

The Competitiveness of Global Port-Cities:

The Case of the Seine Axis (Le Havre, Rouen, Paris, Caen) – France

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ABSTRACT

This working paper offers an evaluation of the performance of the ports of the Seine Axis (Le Havre, Rouen, Caen and Paris), as well as an analysis of the impact of the ports on their territory and an assessment of policies and governance in this field. It examines declining port performance in the last decade and identifies the principal factors that have contributed to it. In addition, the report studies the potential for synergies between the different ports, and surveys impending developments that are likely to influence port performance. The effect of the ports on economic, social and environmental questions is studied and quantified where possible. The value added of the port cluster of Le Havre/Rouen is calculated and its interlinkages with other economic sectors and other regions in France delineated. The paper outlines the impact of the ports' operations, and shows how their activities spill over into other regions. The major policies governing the ports are assessed, along with policies governing transport and economic development, innovation, the environment and spatial planning. These include measures instituted by the port authorities, as well as by local, regional and national governments. Governance mechanisms at these different levels are described and analysed. A port reform package, implemented in 2011, has changed the roles of the principal actors within the ports, and initiatives at the regional level have been intensified. Based on the report's findings, recommendations are proposed with a view to improving port performance and increasing the positive effects of the ports on their territory.

JEL classification: R41, R11, R12, R15, L91, D57

Keywords: ports, regional development, regional growth, urban growth, inter-regional trade, transportation, input/output

FOREWORD

This working paper is one in a series of *OECD Working Papers on Regional Development* published by the OECD Public Governance and Territorial Development Directorate. It is the first case study of the *OECD Port Cities Programme*. This paper was written by Olaf Merk, César Ducruet (CNRS – Université de Paris I Panthéon-Sorbonne), Patrick Dubarle, Elvira Haezendonck (Vrije Universiteit Brussels) and Michael Dooms (Vrije Universiteit Brussels). It was directed by Olaf Merk, under the responsibility of Lamia Kamal-Chaoui (Head of the Urban Development Unit) and Joaquim Oliveira Martins (Head of the Regional Development Policy Division). It draws on the work of a number of other contributors, including Mathieu Bordes, Walter Manshanden and Martijn Dröes (TNO Inro Netherlands), Wouter Jacobs (Utrecht University) and Xiao Wang. The publication was edited by Vicky Elliott. Valuable comments on a draft of the report were provided by Elisabeth Gouvernal (IFFSTAR) and Michèle Collin (CNRS).

The paper can be downloaded on the OECD website: www.oecd.org/regional/portcities.

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EXECUTIVE SUMMARY

Paradoxical port performance

The market share of the Seine Axis seaports (Le Havre, Rouen and Caen) has declined from 9.9% in 2001 to 8.6% in 2010 in northwest Europe, due partly to limited growth rates in Le Havre. Some of the actors responsible for the selection of global ports, and in particular the shipping lines, perceive the port of Le Havre in a less than positive light. A variety of factors have contributed to this situation, including strained labour relations, the relative lack of competition, a certain reputation for inefficiency and Le Havre's limited connections with the hinterland by train and barge. Several developments on the horizon, including the completion of the Seine-Nord Canal, will intensify competition between ports in northwest Europe and increase the need to improve port performance. Nevertheless, the competitive position of the Seine Axis ports has been improved by recent investments and reforms, such as the Port 2000 port extension in Le Havre and the French port reform, implemented in 2011. Co-operation between the ports (Le Havre, Rouen, Caen and Paris) could also help in this respect. Each has different functions and specialisations, but there is considerable potential for developing synergies based on their common interests.

An impact that extends beyond Normandy

The port cluster of Le Havre/Rouen represents a large share (more than a fifth) of regional value added. It also has considerable indirect effects on several other economic sectors; these multipliers are larger than those for the main ports in the Netherlands, although they are less substantial than those of major Belgian ports. Most of these indirect economic effects have an impact in Greater Paris (Ile de France) and the rest of France, but not in Normandy, where Le Havre and Rouen are located. Although the port clusters in the Seine Axis represent a large number of jobs (a total of 136 000 in 2008), their specialisations are not favourable to job creation. On the environmental front, freight transport from the port of Le Havre entails relatively large external costs (EUR 22 million in 2000), mainly associated with the large share of lorries in the modal share.

The constellation of a small port city (Le Havre) and a large metropolis without a seaport (Paris) is a relatively unusual phenomenon. Most of the port regions in northwest Europe are themselves fairly large metropolitan regions. By comparison, the economy of Le Havre/Rouen has fewer high-value-added jobs and innovative activities. While Paris, rather than Le Havre or Rouen, is France's global centre of advanced maritime services, in Rotterdam and Hamburg, such services are based in the port-cities themselves.

Recent emphasis on infrastructure and labour relations

Although Port 2000 (the port extension in Le Havre) has been completed, the port and other actors are still devoting much energy to additional infrastructural improvements, such as dredging, new inland ports and multimodal platforms. In addition, social dialogue and labour relations have recently been a major area of contention. The French port reform, passed in 2008 and implemented in 2011, involves the transfer of container and other cargo-handling functions to the private sector; this is expected to ease labour relations. In addition to these priorities, several challenges have yet to be resolved. The interface of Port 2000 and river transport, for example, is a pressing concern, as is the saturation of the railway network for freight transportation. Meanwhile, the time is now ripe to focus on enhancing commercial spirit in the Seine Axis and to work on further common projects.

More competition and commercial spirit needed

An active search for markets and hinterlands is now called for, in light of the strong competition from other northwestern European ports. This will require new approaches by port authorities, including co-operation with foreign ports, co-ordination of services, and private sector involvement in the region and the country. Governments can facilitate this process, for example by reconsidering the application of VAT at the border. As part of this strategy, competition in port services could be stimulated, and freight transport further liberalised. A comprehensive analysis of competitive conditions in the Seine Axis ports could be undertaken to identify any monopolistic rents. Partnerships with the private sector could help to anchor the port-related activity regionally. These could explore win-win-situations involving regional spill-overs and new traffic generated for the ports. The mix of industries in the port clusters of Le Havre and Rouen presents possibilities for bio-based renewable energy, but ports such as Rotterdam are competing for similar functions. Increased partnerships with universities and research institutes could help to articulate these pro-active and commercial strategies. Some form of clustering of maritime and logistics expertise might be needed for this purpose.

Joint projects

Institutional co-operation between the ports and the local governments in the Seine Axis has already been increased. If the aim is to transform the Seine Axis into a "gateway" region, the alignment of projects with a common strategy will have to be intensified. This implies a clearer understanding of the roles of the different ports, and more common projects and joint ventures, along the lines of those that have been undertaken in many other gateway regions, including Flanders and the Yangtze River Delta.

RECOMMENDATIONS

Develop a pro-active commercial port strategy:

- Improve data collection and statistics (at the national as well as the local level) on port-related matters, such as hinterland destinations, co-ordinated employment figures and value added of ports and port-related activities. Annual updates of these numbers, as collected in Belgium and the Netherlands, could be useful.

- Increase the number of strategic partnerships with foreign ports, joint ventures in inland ports and multimodal platforms in and outside the Seine Axis.

- Stimulate competition in port services. Undertake a comprehensive review of the competitive conditions in the different ports to identify where more competition is appropriate.

- Solve obstacles at the national level, such as VAT treatment at the border, that place French ports at a disadvantage to Belgian and Dutch ports.

- Develop a maritime diversification strategy, by further developing short-sea shipping to the Iberian Peninsula, the United Kingdom and Ireland.

- Raise the environmental profile of the Seine Axis ports by developing a common strategy governing how the different port areas could play a role in renewable energy production, e.g. biomass.

Consider ports as strategic assets in regional economic development:

- Increase regional linkages with the ports by creating partnerships with the private sector. This could be part of an economic development strategy for the Seine Axis. Commodities handled by the port could be used to encourage regional value-added activities, in combination with other economic sectors, e.g. in energy or agriculture.

- Make more strategic use of the information on ports and logistics available in universities and research institutes, by developing long-term partnerships.

- Consider economic diversification strategies in the cities of Le Havre and Rouen to increase the attractiveness of the city to knowledge workers.

- Increase efforts to improve the ports' external communications with firms and the public at large, mainly by publicising strategic indicators, presenting key programmes and organising forums on subjects of common interest and on environmental issues.

- Develop co-ordinated tourist endeavours (e.g. cruises), with the city of Paris and the appropriate local governments in the Seine Axis.

Stimulate sustainable forms of hinterland transportation:

- Improve the maritime-river interface in Le Havre (Port 2000).
- Reduce the saturation of the freight railway network; promote further liberalisation of freight railway services.

Apply and expand knowledge:

- Consider clustering the knowledge and research on maritime affairs and logistics.
- Remedy shortcomings in training and education in logistics, e.g. with respect to inland river transport, maintenance and maritime activities.
- Review education in inland river transportation and strengthen the specialised institutes in this domain.
- Improve co-ordination and R&D projects between universities in Normandy and Paris on logistics and maritime issues.

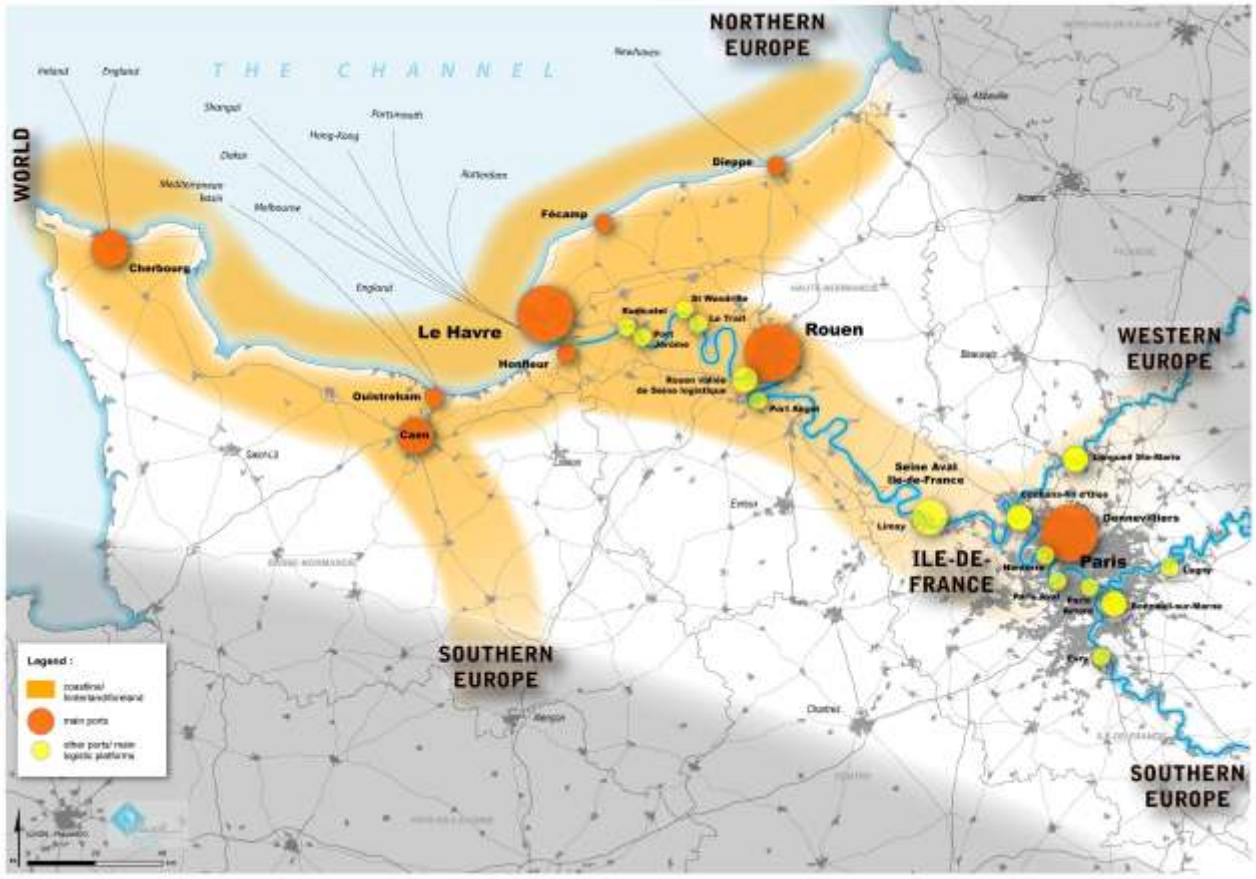
Promote more efficient governance systems for the ports and in the Seine Valley

- Encourage the Inter-port Council to engage in common and comprehensive projects.
- Start discussions to develop a contract for the Axis (or an interregional *contrat de projet*) that engages the state and the three regions.
- Favour and modernise social dialogue in the ports.
- Stimulate the local governments along the Seine Axis to form organisations where they may express their opinions and develop common activities.

