in France. More than 80% of the hinterland of the port of Paris in 2010 was located in Ile-de-France and Haute-Normandie, according to the port of Paris.

One major explanation for the limited reach of hinterlands other than France is the dominance of HGVs in freight transport from Le Havre: 95% of the total freight traffic by HGVs coming from Seine-Maritime in 2009 remained in France (Merk, O., et al., 2011). Moreover, the modal share of container barge transport in ports is significantly lower than elsewhere: 9% of TEU in Le Havre (32% in Rotterdam and 33% in Antwerp) (Lendjel E. & Fischman M., 2012).

The conquest of the distant hinterland such as Ile-de-France by Antwerp has been made simple. It benefits from an expanded range of logistical services to adapt to a multifaceted clientele, with a cost advantage over other



ports. Le Havre's strategy goes hand and hand with the ambition of the port to stretch its hinterland reach beyond the Seine basin (its core hinterland) and even across French borders, backed up mainly by rail services.

The example of hinterland services to and from the port of Le Havre shows that the competitiveness of combined transport in terms of price varies greatly according to the way road transport is organized by rivals. The competitiveness of combined transport compared with road transport is also due to the commercial policy of combined transport operators. The involvement of the three main shipping lines, Maersk, MSC and CMA CGM in the implementation of waterway-road services on the Seine has tended to improve the competitiveness of this mode of transport. In order for clients to shift from road to combined transport, prices must be between 10% and 20% lower (Frémont A. & Franc P., 2010).

### 3. The Seine Axis, a maritime interface

The port may be defined as representing a dual function in flow conversions. The first concerns the conversion of maritime flows which are random in nature into regulated land flows. The second function of the conversion of traffic through the port consists of transforming high-volume flows in the maritime segment (ships of 18,000 TEUs have been ordered by the shipowner Maersk) into the fragmented overland flows which are designated, for example, for a supermarket shelf or assembly line in an industrial plant. Much still needs to be improved in this area in the Seine Axis, even if initiatives are emerging in inland waterway transport (The Havre-Gennevilliers shuttles) or river-sea vessels (The Havre-Caen shuttles). The big handicap remains railway transport in order to reach the distant hinterland and bypassing Ile-de-France.

#### 3.1. Overview of the logistical equipment of the Axis

The logistics space of the Seine Axis can be considered as a dichotomous space where two logistical systems coexist, one characterized by the function of storage and the other driven by operators in international transit (Fig.2).

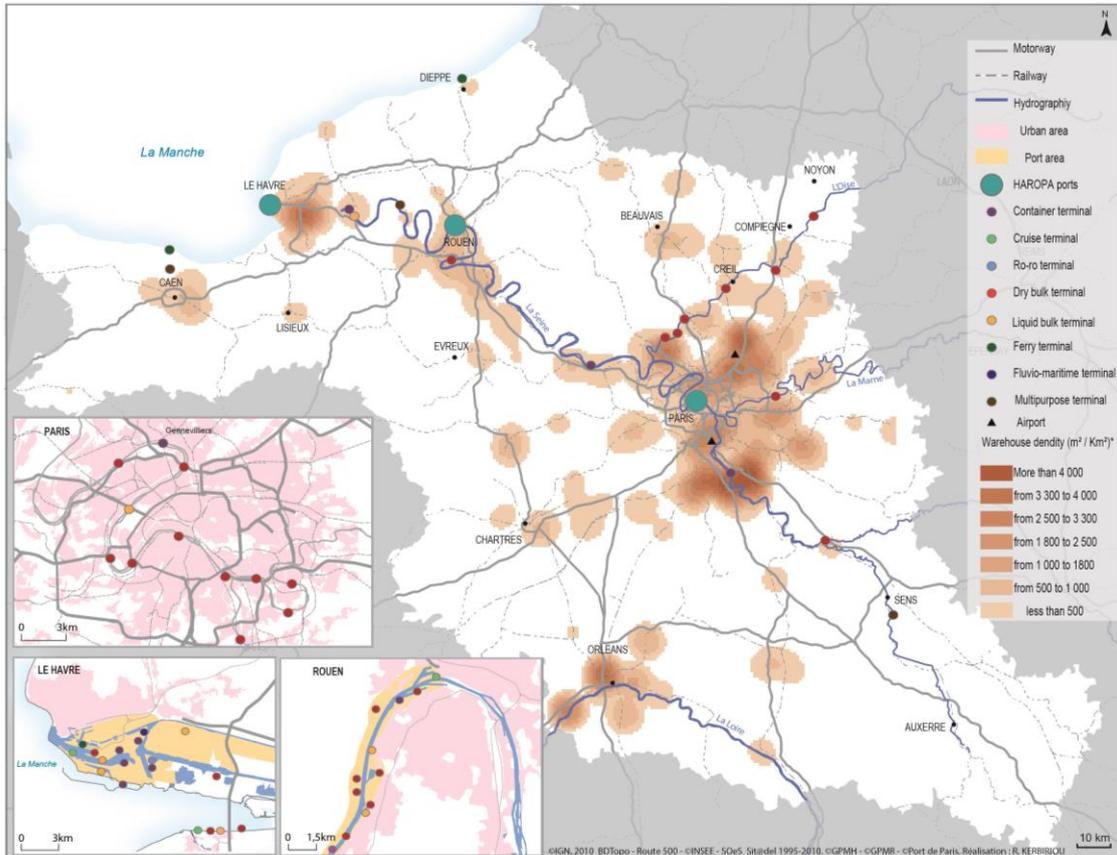


Fig.2. The Seine Axis, logistics area



With the diversity of port terminals on the River Seine, a global organization based on complementarity, subsidiarity and substitutability might be considered. Located near multimodal logistics platforms, a regional port system is taking shape. Water transport is an internal artery to the port system which increases the offer of services. The transit of empty containers on inland waterways, the use of dry port terminals, shuttles between Le Havre and Caen, are the start of this type of operation.

Supplying a region of more than 15 million inhabitants with high-performance industrial facilities relies on a network of enterprises in which road transport dominates. A large number of operators in the transport chain means that perfect coordination and solid experience are required to ensure fluidity and absorb the uncertainties inherent in maritime transport. Therefore, certain services play a strategic role in the logistical organization of companies, notably those offered by freight forwarders. Besides international groups, there are often medium size companies that have accumulated know-how on niches: wines and spirits, cosmetics and perfumes, etc. streamlining their operations by setting up a network of warehouses, agencies and logistics centres in the Seine Axis.

### 3.2. Seine Axis ports today

The ports are largely complementary, Le Havre handling general cargo mostly in containers, Rouen, upstream from Le Havre, handling mainly bulk cargo. It is the main European port for exports of wheat grown in France's northern plains. Le Havre serves the industry based in its surroundings (e.g. Renault) and also the region of Paris with a large concentration of the French population and GDP (Guerrero D., 2012).

The Seine Axis ports face stiff competition from other ports in north-western Europe such as Antwerp and Rotterdam (Fig.3). Larger ports tend to handle greater volumes of transit traffic than smaller ports due to the expanse of their hinterlands, especially regarding Le Havre, Paris' main gateway. As regards Le Havre, about one-third of its container traffic is bound for the Greater Paris region (Ducruet C., ITOH H., Joly O., 2012).