INTRODUCTION

Le Havre is a global port; Paris a global city. This interesting combination has not been lost on many observers, and the relationship between the two cities – as well as between Normandy and Greater Paris – has been a recurrent subject of interest (e.g. Baudouin and Collin, 1999). Such discussions have been given impetus since 2008 by the debates over the future of Greater Paris, in particular thanks to the architect Antoine Grumbach's project "Seine Métropole", and the subsequent speeches of President Nicolas Sarkozy of France.[1] Increasing acknowledgement of the importance of a maritime outlet for a global metropolis such as Paris coincided with a long-awaited port reform in France, which was implemented in 2011. This is the context for this case study on port cities in the Seine Axis, which was conducted at the request of the different actors in the area, including the main ports, cities and town planning organisations.[2]

Figure 1. Map of Seine Axis and the maritime outlet of Paris



Source: AURH.

This study is the first of a series of case studies in the OECD project on port cities, whose objective is to identify the impact of ports on their territories and possible policies to increase the positive spill-overs of ports to their regions. For the purpose of this study, interviews (Annex 1) were carried out with a variety of actors. Some of the essential conditions for positive regional effects include performing ports and well-developed links between the port sector and the wider regional economy. A particular challenge of the Seine Axis ports will be to realise the potential of co-operation. Synergies are possible between these ports,

which are now working more closely together, for example, in a recently created inter-port council, but these will have to be made concrete in the coming years and to be translated into action.

The Seine Axis ports face stiff competition from other ports in northwest Europe such as Antwerp and Rotterdam. This will only increase with the finalisation of the Seine-Nord Europe Canal, expected in 2017.[3] This greater access of the French hinterland to foreign competition (along with the greater access of foreign hinterlands to French ports), will necessitate a strengthening of the competitive position of the Seine Axis ports; and increased regional co-operation could be an important element in this endeavour. This study identifies main obstacles to port performance, identifies the impact of ports on the territories in the Seine Valley and analyses policies and governance arrangements. On the basis of this assessment, recommendations are formulated for the different actors concerned.

1. PERFORMANCE

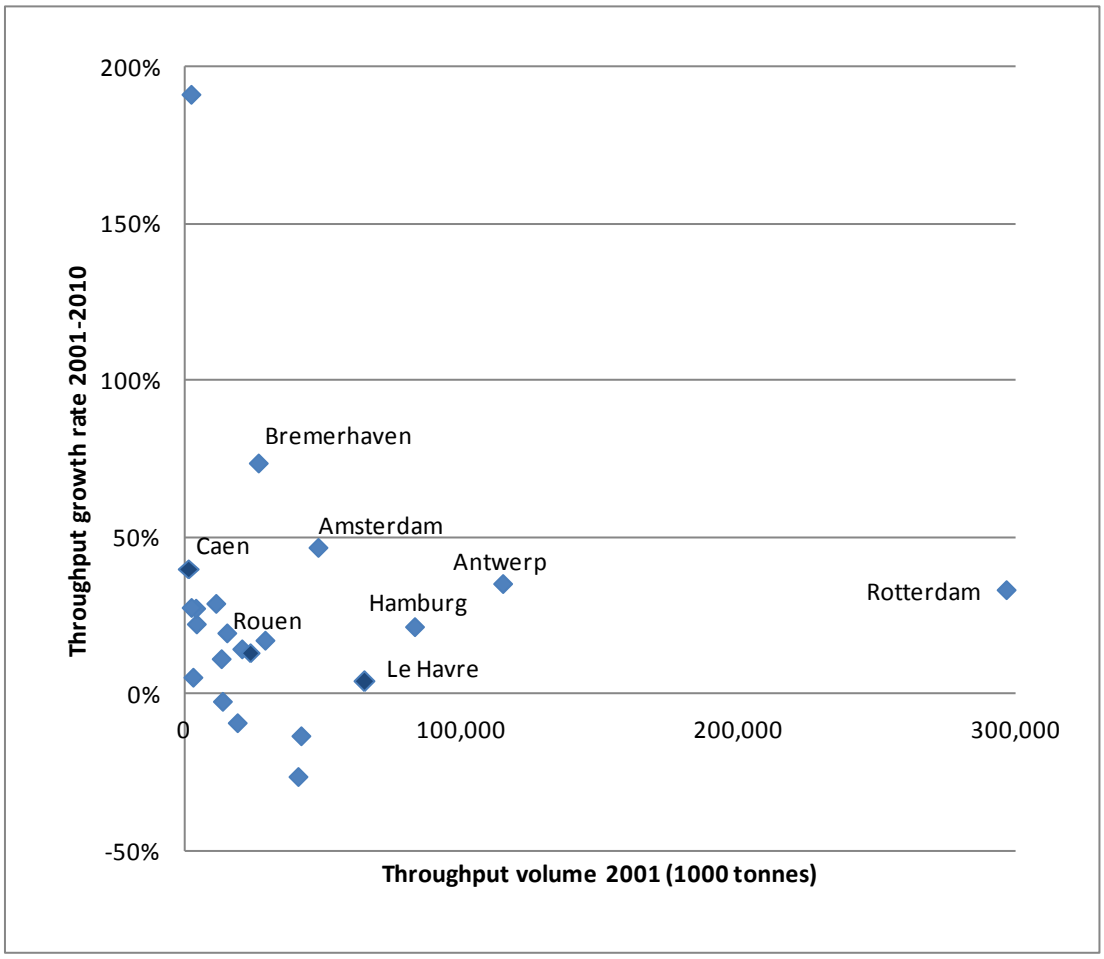
Commentary on the decline of French ports has been persistent (e.g. the Cour de Comptes, 2006). The latest available data on port performance in the Seine Axis, provided in this chapter, confirm this view, but also reveal considerable variety between the different ports. The principal reasons for this lagging performance are associated with their accessibility, hinterlands, competition, efficiency and environmental sustainability. Although comparisons with other northwest European ports on these benchmarks are not always flattering, the Seine Axis benefits from its maritime access and the established hub position of Le Havre, and has made the most of strategic niches, such as agricultural products in Rouen. The current performance of the Seine Axis could be seen as a paradox: it has great assets, but has not yet quite lived up to them. Investments, reforms and common initiatives, described in Chapter 3, have been set in motion that are likely to have an impact on port performance. One of the keys for unlocking this potential could be the synergies between the different ports in the Seine Axis, for which the pre-conditions are promising, since the roles and functions of the different ports are complementary, as this chapter shows. But the stakes are high: future developments, identified at the end of the chapter, will probably intensify competition for the ports in the Seine Axis.

1.1. Lagging performance

Growth rates in the ports of the Seine Axis have been disappointing over the last decade, which has led to declines in market share. Whereas ports in northwestern Europe have on average grown by 24% between 2001 and 2010, the figure was 7% for the Seine Axis ports.[4] As a result, the market shares of the Seine Axis ports have declined: their combined throughput represented 9.9% of the total throughput of northwest European ports in 2001, but only 8.6% in 2010.[5] Whereas the northwest European ports on the whole managed to increase their market share among European ports from 31% to 35%, the European market share of the Seine Axis ports decreased from 3.1% in 2001 to 3.0% in 2010. There is some variety among the Seine Axis ports; the growth rate over 2001-10 was 4% in Le Havre, 14% in Rouen and 40% in the port of Caen (Figure 2). The market share of the port of Le Havre has been declining since 1980. The growth rate of the inland port of Paris over 2001-10 was 14%.

The port of Le Havre has not benefited from its favourable specialisation, but Rouen and Caen have done better. Most of the throughput growth in northwest European ports has taken place in commodities in which Le Havre is specialised (containers and liquid bulk) relative to other European ports. However, the growth in container volumes has been 58% in Le Havre but 84% on average in northwest European ports; liquid bulk volumes even decreased slightly in Le Havre (-5%), whereas they grew by 22% over 2001-10 in northwest European ports. In other commodities as well, the port of Le Havre has scored structurally less well than the average among the northwestern European ports, with liquefied gas being the only exception. The specialisations of Rouen and Caen were less favourable, but they have nevertheless managed to grow in their main specialisations: 37% in Rouen and 14% in Caen for dry bulk, whereas the growth in northwest European ports was 0% (Table 1). In specific traffic categories, such as crude oil and refined oil, the port of Le Havre has lagged by comparison with its direct competitors, whereas Rouen has sustained and expanded its position as a leader in agricultural products.

Figure 2. Throughput volume growth rates 2001-2010



Source: OECD Secretariat on the basis of Eurostat data.

Table 1. Average annual growth rate of throughput volumes per traffic category (2001-2010; in tonnes)

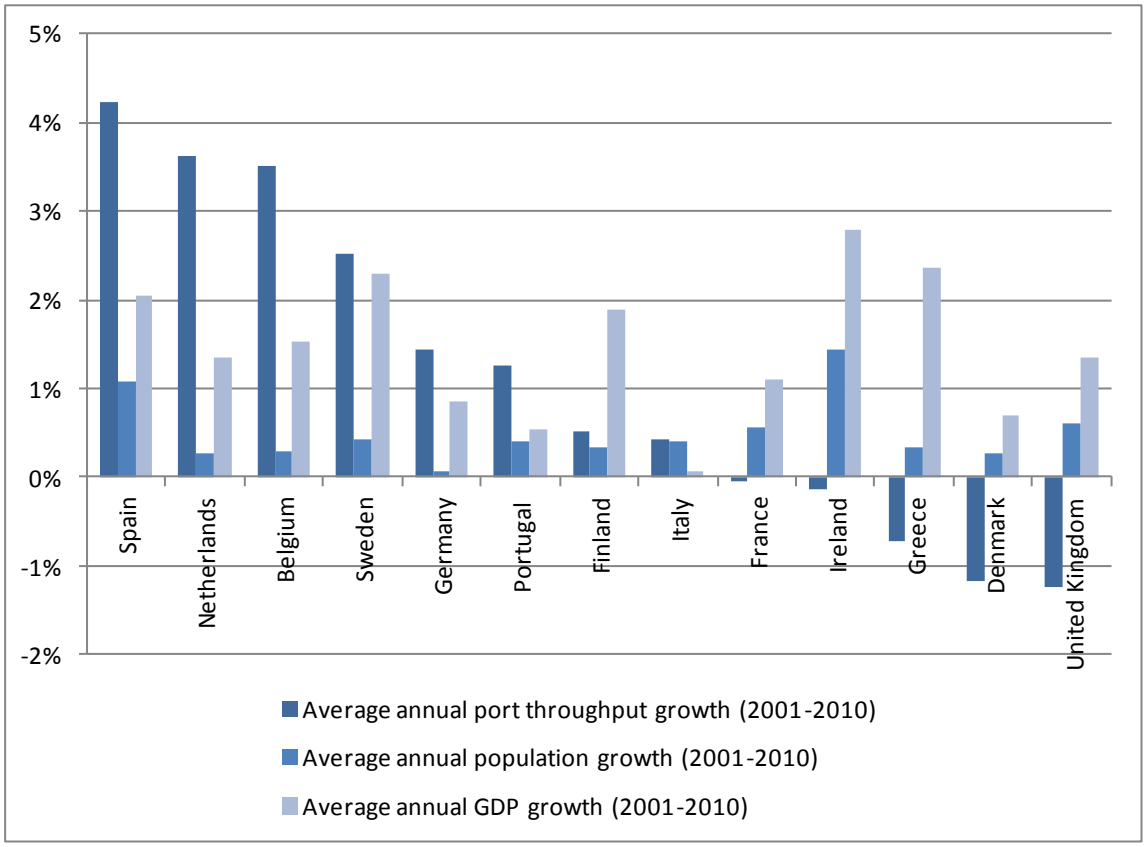
	Total	Containers	Liquid bulk	Dry bulk	RoRo	Other cargo
Average northwest Europe	2.7%	9.3%	2.4%	0%	1.0%	-1.1%
Le Havre	0.4%	6.4%	-0.6%	-2.0%	-6.4%	-8.3%
Rouen	1.6%	-1.9%	1.4%	4.1%	70.3%	-5.9%
Caen	4.4%	-11.1%	-11.1%	1.6%	9.0%	-7.0%
Paris	1.6%	46.0%	-4.1%	-0.2%	-	11.7%