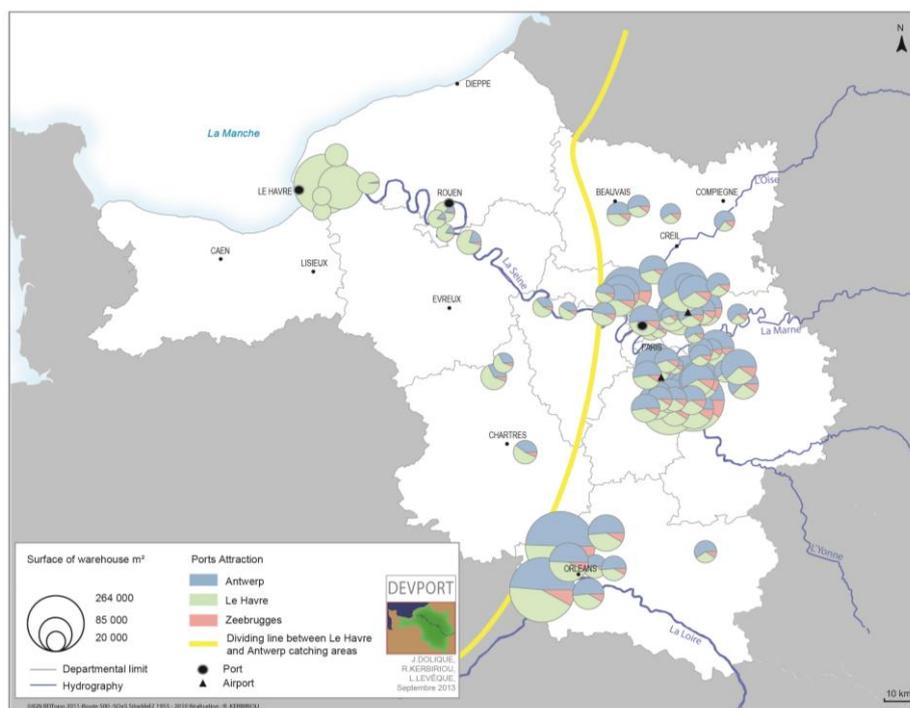


Fig.3. Port attraction in economic areas

Growth rates in the ports of the Seine Axis have been disappointing over the last decade which has led to a decline in market share. Whereas ports in north-western Europe grew on average by 24% between 2001 and 2010, the figure was 7% for the Seine Axis ports. As a result, the market shares of the Seine Axis ports have declined: their combined throughput being only 8.6% in 2010. The port of Le Havre has not benefited from its



favourable geographical location and its specialization in container transport, but Rouen and Paris have done better. While the growth of throughput in the north-western European ports concerns essentially those sectors in which the port of Le Havre is specialized (containers and liquid bulk), the growth of container volume was only 58% in Le Havre compared with 84% on average in the other ports. The specialization of Rouen was less favourable, but it has nevertheless managed to grow: 37% for dry bulk, whereas the growth in north-western European ports was 0% (Merk, O., et al., 2011).

The port of Le Havre scores well in terms of maritime accessibility. It can pride itself on a relatively large number of operators, vessels and direct calls at its port, which are an indication of good maritime connectivity. It has a strong presence along intercontinental shipping routes of the main global shipping lines. Despite good maritime connectivity, Le Havre is only a minor European hub, and its position in maritime networks has weakened over the last decade, even if in recent years there has been a rapid growth in containerized traffic.

### *3.3. The notion of cluster, the nucleus of the maritime interface*

The notion of a cluster has been widely developed to explain the resilience of one type of spatial organization in relation to the centrifugal forces of globalization, a cluster being a geographic concentration of interconnected businesses, suppliers, and associated institutions in a particular field. Clusters are thought to increase the productivity with which companies can compete, both nationally and globally.

The cluster concept can be usefully applied to the study of clustering in maritime activities, such as shipping, shipbuilding and port and maritime services, which are clearly geographically concentrated in a number of maritime clusters (De Langen, 2008). Due to ongoing internationalization in these industries, the concentration of maritime activities in clusters is likely to increase. As regards the port cluster in Le Havre, there is a whole series of complementary port service activities:

- Professional associations such as the Maritime Union and Port (UMEP), which is composed of several families of professions (freight forwarders, customs agents, ship-owners, shipping agents, road hauliers, etc.);
- Trades unions of employees of the various transport branches in the port;
- Administrations like customs, maritime affairs, veterinary services;
- Higher education and research in the maritime domain: the National Maritime College, the Institute of International Transport and Ports, the institutes and departments of the University of Le Havre, including the ISEL, the School of Engineering in Logistics,
- Interface bodies operating between research and the professional world: "Logistics Seine Normandy", a competitiveness cluster "Nov@log", a research centre for innovation and technology transfer dedicated to transportation and logistics, a development agency;
- Various associations linked to the sea like the Seaman's club, the veterans of the "marmar", of the "naval" (shipbuilding), the Port Centre, the Maritime Museum, etc.

The cluster makes a major contribution to regional development. During the period that preceded the financial crisis, job creation within maritime and port activities represented nearly 60 per cent of the total growth in regional employment. However, the port cluster in Le Havre/Rouen is not well established enough in the regional economy which is a missed opportunity for the region. In contrast to most other port cities in northwest Europe, the flow of goods in the Seine Axis are disconnected from high value-added activities; goods pass through Le Havre and Rouen, but advanced maritime services and research are concentrated in Paris. This makes regional co-operation all the more important. Partnerships could be forged between firms and research institutes; concrete projects could be designed to increase the current impetus towards regional cooperation (Merk, O., et al., 2011).

## **4. The Seine Axis, the metropolitan interface**

### *4.1. One metropolis, two logistics markets*

Ile-de-France represents 5% of GDP in Europe. The region generates 305 million tons of freight (SITRAM). In Ile-de-France logistics, real estate represents nearly 25 % of the national stock, the largest in Europe. Between 1995 and 2012, 7 million square metres of warehouses were built in Ile-de-France (SOeS -Sit@del2). The department of Seine-et-Marne alone accounted for 35% of these constructions. The recent development of



storage plants and warehouses has been concentrated in Ile-de-France. They are influenced either by logical supply chains (the proximity of major facilities like port terminals and airports), or by the requirement for distributors to have easy access to markets. A hierarchy has gradually developed; from the logistics platform to the logistics area and then to the logistics centre, as in Senart in the southeast of the Paris region (Fig 4).

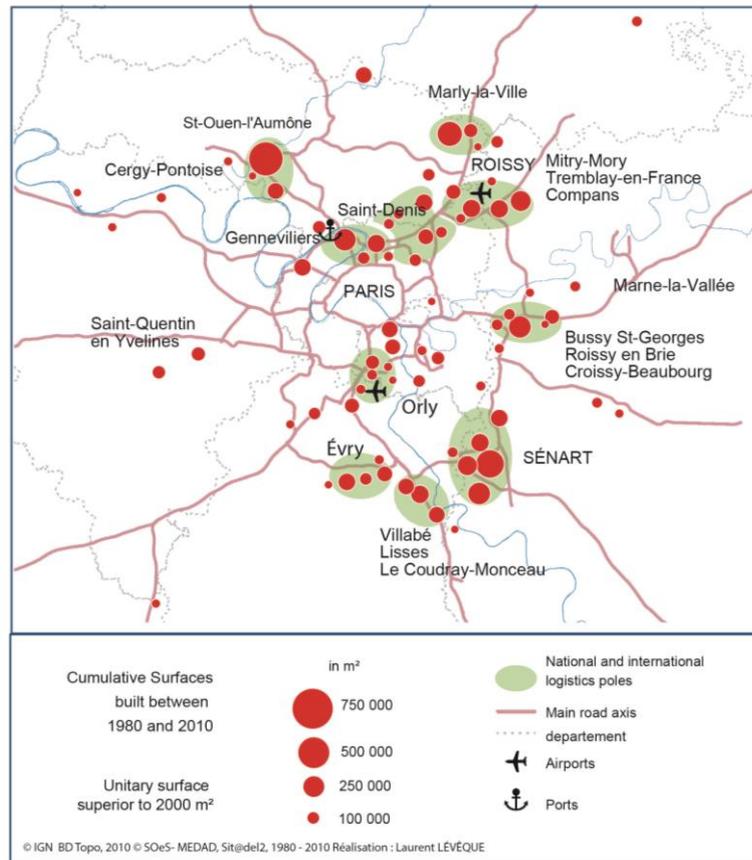


Fig.4. The logistics organization of the Ile-de-France

These warehouses are home to a wide range of logistics activities: storage for port and airport cargo traffic, industrial suppliers, distributors' regional platforms, cross-docking activities, courier services which have developed through online sales. These activities include services like IT management of flows, controlled temperature, technical inspection of goods, pre-assembly and packaging, and so forth. Geographical segmentation has gradually been established depending on the type of activity and the frequency of access to the heart of the market. Urban logistics and messaging are located along the A86, regional distribution platforms between the A86 and the A104 and interregional and international platforms beyond the A104.

According to conventional economic theory, two factors are involved in the location of logistics services and facilities: access to markets and land costs. Transport delivery accounts for 33 % of total logistics costs (Savy, 2006) the location of warehouses closer to consumer markets and processing centres represents a strategic issue for investors and logisticians. From a theoretical point of view, we are faced with a classical equilibrium model where gains made through easy access to the heart of the market should be offset against the cost of land which increases the more central the position. This balance also depends on interregional accessibility. According to our calculations, this distance is 40 km from the centre of Paris which allows for one rotation per day to the densely populated areas while remaining connected to the national and international motorway network. It is therefore possible to combine a delivery service to the final customer together with an interregional service. The dense motorway network in Ile-de-France makes it possible to be located away from the centre of the conurbation and avoid high land prices while maintaining easy access to the heart of the market. In Ile-de-



France, the balance between accessibility to the heart of the city and the national and international service is to be found on large platforms located in the eastern periphery of the region, at the intersection of the Paris ring road and the major motorway connections (Fig.4).