Source: OECD Secretariat on the basis of Eurostat data.

Note: RORO indicates “Roll on, roll off” cargo that is driven on and off the ship on its own wheels, such as cars, lorries, semi-trailers and railroad cars.

The lagging growth rates for the Seine Axis ports fits in with a larger picture of decline of the ports sector in France. Out of 13 European countries for which comparative data on port traffic exist, eight countries had on average positive annual growth rates in goods handled through their ports during 2001-2010. Spain, the Netherlands and Belgium all had annual average throughput growth rates of more than 3%; France had zero growth during this period. This lagging growth of the ports sector in France cannot be explained by demographic developments or economic growth rates: there is no correlation between the development of port throughput in these 13 countries and population growth or GDP growth during this period (Figure 3). One of the reasons for this is that port hinterlands do not follow national boundaries.

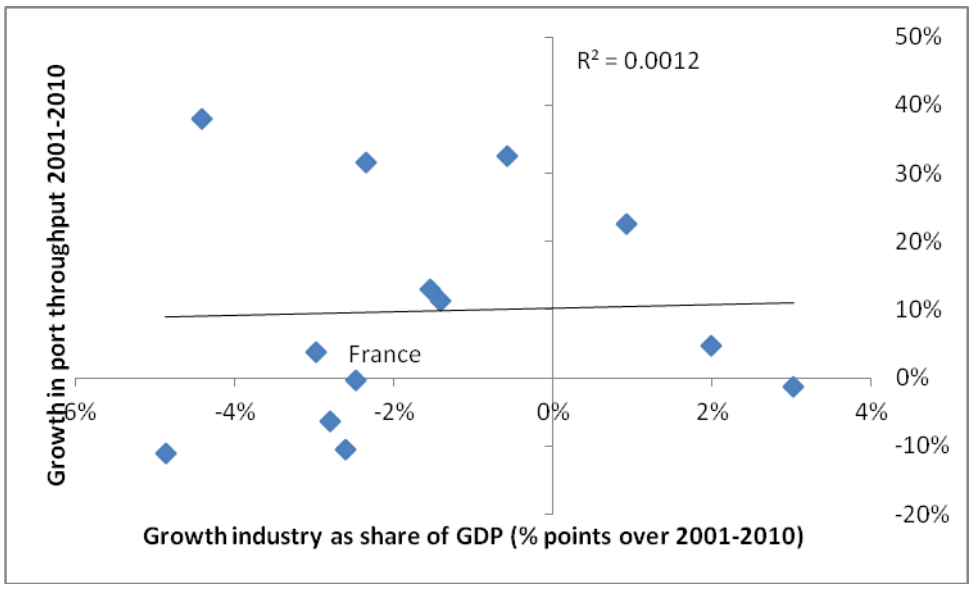
Figure 3. Port throughput growth, population growth and GDP growth in maritime EU nations (2001-2010)



Source: OECD on the basis of Eurostat data.

There is no evidence to assume that the lagging growth of the ports sector in France is connected to de-industrialisation tendencies. Using data for the same 13 European countries, no correlation is found between the growth in port throughput and the decline of the industrial sector as part of the national production (Figure 4). The industrial sector is decreasing in importance in many European countries, but the growth rates of port throughput widely diverge between them, and do not correlate with the extent of the de-industrialisation. In absolute terms, there is no correlation between port throughput and the size of the industrial sector, nor is a correlation found with the size of a country's exports and imports. This suggests that other factors explain the performance of ports.

Figure 4. Correlation between port growth and de-industrialisation



Source: OECD on the basis of Eurostat data.

1.2 Explanations for lagging performance

Two different kinds of studies can be used to identify the factors underlying the attractiveness of the ports in the Seine Axis: direct surveys of port users, and studies on the most important factors for port selection, which can then be applied to the Seine Axis ports. The academic literature is fairly extensive on port choice, the actors that decide on the selection of ports and the criteria most important to them in this selection process. The various decision makers that have been identified in these studies are shippers, freight forwarders, shipping lines and terminal operators. Although there is no consensus on which is the dominant actor in port selection, there is a growing tendency to consider port selection as involving several actors. In addition to a port's attributes, its integration in a wider set of criteria concerning global supply chains is of special importance (Magala and Sammons, 2008; Robinson, 2005; Bichou and Gray, 2004).

The port of Le Havre is negatively perceived in several surveys on the preferences of port users. In a survey of decision makers on port choice (shipping lines, terminal operators, shippers, logistics groups and European logistics centres), comparing main ports in northwestern Europe, the port of Le Havre received relatively low scores. It scored particularly low on reliability and flexibility, due to the social instability created by trade unions and frequent strikes, according to Aronietis et al., 2010 (Table 2) in a study conducted before the French port reform was implemented in 2011. Lack of hinterland connections is also mentioned as a disadvantage in Le Havre, according to the same source. The best scores for most of the criteria considered were found in Antwerp. The findings for Le Havre are in line with those in other studies. A survey of preferences of decision-makers of the top 30 global shipping lines revealed a very negative perception of the port of Le Havre, in comparison with the ports of Antwerp, Bremerhaven, Felixstowe, Hamburg and Rotterdam (Ng, 2006). The main negative factors identified were delays in loading and unloading vessels, reliability, the reputation of the port, marketing efforts by the port authority, a lack of dedicated terminals and facilities for transhipment, among a variety of other factors on which the port of Le Havre scored less well than its competitors. Among the ports examined, Le Havre was considered to have the worst geographical situation for servicing Scandinavia and the Baltic Sea, but the best location for traffic to the Iberian Peninsula and the continental European Atlantic coast, although Rotterdam followed closely on that indicator. However, not all perceptions are negative: in a poll among

readers of the logistics newspaper Cargonews Asia, the port of Le Havre was elected "Best Seaport in Europe 2011". As the design of this survey has not been made publicly available, it is difficult to evaluate the seriousness of this study. It is worth noting, however, that similar awards were received by other ports during the same period: at the end of 2010, the Port Operator Award of the logistics daily Lloyd's List was awarded to the port of Antwerp.There are no such studies for the other ports of the Seine Axis, so a more detailed study on the factors relevant to port choice in the Seine Axis could shed light on this.

Table 2. Appreciation of ports by port choice actors in northwest Europe

	Le Havre	Antwerp	Zeebrugge	Hamburg	Felixstowe
Cost	3.1	4.4	4.0	3.4	3.2
Hinterland connections	3.6	4.5	3.3	4.4	3.4
Port capacity	4.4	4.6	4.3	3.7	2.7
Reliability	2.4	4.5	4.3	4.1	3.0
Port location	3.8	4.2	3.4	4.4	3.2
Cargo base	3.3	4.4	3.1	4.2	3.4
Flexibility	2.4	4.5	4.0	3.8	3.0
Customer service	3.1	4.2	3.8	3.9	3.5
Frequency	2.6	3.4	2.9	4.8	2.7
Risk of loss/damage	4.3	4.8	4.4	4.6	4.0
Customs service	2.9	3.0	3.4	3.9	3.6

Source: OECD Secretariat based on Aronietis *et al.*, 2010.

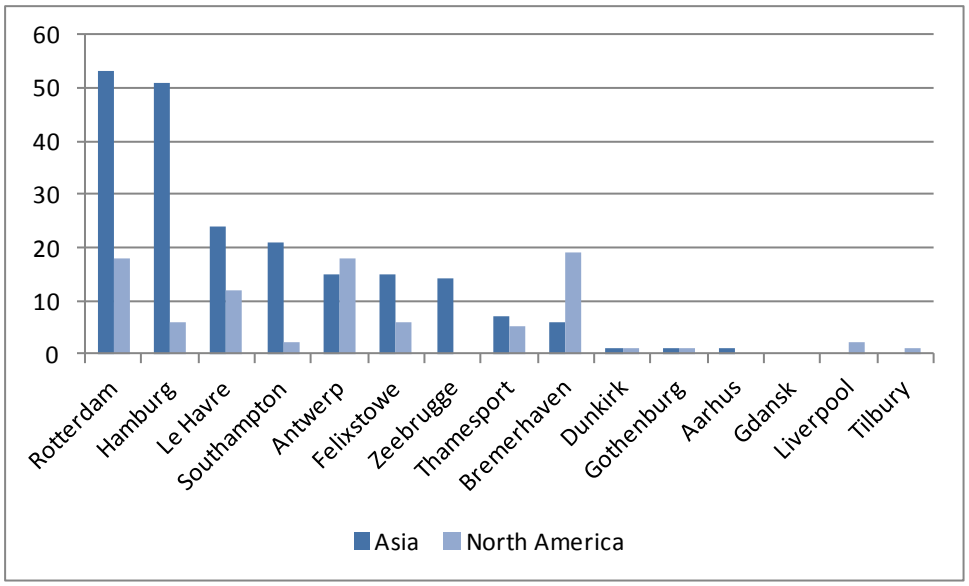
Note: the scores range from 1 (very low appreciation) to 5 (very high appreciation).

Main indicators that are mentioned in several port choice studies are: *i)* maritime accessibility; *ii)* hinterland; *iii)* competition; *iv)* efficiency; *v)* environment.

Maritime accessibility

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 among the intercontinental shipping routes of the main global shipping lines: in this respect, it could be considered the third European port for traffic between Asia and Europe (included in 24 of 57 routes in 2011), and the fourth for traffic between North America and Europe (included in 12 of 26 routes) (Figure 5). Its position in the Far East routes has improved in this respect in comparison to 2006, a year for which similar data exist (Notteboom, 2009). The maximum depth of its container terminals, an important attribute for berthing the largest container vessels, is approximately 15 metres. This is in line with the maximum depth of several northwestern European competitors, although some ports such as Rotterdam have larger maximum depths.

Figure 5. Number of direct port calls on intercontinental routes of major global shipping lines in 2011

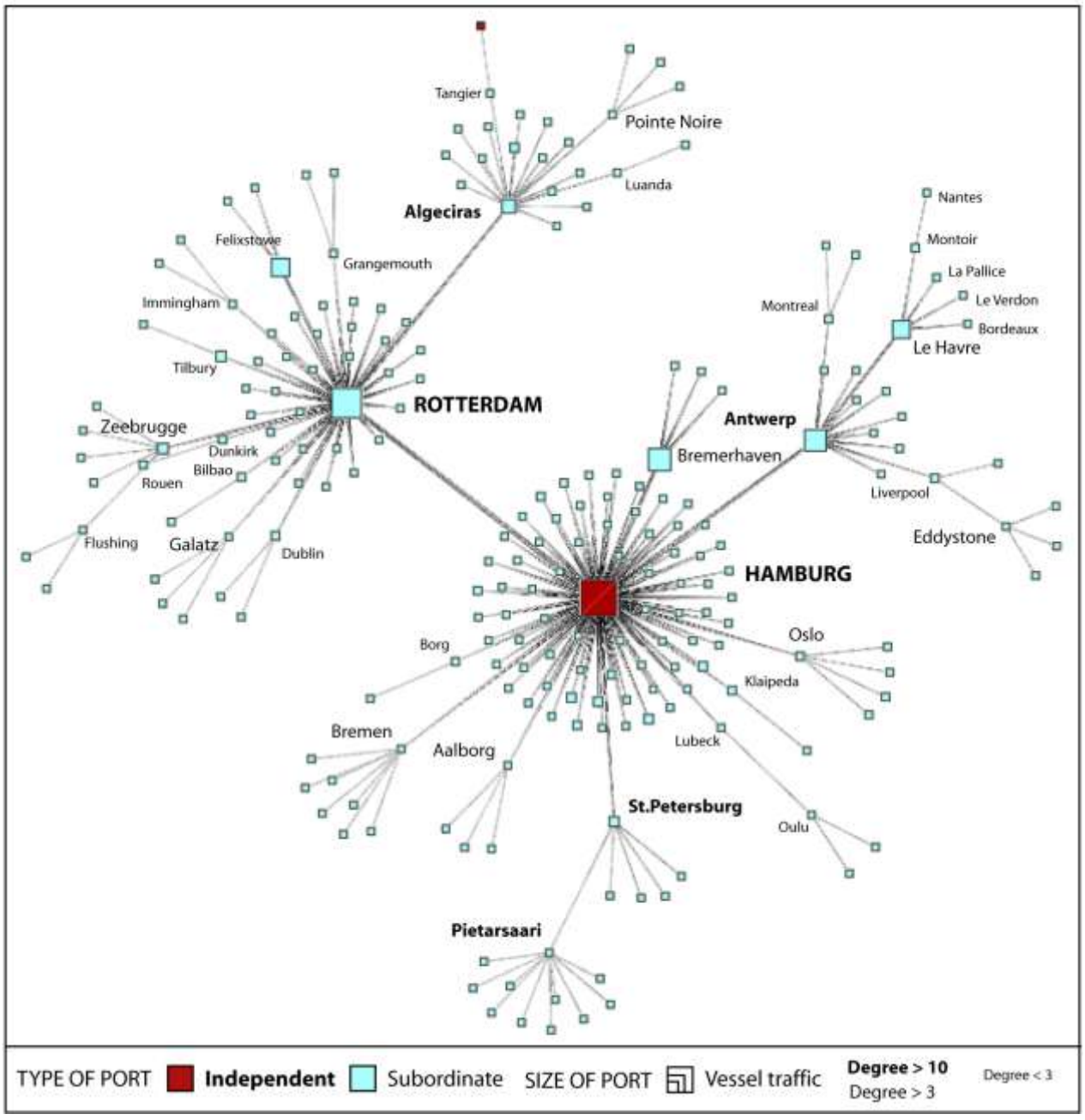


Source: OECD on the basis of data from major global shipping lines (March 2011).

Note: The intercontinental routes of nine of the ten largest global shipping lines are included, with the exception of MSC.

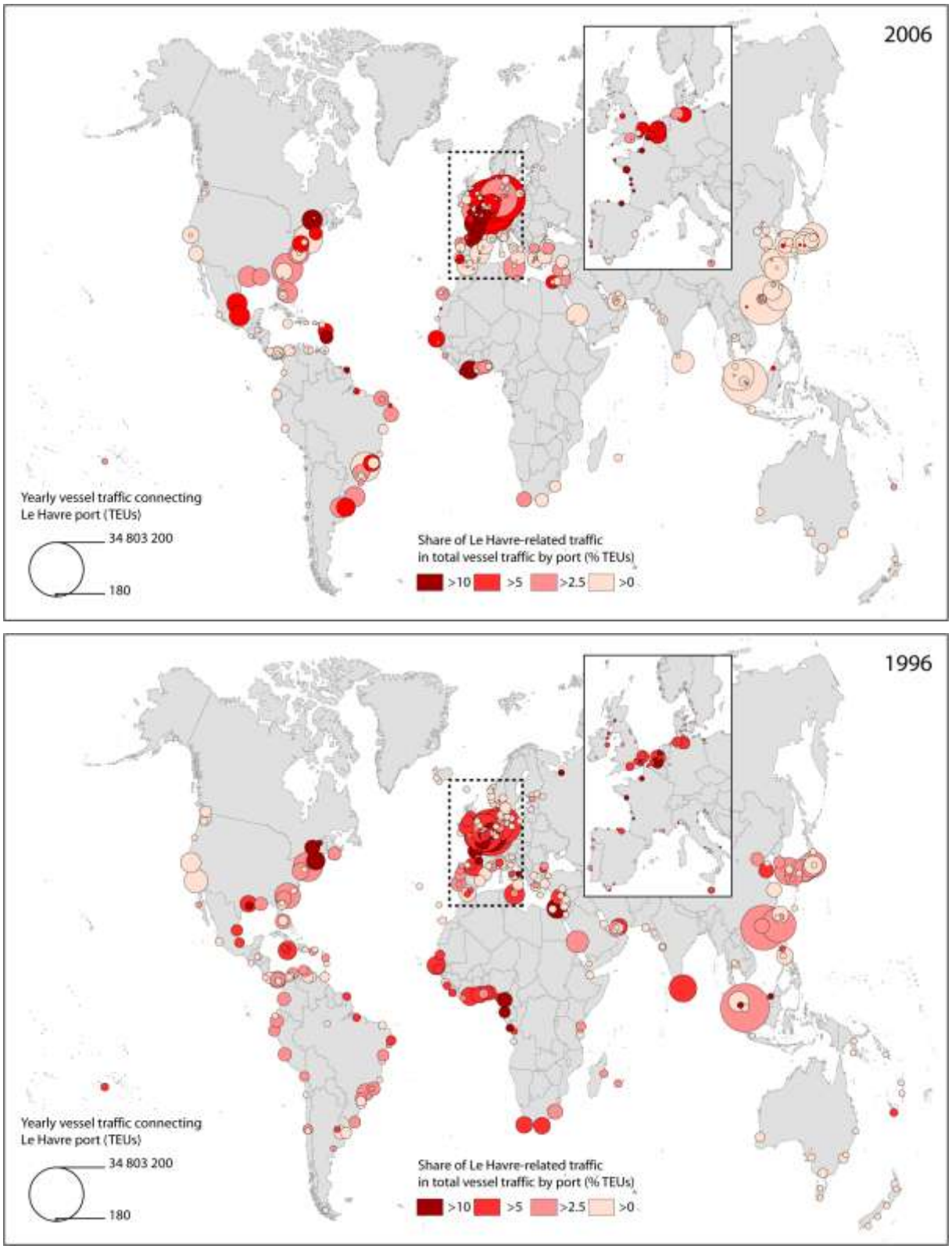
Despite good maritime connectivity, Le Havre is only a minor European hub, and its position in maritime networks has weakened over the last decade. However, the performance of ports is less dependent on the number of direct port calls than on the capacity to connect different scales of good flows (De Roo, 1994); which can be expressed by their centrality in global networks. In this respect, Le Havre's performance is modest. Although it is connected to a relatively large number of ports, it is dominant in only a very limited number: there are only six smaller ports (all French) whose strongest traffic link is with Le Havre (Figure 6). The port of Rouen is not one of these six ports, as it has its strongest links with the port of Dunkirk and forms part of another maritime network (in the respective period, more vessels were moving between Rouen and Dunkirk than between Le Havre and Rouen). In contrast to its main competitors, the score of Le Havre on some indicators of centrality in port networks (the indicator centrality of intermediateness) has decreased over 1996-2006. In terms of connections with its foreland, Havre has privileged links with ports in West Africa and eastern Canada. It became less important for Asia and the West Coast of the United States over 1996-2006, but Mexico and Brazil have risen in importance (Figure 7).

Figure 6. Position of Le Havre in the main flows of containerised goods (2006)



Source: OECD on the basis of LMIU data,

Figure 7. The maritime forelands of Le Havre (1996 and 2006)



Source: OECD on the basis of LMIU data.

Hinterlands

The relatively weak port performance of Le Havre is connected to the gradual loss of its "natural hinterland" in France to foreign competitors. The geographical position of Le Havre is close to European concentrations of population and wealth, even if Antwerp, Rotterdam and some French port cities (Dunkirk and Calais) are better positioned (Chapelon, 2006). In general, the French hinterland is divided by its two large ports, Le Havre and Marseilles, but they are far from dominant. Foreign ports have managed to make considerable inroads in this area. The east of France is mostly serviced by Belgian ports (in particular Antwerp), whereas other regions in France can be considered the hinterland of Rotterdam and Barcelona (Guerrero, 2010). Antwerp and other northwestern European competitors transport more than 40% of the tonnage expedited by French freight forwarders.

Box 1. French hinterlands of Seine Axis ports

According to the port of Le Havre, only 48% of the container traffic from and to Greater Paris in 2007 came from or goes to the port of Le Havre; these shares are 51% for the west of France and 41% for the central east. Other regions in France are only marginally served, with market shares of for example 14% in the north and 21% in the northeast (Port du Havre, 2010).[6] These shares are lower if all freight categories, rather than containers only, are taken into account. Data provided by the port of Rouen (based on customs data) show that the market share of Le Havre among French ports in 2005 was 36% in Ile de France, 43% in Haute Normandie and 38% in Basse-Normandie. Le Havre had no market shares of more than 50%, apart from the Centre region, where it had a 72% market share. The port of Rouen, according to these figures, has a market share of 41% in Haute Normandie and 20% in Basse Normandie, but marginal shares elsewhere in France. More than 90% of the port hinterland of the port of Paris in 2010 was in France, 90% of it in the Ile de France and Haute-Normandie, according to the port of Paris. The port hinterland of the port of Caen is limited to the Caen agglomeration and Basse-Normandie.

To a greater extent than in the past, the competitive position of Le Havre is dependent on capturing hinterlands. A study conducted on northwest European ports using data of the 1990s found a price elasticity for the port of Le Havre of 1.1, but of 3.1 in Hamburg and 4.1 in Antwerp (Atenco, 2001). If these elasticities were correct, that would suggest that changes in price (and its competitive position) in Le Havre would barely influence the traffic using the port. This situation, in which the port of Le Havre could rely on its French hinterland, has changed. Le Havre is now competing not only with French and Belgian ports, but with other ports in northwest Europe. Global shipping lines and other actors in the logistics chain will chose their port according to a range of criteria, including their integration in supply chains reaching foreign hinterlands.