These developments can take advantage of the star-shaped organization of the national motorway network concentrated mainly in the capital. As a result, the cost of access to the rest of France is lower in Ile-de-France than in the rest of the country (Lafourcade, Combes, 2002). By locating one's activity on the periphery of the Ile-de-France region, a regional market of 11 million people as well as domestic and European markets can be served. The eastern sectors of Ile-de-France are in a privileged position because they can reach populated areas of Europe and the Rhineland but also Lyon and the south-eastern part of France.

Despite its peripheral location in relation to the European backbone, Ile-de-France is in a position to provide logistics services on a European scale thanks to its domestic market as well as its air freight hub at Roissy which accommodates the world's principal air freight operators. Furthermore, the advantage for an investor renting property in a large metropolitan area would be a reduction in risk, making it easier for the warehouse manager to find new tenants in the event of his vacating the premises at the end of a contract. Finally, it would appear that rental costs of warehouses are lower in Ile-de-France than in other European metropolitan areas, which explains the demand from international companies seeking a location for its "Europe" region. The logistics of Ile-de-France are part of the international dimension of a metropolitan concentration of activities, people and services.

#### *4.2. Waterways: an emerging component of the metropolitan interface*

Today, waterways play a minor role in freight transport. But after a century of continuous decline, the use of waterways for transporting goods is changing. Even if container traffic only represents 10 % of the total traffic on the river Seine in terms of tonnage, it has steadily grown over the past four years, the total volume doubling since 1997. If these trends continue, facilities on the lower Seine and the Tancarville canal will eventually have to be modernized, as will those in Port 2000 (installation of a lock). It represents the third largest sector of industry after building materials that feed the huge Paris Region and agricultural produce that is shipped to Rouen for export. Seven operators are now using a network of inland terminals on the river but also on the tributaries of the Seine like the River Oise at Conflans, Saint-Ouen and Bruyère, the River Marne at Bonneuil and the River Yonne at Gron and Montereau. Urban logistics support the revival of the waterway system thanks notably to the initiative of the Monoprix group that uses waterways to supply its Franprix stores in central Paris on barges. A total of 251,000 containers were thus transported throughout the Seine basin in 2012.

River transport enjoys lower transport costs especially as regards empty containers which represent over 20% of maritime traffic; road traffic congestion in the capital region can also be avoided. It represents an attractive alternative to road transport, especially if it entails a reorientation of imports, as might be the case for companies which are located near inland terminals like Gennevilliers. Even taking into account the limited capacity of barges, 128 TEUs in Bonneuil sur Marne as opposed to 356 TEUs in Gennevilliers downstream, both ports can cover all the platforms and logistics warehouses in Ile-de-France under particularly economically attractive road transport conditions.

## **Conclusion**

The Seine Axis presents some paradoxes. The port's performance has been lagging, but they have great assets, such as well-developed infrastructure and sea access. In fact, the integration of the two interfaces, both maritime and metropolitan, is low (Fig.5). In the same way, the integration of markets remains to be strengthened.