Although there are no precise data for the port of Le Havre, it is clear that it has only small market shares in foreign regions.[7] One major explanation for the limited reach of hinterlands other than France is the dominance of lorries in freight transport from Le Havre. Although lorry transportation is used to some extent for international freight transport, its share remains relatively limited. Even in a small country like the Netherlands, 84% of the lorry traffic connected to the port of Rotterdam in 2010 remained in the Netherlands.[8] This percentage is likely to be much higher in a large country like France, which is also suggested by the fact that 95% of the total freight traffic by lorry coming from Seine-Maritime in 2009 remained in France. Train and barge are frequently used for longer-haul hinterland transportation from Hamburg, Rotterdam and Antwerp. An estimation of the foreign hinterlands of Le Havre reached by train or barge shows lower volumes than for its north-western European competitors. Rouen's port hinterland in 2010 was 40% foreign, mostly for liquid bulk, in particular to the Netherlands, which accounted for 15% of Rouen's total imports/exports, according to its authorities.

Competition

There are indications that intra-port competition improves port performance. This refers to a situation where two or more different terminal operators within the same port are vying for the same market. This competition provides benefits because it prevents monopolistic rent seeking of port service providers and because it is a means to achieve economies of scope and flexible multi-service organisation structures (De Langen and Pallis, 2005). At the same time, there are barriers to entry in the port sector: a survey of 28 European ports in 2004 showed that there was only one service provider of container handling services in almost half of the ports surveyed (De Langen and Pallis, 2007).

The ports sector in France has only recently opened up to international competition. The late arrival of international terminal operators in France was the combined result of the peculiar status of container crane drivers in French ports before the port reforms, the captive nature of much of the French cargo and the shelter strategies of local terminal operators (Slack and Frémont, 2005). This situation has changed, and various global terminal operators are now active in the port of Le Havre (although less than in Antwerp and Rotterdam) and also to a limited extent in Rouen. It should however be noted that MSC and CMA-CGM are the dominant players in Le Havre, and that they generally tend not to manage a facility directly but to outsource day-today operations frequently to local stevedores (Parola and Musso, 2007). This may perpetuate institutional lock-in. A similar situation obtains in Rouen, where MSC is the main global operator, in partnership with local actors. Internationally based stevedore companies have been found to have a positive impact on the efficiency of container terminals, but not on global carriers, such as CMA-CGM and MSC (Cheon, 2009). Internationally based stevedore firms, such as Hutchison Port Holdings, PSA, Eurogate and Dubai Port World, are more of a presence in the ports of Antwerp, Rotterdam, Bremen and Hamburg. In addition, there are other indications of relatively limited competition.

Intra-port competition is also limited by relatively long terminal concessions in the Seine Axis ports. Although there is no accepted rule of thumb about the duration of concessions in the port sector, there is agreement that the duration of the concession will vary according to the amount of investment required. Port authorities have several reasons to aim at relatively short concessions: to maximise revenues, to reduce entry barriers and to optimise the possibility of port redevelopment. When the length of concessions is long, concession holders will seek compensation if they are affected by port re-development (Pallis et al., 2008). Port authorities try to find a balance between a reasonable payback period for the investments made by terminal operators on the one hand and the maximum chance of attracting potential newcomers on the other (Theys *et al.*, 2010). The port concessions related to Port 2000 in Le Havre are for 36 years; although not extremely long, several concessions to new port terminals are shorter (e.g. 25 years for the Maasvlakte 2 concessions in Rotterdam). However, the port concession for the commercial port in Caen has a duration of 48 years.

Moreover, competition for port services in Le Havre is an issue. A monopoly in service provision of pilotage and towage prevails in Le Havre. This is relatively common in European ports, but the number of handling-service suppliers generally increases with port size. In the case of Le Havre, the annual container volume can be considered sufficient to accommodate at least two towage, pilotage, mooring and unmooring service companies (De Langen and Pallis, 2007). In the ports of Hamburg and Bremerhaven, and also in Spanish and English ports, a large variety of companies provide these services. The port authorities in the Seine Axis could also help to encourage smart clusters, in order to reduce entry barriers. Such a co-ordinator manages networks of stakeholders and prevents decisional and operational fragmentation by co-ordinating integrated port services, all of which could increase opportunities for the entry of small and medium-sized companies. These services could include warehouses, dedicated facilities (such as covered terminals) and office space for third parties (De Langen, 2003).

Meanwhile, the lack of international intermodal operators in Le Havre is problematic. Intermodal operators are transport companies that vertically integrate in the transport chain: they exist in order to overcome separations between transport modalities, such as separation in time, space and ownership. They are distinguished from transport firms, which own assets and carry goods by means of vehicles, and from freight forwarders, which are mainly involved in organisational issues. Port performance is closely related to the presence of intermodal operators, because ports that attract intermodal operators are more likely to be well integrated in international transport chains (Ducruet and Van der Horst, 2009). Most major northwest European ports have a high share of intermodal operators; this is not the case in Le Havre and Rouen (Table 3).[9] This might be related to limited liberalisation of rail freight, since countries with low scores on the freight rail liberalisation index tend to depend heavily on forwarders, whereas countries where rail freight is highly liberalised have more intermodal operators (Ducruet and Van der Horst, 2009).

Table 3. Transport employment according to type (as a share of transport employment, 2005)

	Intermodal operators	Freight forwarders	Transport firms
Le Havre	4.8%	41.2%	54.0%
Rouen	2.9%	19.3%	77.8%
Southampton	3.1%	9.6%	87.4%
Hamburg	9.7%	24.1%	64.4%
Bremen	27.8%	35.0%	37.2%
Antwerp	39.3%	40.7%	20.0%
Rotterdam	58.0%	29.4%	12.6%

Source: Ducruet and Van der Horst, 2009

Efficiency

In the available studies on port efficiency, Le Havre scores consistently less well than its competitors. There are different methodologies and different datasets to measure ports' relative efficiency. All of these studies are consistent over time on the relative inefficiency of Le Havre in comparison with its main competitors in northwest Europe, although they obviously present situations at a certain point in time; and do not take most recent events into account, such as the French port reform, which has arguably improved the image of the port of Le Havre and might have positive effects on its efficiency. Based on data from 2007, Wu and Go (2010) find relatively low efficiency scores for the port of Le Havre. Using data from 2002, Le Havre was found to be among the least efficient terminals among 74 European container terminals (Cullinane and Song, 2006). This is in line with the relatively low scores of Le Havre in 1994 among 36 European container terminals, which showed that almost all northwest European competitors had one or more container terminals that were more efficient (Notteboom et al., 2000). The few inter-temporal studies that exist on efficiency of container terminals confirm that Le Havre's position with respect to port efficiency did not improve over the period 1991-2004. The port of Le Havre remained in the second quartile among 140 container ports all over the world, whereas its main competitors were already more efficient (Rotterdam) or became more efficient (Hamburg, Antwerp, Bremen) during that period, moving from the second or first quartile to the third quartile (the fourth quartile being among the most efficient 25% ports in the world) (Cheon, 2008). Similar comparative studies do not exist for the other ports in the Seine Axis; the port of Rouen could in principle be included in the existing studies on efficiency of container ports, although it would probably make more sense to compare it to other ports specialised in dry bulk.

Table 4. Efficiency of northwest European ports

Seine Axis ports	Result	Competitors	Results	Methodology	Source
Le Havre	0.2548	Bremen/Bremerhaven Felixstowe Thamesport Hamburg Southampton	0.8929 0.8645 0.8010 0.8010 0.7853	SFA	Cullinane and Song (2006)
Le Havre	0.863	Southampton Thamesport	0.930 0.906	FDH and DEA	Herrera and Pang (2006)
Le Havre	0.72	Hamburg Bremen Bremerhaven Rotterdam Antwerp Zeebrugge Felixstowe Thamesport	0.77-0.80 0.65 0.79 0.69-0.83 0.79-0.85 0.77 0.81 0.69	SFA	Notteboom et al. (2000)
Le Havre	0.343	Hamburg Felixstowe	0.472 0.429	DEA	Wu and Goh (2010)
Le Havre	4.279 (The higher the score, the lower the efficiency)	Southampton Rotterdam Felixstowe Hamburg Antwerp Bremen/Bremerhaven Zeebrugge	2.178 2.550 2.633 3.323 3.345 3.502 5.450	DEA	Cheon (2008)
Le Havre	1.471	Antwerp Southampton Hamburg Bremen/Bremerhaven Zeebrugge Rotterdam	2.234 2.151 2.009 1.903 1.533 1.447	MPI	Cheon et al. (2009)

Note: SFA stands for stochastic frontier analysis, FDH for free disposable hull, DEA for data envelopment analysis and MPI for Malmquist Productivity Index. In all cases, a higher score indicates a higher level of efficiency, except in the case of the Cheon 2008 study, where a higher score means a lower level of efficiency.

An important element related to the efficiency and reliability of ports is labour. Labour costs account for around 60%-70% of operating costs, even on capital-intensive container terminals. As labour demand fluctuates widely from one day to the next, labour arrangements must be sufficiently flexible to match labour supply without imposing excessive costs. Labour arrangements also largely determine a vessel's time in port and the risk of disruption (Barton and Turnbull, 2002). In many ports, recurrent strikes and other forms of industrial action have caused significant delays for shipping, but the risks of disruption differ markedly from one port to the other (Turnbull and Sapsford, 2001). The effects of strikes on port attractiveness can be large, as can be illustrated by the container traffic rerouting from the West to the East Coast of the United States connected to labour relations (Jaffee, 2010). Although comparative data on strikes in northwest European ports are not available, the port of Le Havre has been perceived as a port relatively prone to labour disruptions, as noted earlier.

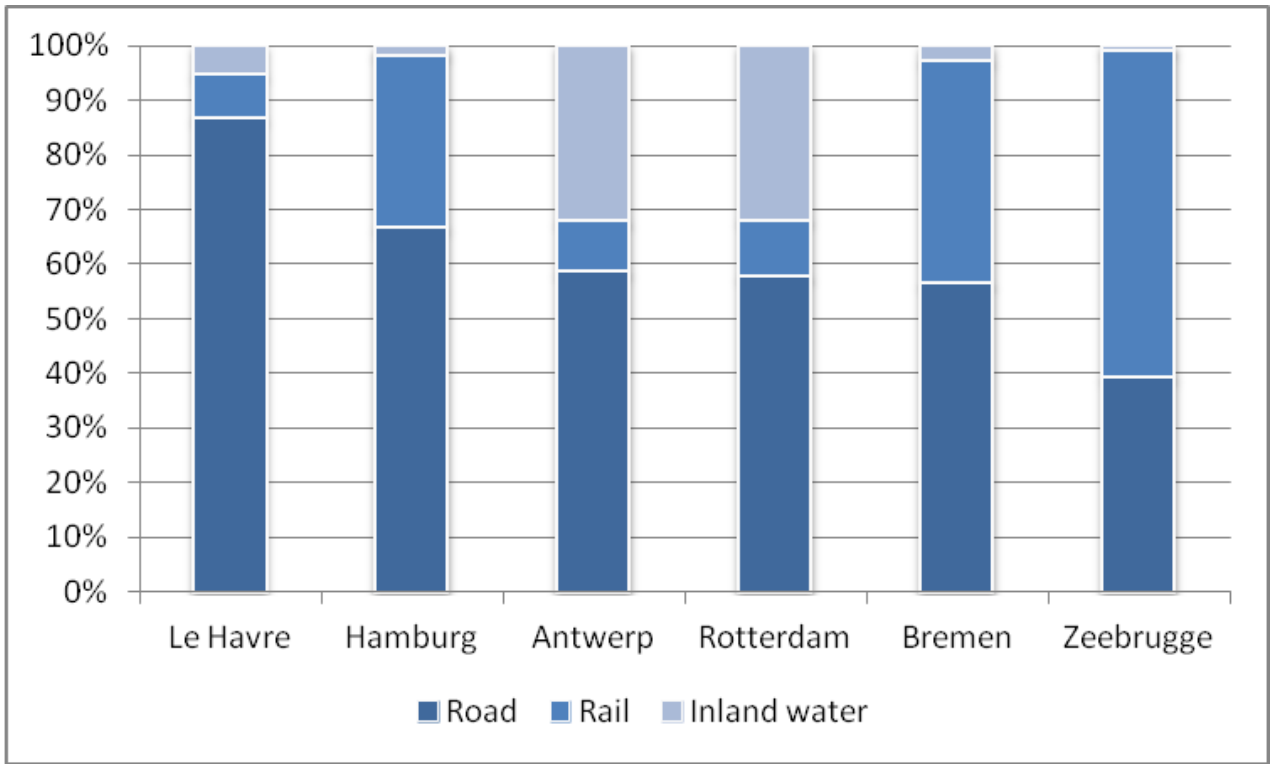
Environmental sustainability

Environmental sustainability is increasingly becoming one of the criteria in port choice, but data for Seine Axis ports are relatively scattered and in general not publicly available. The port of Le Havre has collected data on air quality, but the latest date back to 2005, so that it is difficult to monitor progress. These data showed that 17% of NO_x emissions and 10% of SO_2 missions in 2005 in the agglomeration of Le Havre were connected to maritime and inland river transportation. A very large share of emissions

(approximately 70% for CO_2 and NO_x; and 85% of SO_2) is associated with energy-related sectors in the port area. Monitoring of water quality and waste is more regular, but many data available for other ports (on carbon footprint, measurement of air quality in the port area and energy use) are lacking or not publicly available. Estimations of possible impacts of climate change on the Seine Axis do not exist.

Large direct environmental impacts of port activities are related to the modal split of goods entering or leaving the port. Although some important inherent conditions, such as a network of rivers connecting a port with its hinterland, may favour some ports in such a perspective, strategic measures favouring rail and inland navigation, such as new infrastructure, close collaboration with operators and lobbying for reforms, can enhance a port's environmental performance and competitive position (Haezendonck, 2001, and Dooms and Haezendonck, 2004). In the early 2000s, Le Havre already showed poor environmental performance in this respect, compared to its rivals in the Hamburg-Le Havre range. The most recent available figures on Le Havre's modal split do not show any substantial shift towards more environmentally friendly modes: between 2000 and 2008, the share of road transport gained two percentage points, to 87%, with share of rail decreasing and the share of inland navigation increasing. In the same period, its competitors succeeded in improving or maintaining their environmental impact (Figure 8).

Figure 8. Modal shift for container traffic in the Hamburg-Le Havre range (2008)



Source: OECD on the basis of data from port authorities.

1.3 Synergies between the ports in the Seine Axis

The differences between the Seine Axis ports offer potential for synergies. Ports may compete, co-operate or operate in isolation, but synergies can result if co-operation results in greater net benefits than if the different port operations operate in isolation from each other. Of course, ports can compete and still co-operate, but generally co-operation occurs more often when there are fewer areas of competition. The potential for synergies between the ports in the Seine Axis is thus to some extent determined by the extent of the differences between the ports in the following areas: *i)* their roles; *ii)* their specialisations; and *iii)* their forelands and hinterlands.

Ports in the Seine Axis have different roles

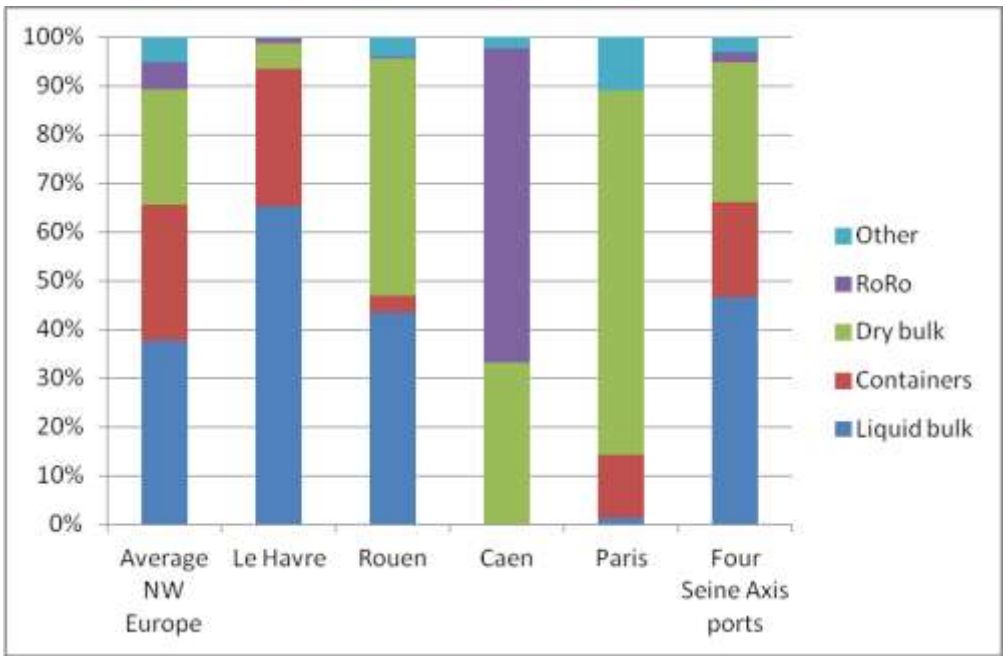
Le Havre has important hub functions for containerised cargo, Rouen is an important player in the niche market of agricultural products, and Caen has a more localised role, serving its regional market. Around a quarter of the traffic to Le Havre is transhipment of goods; and although France is an important home market for the goods handled in Le Havre, other countries are also serviced by it. Most global shipping lines call directly at the port of Le Havre, which is not the case for the other Seine Axis ports, nor could they hope to play that role. Dunkirk is the only other French port in northwest Europe that could develop hub functions, but it has only very limited direct calls at present from global shipping lines. The port of Paris, an inland port without nautical access, plays a role complementary to that of Le Havre, Rouen and Caen, managing dry port platforms in the Ile de France. Its main function is to channel goods to and from metropolitan Paris. Situated at the juncture of the Seine Axis and other more north-south oriented flows of goods, the port of Paris can play an important role in structuring the hinterland of the ports in Normandy.

Ports in the Seine Axis have different specialisations

The port of Le Havre is specialised in liquid bulk, in particular crude oil. Liquid bulk represented 65% of its traffic in 2010; and 43% of total throughput in tonnes was crude oil, which represented only 15% of throughput in northwest European ports on average. The secondary specialisation of Le Havre is container traffic, although the specialisation rate is in line with the average of northwest European ports (28%). Le Havre has a low specialisation rate in dry bulk, such as coal and ores. In Europe, Le Havre's port specialisation pattern is similar to Southampton, which is also heavily oriented towards liquid bulk and includes a substantial share of container traffic.

Le Havre's low rate of traffic in dry bulk is compensated for by the seaports of Rouen and Caen, which specialise in it (Figure 9). In 2010, dry bulk represented 49% of port throughput in Rouen and 33% in Caen, with agricultural products accounting for 40% in Rouen and 20% in Caen. As in Le Havre, liquid bulk represents a substantial share of traffic in Rouen, but this is mostly in refined oil (29% of total tonnage), whereas Le Havre specialises in crude oil. Roll-on/roll-off rolling stock cargo, or RORO (non-propelled), is the most important commodity in Caen, representing 64% of the total tonnage. Few European ports have specialisations comparable to Rouen's; the closest comparisons are much smaller ports such as Clydeport, Brest and Lorient. It is even more difficult to find comparisons with Caen, although the Italian port of Olbia comes closest, since it is equally specialised in RoRo (non-propelled), and has a secondary specialisation in dry bulk. The port of Paris is even more specialised in dry bulk, which represents 75% of its throughput in tonnage, a majority of which is construction materials. Paris' port specialisation is comparable to that of the inland port of Brussels, but is different from that of other large European inland ports such as Liège and Duisburg, which have a more industrial profile. As a result of the specialisations of the ports of the Seine Axis, the vessel types calling at the ports are different, with general cargo carriers in all three seaports, more container ships, tankers and specialised carriers in Le Havre and more dry bulk carriers in Rouen (Figure 10).

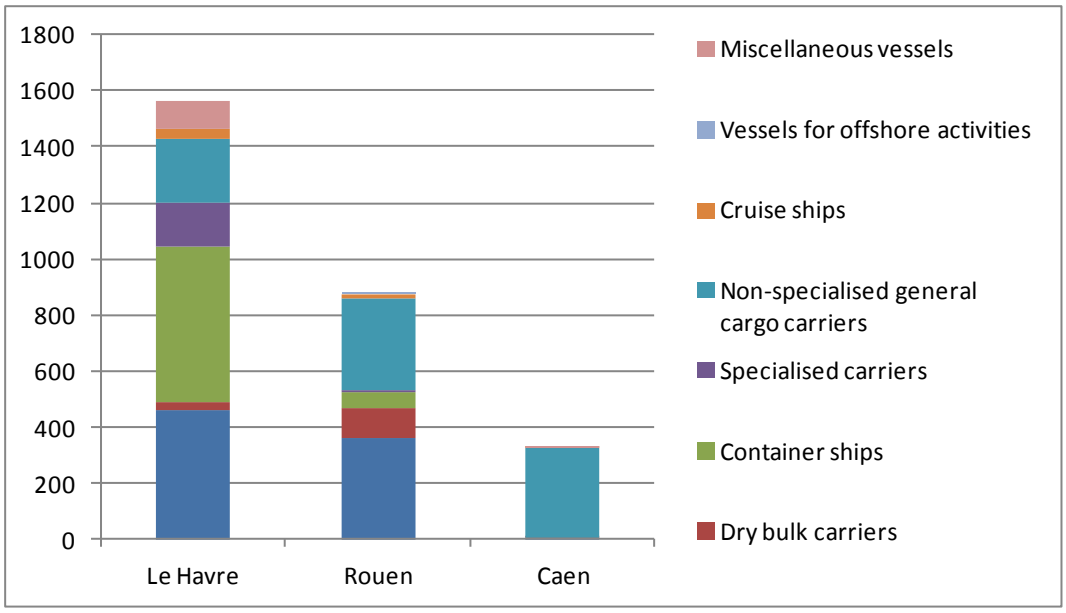
Figure 9. Traffic categories (as share of total tonnage) in Seine Axis ports (2010)



Source: OECD on the basis of Eurostat data.

Note: The Seine Axis ports are in this instance considered to be Le Havre, Rouen, Caen and Paris.

Figure 10. Number of vessels in Seine Axis seaports (April-June 2010)

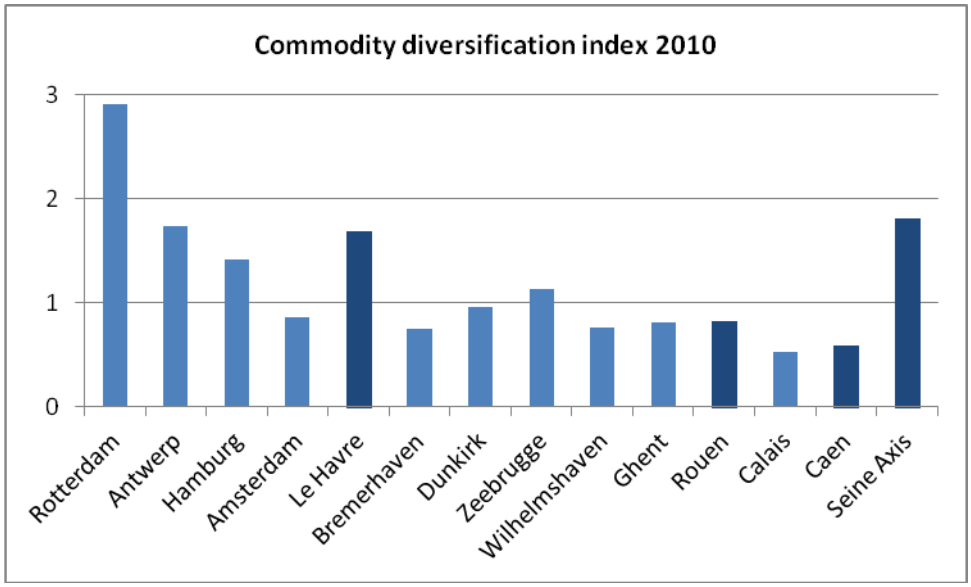


Source: OECD on the basis of Eurostat data.