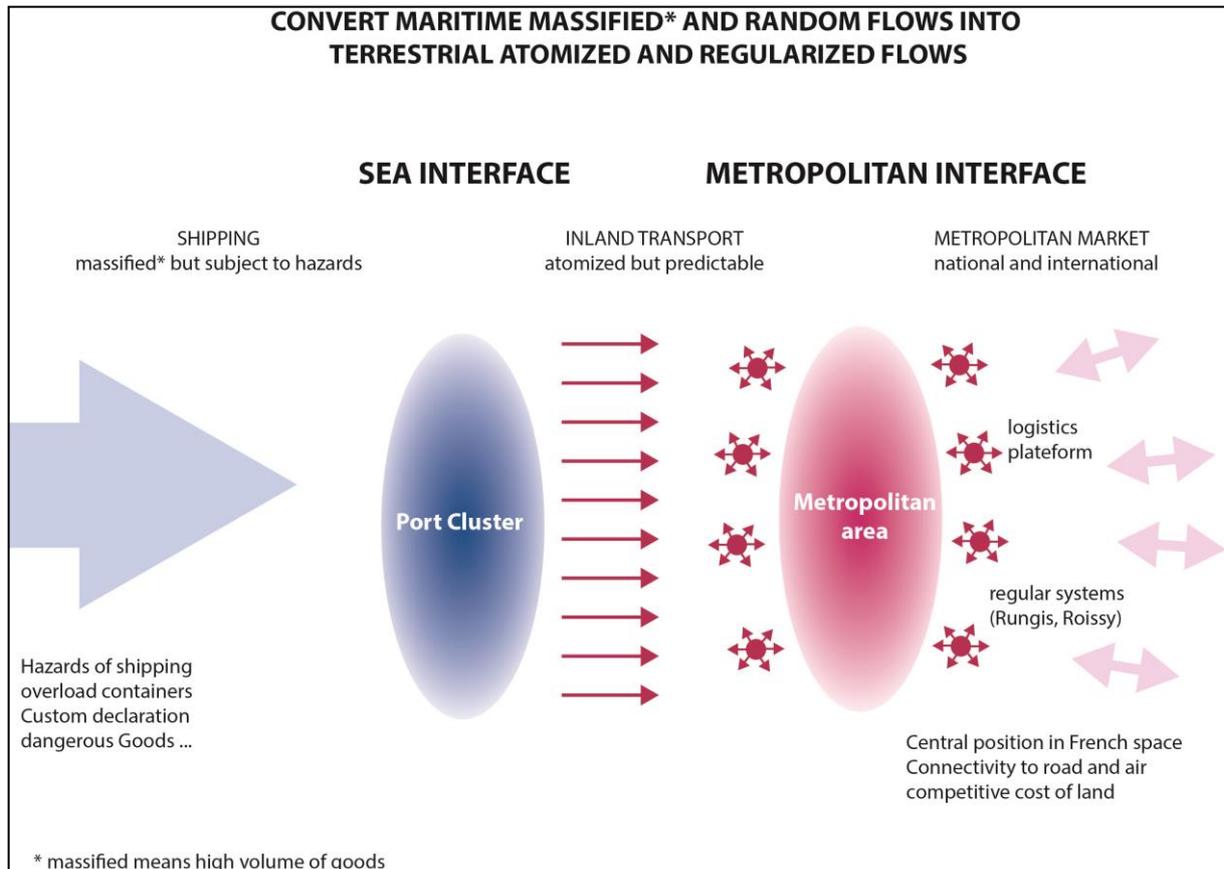


Fig.5. Seine axis: two interfaces

The Seine Axis ports operate in a competitive environment, contending with ports such as Antwerp and Rotterdam that have managed to capture parts of the French hinterland. An essential element for improving port performance is increased regional coordination.

Several guidelines could provide a better spatial integration of the systemic functions of the transit of goods through ports on the Seine Axis.

Firstly, the development of domestic, river and rail terminals for containerized traffic in Ile-de-France in order to reduce the "last mile" by truck, bringing reloading closer to the end user and thus contributing to a reduction in unit costs and GHG emissions. From a conceptual point of view, this would correspond to a transition from a port considered as a node in a network to the multimodal and multi-scale "Port-Network", a system that is already operational in the Rhine-Scheldt delta.

As regards the Seine Axis, an appropriate strategy would be to develop the relationship between "Main Seaports" (Le Havre and Rouen), regional ports (Dieppe, Fécamp, Caen, Cherbourg) and river ports of the Port of Paris (Bruyère-sur-Oise, Limay, Gennevilliers, Bonneuil-sur-Marne, Evry .etc.) .

In order, therefore, to achieve this goal, the governance arrangements will play a fundamental role between port authorities through HAROPA, with linkages between multi-specialized clusters belonging to both the maritime and metropolitan interfaces; and between local authorities, in particular the regional authorities in the Seine Axis. The French government, which has set up an "Inter-ministerial Commission for the Development of the Seine Valley", has shown an interest in the question.

In terms of planning, the "shift" of metropolitan logistics organizations from the East to the North–West of Ile de France is a long-term investment. It is based on land offer and real estate policies established around river terminals such as Gennevilliers, Limay and Achères (a new HAROPA project).



From an academic point of view, the complexity resulting from the interaction between local and global flows, the diversity of actors and the mechanisms of regulation, the rapid transformation of logistics organizations for them to adapt to the hazards of globalization, the issue of integration, point further research towards the notion of a complex territorial system and use of the relevant tools as an aid to understanding, such as multi-agent models or models of simulation of flows. This exercise also shows that there is still a wide scope of investigation in the field of economic intelligence and decision support tools to help businesses and public actors to achieve better market integration and public policies in the valley of the Seine.

### **Acknowledgements**

The Communication reports on the results of a research programme conducted by a multidisciplinary team funded by the Region of Haute-Normandie and the ERDF.

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