The port of Le Havre is one of the most diversified in northwestern Europe. Its score on a commodity diversity index (CDI) in 2010, based on 14 different commodities, was 1.69, following the more diversified ports of Rotterdam and Antwerp.[10] The port of Rouen is less diversified and has CDI scores similar to those of Amsterdam, Dunkirk and other ports of Rouen's size, such as Ghent and Flushing. The port of

Caen is one of the least diversified seaports in the Hamburg-Le Havre range, with a score of 0.59. If the three Seine Axis seaports were considered one functional entity, it would be the second most diverse port in northwestern Europe, with a score of 1.81, surpassing Antwerp.

Figure 11. Commodity diversification index for northwest European seaports (2010)

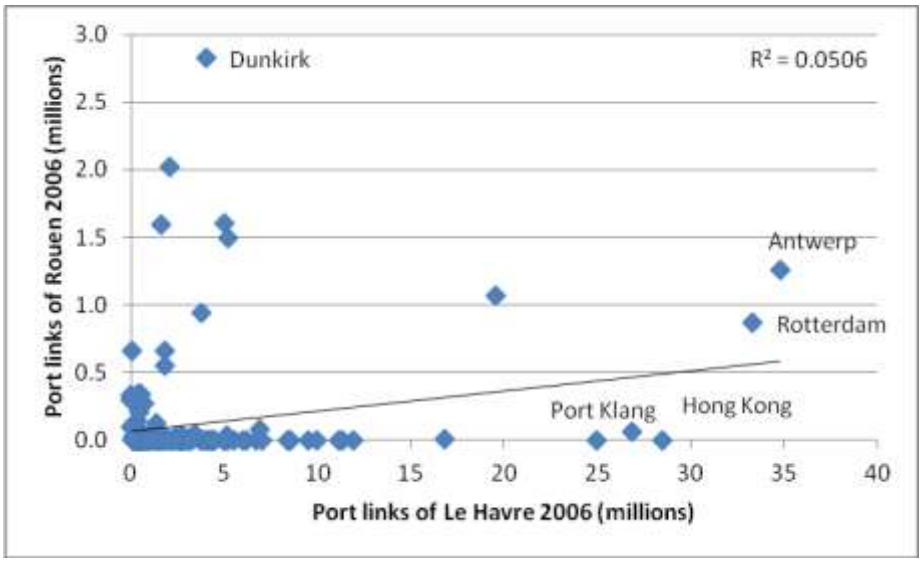


Source: OECD on the basis of Eurostat data.

Forelands and hinterlands of ports in the Seine Axis

The ports of Le Havre and Rouen do not have the same relations with other ports. These can be measured through vessel movements in and out of these ports. The port of Le Havre has strong linkages with the ports of Antwerp and Rotterdam in Europe, as well as Asian ports such as Hong Kong and Port Klang. The port of Rouen has more frequent links with another set of ports, in particular Dunkirk. The correlation between the port links of Le Havre and Rouen is very small, which indicates that they form part of different port networks with relatively limited overlaps; their maritime forelands and hinterlands are complementary. As these are container vessel movements, data for Caen are not available (given that Caen does not currently handle containers).

Figure 12. Correlation between the port links of Le Havre and Rouen (2006)



Source: OECD on the basis of Eurostat data.

Note: Each dot in this figure represents a port with which Le Havre and/or Rouen have relations, in that ships ply between these ports and Le Havre and/or Rouen. The numbers on the horizontal and vertical axes respectively represent tonnes and kilometres in 2006.

The ports of the Seine Axis have complementary hinterlands. Both Le Havre and Rouen have more international hinterlands than Caen. The hinterland of Caen is local and limited to the agglomeration of Caen, Basse-Normandie and parts of Brittany. The hinterlands of Le Havre and Rouen are more diverse. Rouen serves a variety of European countries, in particular the Netherlands, Belgium and the UK. Precise hinterland statistics for the port of Le Havre are not available, while in contrast, Rouen and major northwest European ports such as Antwerp and Rotterdam make these data publicly available on their website.

1.4 Possible trends influencing port performance

The development of alternatives to current shipping routes could change market shares of ports in northwest Europe. Current shipping routes are most likely to remain the main trade corridors for the next few decades, but several developments might shift these routes. For example, the freight forwarder DB Schenker hopes to establish a regular freight link between China and Germany in 2011, following a successful test trip between Chingqong and the port of Duisburg, which was concluded in 16 days, half the transit time of regular sea freight (Berkenkopf, 2011). The development of the TEN-T network might provide new opportunities for some Mediterranean ports to recapture market shares and hinterlands currently dominated by northwest European ports. Full operation of newly planned hub ports, such as Tangiers Med, might increase the competition for container traffic from Asia to Europe. In contrast, the possibilities of developing the northern sea route (NSR) in Arctic waters in the advent of melting ice, are limited based on current estimations.[11]

The canal linking the Seine with the Scheldt (the Seine-Nord canal), will have an impact on the market shares between northwest European ports. This EUR 4.2 billion investment will link the Seine and Oise to the wide-gauge canals of the Benelux and Germany. This link, equipped with four multimodal platforms, will connect the ports of Le Havre and Rouen to the Rhine Valley and even the Danube. This will change the circumstances for river transportation and create new opportunities for the Seine Axis. At the same time, it will also intensify competition. The port of Paris will more than ever be situated at the crossing of two hinterland corridors: the Seine Axis on the one hand and the transport corridor to northern ports on the other hand (Dunkirk, Antwerp and other Benelux ports).

Box 2. The Seine-Nord Europe Canal

The Seine-Nord Europe Canal will link the Seine and Oise rivers to the canal network in the north of France, Belgium and the Netherlands. It will be a wide-gauge canal 106 kilometres long, built at an estimated cost of EUR 4.2 billion and due to be completed in 2017. Studies of the possible impact of this canal, carried out by a consortium of consultancies at the request of *Voies Navigables de France* (VNF), predict positive impacts for all the territories concerned, especially for the regions of Picardie and Nord-Pas-de-Calais and the port of Dunkirk (VNF, 2006). According to these studies, inland river transport in both regions is expected to grow by a factor of 3 (Nord-Pas-de Calais) to 3.5 (Picardie). Growth estimations for other regions are more modest: 40% for Ile de France and 22% for Haute-Normandie.[12] These forecasts are the basis of calculations for the different port hinterlands: an increase of market shares of the French ports in the four French hinterland regions (Picardie, Nord-Pas-de-Calais, Haute-Normandie and Ile de France); and a decrease of market share of the Benelux ports. According to these studies, the market share of the ports of Le Havre/Rouen would increase from 54% in 2000 to 57% in 2020, and rise to 60% in 2050; more spectacular growth is predicted for the port of Dunkirk, where market shares would increase from 6% in 2000 to 15.5% in 2020 and 14% in 2050. The same study estimates that the volume of traffic from Belgian and Dutch ports to these four French regions will grow, albeit at a lower rate, so that they will lose market shares in these markets.

These calculations could be considered to be subject to a large margin of uncertainty. There has been criticism of some of the basic assumptions underlying the forecasts, such as the assumed increase of traffic (a doubling of current volumes), which seems at odds with the fact that the Seine-Nord Canal will only add 6% to the inland river canal network in France (Bonnafous, 2009). Moreover, there is uncertainty on whether port users would consider the Seine-Nord canal an improvement on the competitive conditions of the Le Havre/Rouen ports, compared with the other ports that will be connected to it, such as Dunkirk and ports in Belgium and the Netherlands. The assumption in the impact study is that costs of the different ports in northwest Europe will be harmonised, but that does not afford much indication whether an inland water link from Antwerp to Paris would be relatively more interesting for (potential) clients of the port of Antwerp or Le Havre. This larger exposure to inter-port competition will increase the urgency of solving some of the challenges of the ports of Le Havre/Rouen, such as the limited maritime-river interface and relatively limited supply of value-added logistics services by comparison with Antwerp.

The continued concentration of port traffic at major hub ports might become a challenge for the port of Le Havre. Such a dynamic, which has been considered one of the most salient causes of the decline of traditional ports, has recently been questioned in the light of traffic dynamics in different regions all over the world. After decades of concentration, tendencies are now becoming more subtle, due to several factors, such as diseconomies of scale in large ports, construction of new ports and terminals, and regional integration processes. A combination of concentration and dispersion dynamics in port systems remains, due to port competition and the influence of transport players. Major ocean carriers have been increasing the size of their vessels: in 2011 Maersk ordered ten vessels capable of carrying 18 000 TEU (the Triple E), yet another step towards increased economies of scale. This will require ports with high handling capacity and efficiency to prevent bottlenecks at the quayside when these large vessels are unloaded. The port of Le Havre is not included in the route Maersk has proposed to use for the Triple E vessels, but Felixstowe, Rotterdam and Bremerhaven are (Van Marle, 2011).

Growing containerisation provides opportunities for well-equipped container ports such as Le Havre. Containerisation is likely to continue to grow, mostly due to the growing integration among different transport systems, not only physically, technically, but also in managerial terms, and thanks to the co-ordination of standards, inland freight distribution, intermodal facilities, and port regionalisation dynamics, etc. (Rodrigue and Notteboom, 2009). In addition, containers include an increasing variety of cargoes at sea (i.e. neobulks), and competition from air transport in this segment may not cause serious threats to ocean carriers. Several vessel types (such as reefer ships to transport fresh fruits and vegetables) are increasingly being replaced by reefer container-vessels, which require special terminals that neither Le Havre nor Rouen currently have.

Concentration and integration of port business makes good hinterland connections even more important. The consolidation of container shipping is likely to continue, with large companies increasingly involved in terminal and feeder operations: the top 20 container operators carried 75.8% of all container traffic in 2005, with the top five carrying 36% (Frankel, 2006). There has also been a concentration of shipping lines readable in traffic figures, following the trend of dedicated terminals and hub selection (Frémont and Soppé, 2007). In Europe, successful ports clearly host major groups of so-called "transport integrators", multinationals covering a full range of services. Other ports where transport activities are more segmented reveal weaknesses in the transport chain in which they are embedded (Ducruet and Van der Horst, 2009). There is a subtle combination of physical and managerial integration at stake in every large port in the world, notably in Europe and North America, where inland freight distribution is becoming an important component of port competition. This underlines the importance of the need for a regional hinterland strategy. This concern with efficient transport connections also underlies the European transport policy (Box 3).

Box 3. European transport policy

The strategic vision and main transport initiatives of the EU were developed in the Transport Policy White Paper, published by the European Commission in March 2011. It consists of a roadmap of 40 initiatives for the next decade to build a competitive transport system that will increase mobility, remove major barriers and stimulate growth and employment. At the same time, the proposals aim to dramatically reduce Europe's dependence on imported oil and cut carbon emissions in transport by 60% by 2050. To meet this goal, the commission wants to achieve a ban on conventionally fuelled cars in cities, 40% use of sustainable low carbon fuels in aviation, a cut of at least 40% in shipping emissions and a 50% shift of medium-distance intercity passenger and freight journeys from road to rail and waterborne transport. For seaports, the White Paper announces initiatives in the field of port services, financing, safety and, most significantly, integration of ports into the Trans-European Transport Networks (TEN-T).

This integration builds on the idea of a "dual layer" approach. This consists of the development of a core infrastructure network with the ports that would be considered a European priority, based on a broad underlying comprehensive network. The core network would be based on a selection of nodal points (core network of seaports). In the white paper, the commission highlights the need to have more and efficient entry points into European markets, avoiding unnecessary traffic crossing Europe. "Unnecessary traffic crossing Europe" might be interpreted to consist of traffic from ports such as Antwerp and Rotterdam to hinterlands such as Northern Italy, but the implications of this statement are difficult to foresee. The Motorways of the Sea will form the maritime dimension of the core network. In general, the commission expects that the multimodal TEN-T core network will be fully functional by 2030, with a high quality and capacity network by 2050 and a corresponding set of information services. By that time, all core seaports should be sufficiently connected to the rail freight network and, where possible, inland waterway system. The commission expects that 30% of road freight over 300 kilometres should shift to other modes, such as rail or waterborne transport, by 2030, and more than 50% by 2050. For the future position of the ports of Le Havre and Rouen, it is essential that they be included in this core network.

Environmental sustainability and the impact of rising sea levels will become more important elements of port selection. According to Comtois and Slack (2009), successful ports and transport gateways in the future might not be the ones expanding their infrastructure and performance, but those that opt for greener activities. Greener ports would also be able to attract new populations and restructure their economic base, notably in advanced countries, where port cities are hoping to change their image and attract knowledge-based activities and white-collar workers. Some studies have forecast enormous costs for the relocation of the inner urban areas of some port cities such as Copenhagen (Hallegatte et al., 2008) as a result of the predicted rise in sea levels. In the latter case, several million euros a year would be used for the protection and prevention of such a sea-level rise, while without such investment, several billion euros would be needed to cover the potential disasters. Such future trends are increasingly included in the forecast of port selection and performance, as seen in the work of Rodrigue and Guan (2009) on the Northeast American seaboard. The ports of the Seine Axis are do not have a comparative advantage in this, considering the limited preparation the Seine Axis has put into this relative to port cities such as Rotterdam, which have climate change plans and sustainability policies (Box 4).

Box 4. Climate change policies in Rotterdam

The port of Rotterdam is at the forefront of the fight against climate change, and it has designed and implemented a set of policies organised in co-operation with local authorities. The city of Rotterdam has established a programme called the Rotterdam Climate Initiative, whose aim is to "create a movement in which governments, organisations, companies, knowledge institutes and citizens collaborate to achieve a 50% reduction of CO_2 emissions, adapt to climate change, and promote the economy in the Rotterdam region".[13] This programme is developed as part of the global C40 Climate Leadership Group, an international body bringing together several large cities wishing to fight against climate change. The objective of the Rotterdam Climate Initiative is to halve the CO_2 emissions of the Rotterdam agglomeration in 2025 compared to 1990. In order to achieve that objective, the programme involves in an integrated way the different important local actors: the municipality of Rotterdam, the local association Deltalinqs, the environmental protection agency DCMR Milieudienst Rijnmond and of course the Rotterdam port authority. The Rotterdam Climate Initiative is organised along five themes: sustainable city, energy city, sustainable transport, innovation laboratory and sustainable energy port. The port of Rotterdam adheres to this general policy and acts on two of these five themes: sustainable transport and sustainable energy port.

The port of Rotterdam is involved in the objective to improve and develop sustainable transport. Its main actions are aimed at the emissions of vehicles and ships used by the port authority, by implementing a "green fleet" programme. In 2008, the port signed a convention to limit the sulphur emissions of its ships. Land-based vehicles will in future use engines that are less polluting. Moreover, the port of Rotterdam supports the programme to develop service stations in the city that provide biofuels (biodiesel, bio-ethanol, bio-gas).

The goal of a sustainable energy port is also supported by the port authority of Rotterdam and expressed in three different objectives: development of energy efficiency, renewable energies and the capture and storage of CO_2. The ambition of more energy efficiency is taking shape in the development of networks that do not emit greenhouse gases: in particular, a system of exchanging heat by pipeline among the different firms in the port area. As for renewable energy, the objective is to replace fossil fuels by energy sources with no CO_2 emissions. Within this in mind, the port signed a convention in 2009 committing to the extension of land for windmill parks: between 2009 and 2020, the energy produced by this energy source will double from 151 MW to 300 MW. Offshore windmills farther from the coastline are under consideration, as is the development of solar energy, in partnership with Deltalinqs; and the use of on-shore electricity for inland barges has been tested since 2007. Finally, the port of Rotterdam has an ambitious programme for capturing and storage of CO_2 under the North Sea. The port is working with a consortium of private enterprises to develop the technologies and expertise necessary for this project. EU funds up to EUR 180 million would make it possible to finance the first stages of the programme, in particular a pipeline for the transport of CO_2.

Security of ports and transport chains might be an opportunity for Seine Axis ports, given the strict standards of French customs authorities (French Ministry of Ecology, 2009). The pattern of shipping routes is highly vulnerable to targeted attacks, as studied by Angeloudis et al. (2007) who refer to wider studies on network vulnerability and complexity. Since liner shipping networks are scale-free networks (i.e. a network depending on a few large nodes to exist and be connected), it has a high vulnerability to random and targeted attacks (i.e. terrorism). Other analyses are more qualitative in nature and scope, such as the field investigation by Carluer et al. (2008) showing how different port authorities may answer the new challenges brought by the US 100% scanning law, which will impose strict control procedures on each container arriving in a US port. This rule will profoundly modify the structure of transport and logistics chains to and from the US, since currently only about 0.5% of containers are scanned for security purposes. Current plans are notably to impose scanning at previous ports of call in other countries and to build new hub ports in Mexico, where such activities would take place. Another aspect of shipping vulnerability is the dependence of world trade on two main canals, the Suez and Panama canals. It also means that specific "safe" ports will be selected by the US in order to comply with their requirements. The activity of ports that are not selected might decline, with detrimental consequences for adjacent cities and regions. Traffic would also be redirected towards large "safe" hub ports concentrating all cargoes, but this seems to be at odds with the vulnerability of scale-free networks noted earlier.

2. IMPACT

Regions can benefit from ports on their territory, if their ports perform well (as discussed in Chapter 1) and are well embedded in a regional economy. This chapter focuses on the impact of the Seine Axis ports on their territory. They provide value added for the region, but they have relatively limited indirect economic effects. The spatial configuration of Le Havre-Paris has to some extent disconnected flows of goods from high-value-added activities related to goods, such as advanced services, innovation and knowledge-intensive employment. This becomes clear from the comparison with main port regions in northwest Europe, laid out in this chapter. The Seine Axis ports create a substantial number of jobs, but some ports (e.g. Le Havre) are specialised in commodities that create relatively few jobs.

2.1 Economic impact

The value added of the port clusters of Le Havre and Rouen represented around EUR 7 billion in 2005, representing 21.3% of regional GDP. Of this, EUR 4.8 billion was generated in Le Havre and EUR 2.2 billion in Rouen. A port cluster in this instance is taken to mean not only the port activities but port-related activities taking place in the port area, and includes the value added generated by the port and port-related businesses. The value added of the much smaller port cluster of Caen was EUR 0.1 billion in 2008. Similar calculations are difficult to estimate for the port cluster of Paris, because of the lack of detailed employment information for direct and indirect port employment that is necessary for calculating value added.[14] The value added of the Le Havre/Rouen port clusters as a share of regional GDP is high in comparison with those found elsewhere in northwest Europe (Table 5). The port cluster of Le Havre alone represents 14.5% of regional GDP, which is only slightly lower than the share of Antwerp and larger than the share of the biggest European port, Rotterdam, and other Belgian and Dutch ports. When the port cluster of Rouen is also taken into account, the port-related economy as a share of the total regional economy (21.3%) cluster surpasses the shares for other ports in northwest Europe. As the port cluster of Le Havre/Rouen is part of a much larger national economy, its share of the national economy (0.4%) is relatively low compared to those of Antwerp and Rotterdam, but larger than the share of the port cluster of Amsterdam.

Table 5. Value added of port clusters in northwest Europe (2007)

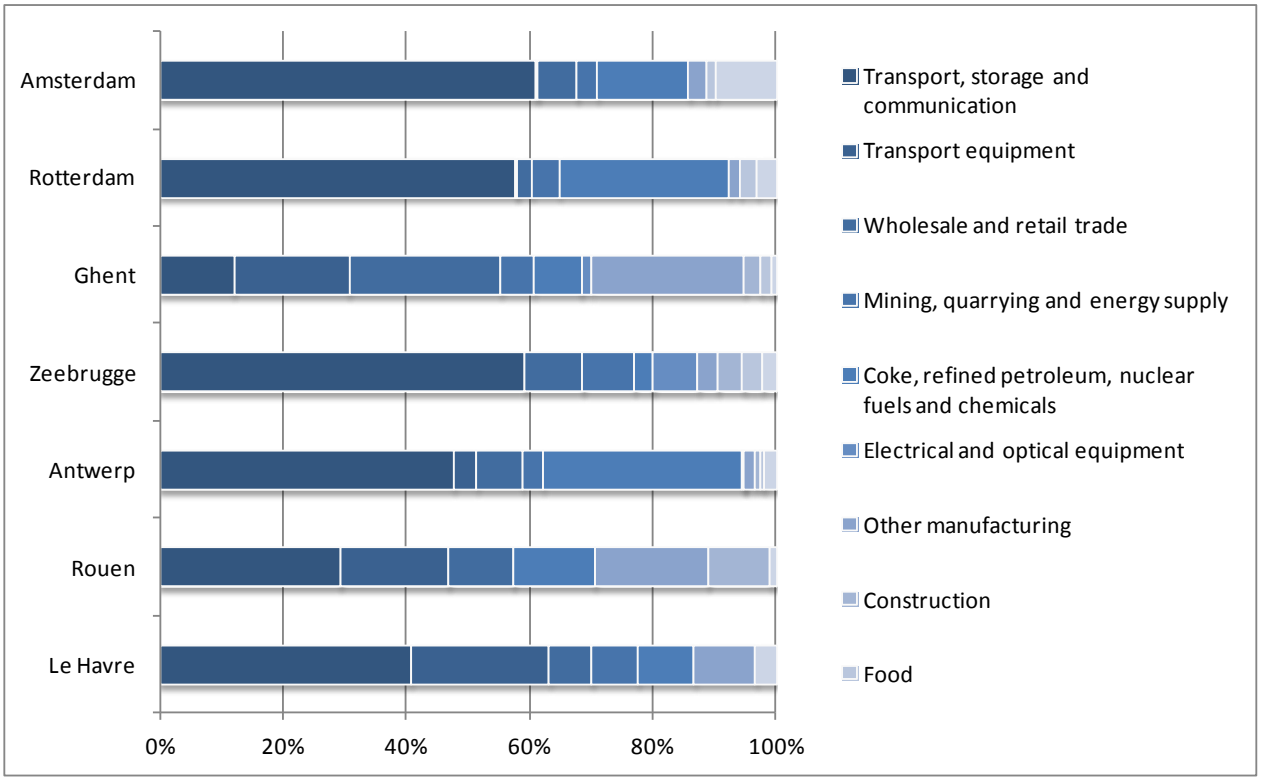
	Value added (billion euros)	Value added as % of regional GDP (TL3)	Corresponding TL3-region	Value added as % of national GDP
Le Havre	4.8	14.5%	Seine-Maritime	0.3%
Rouen	2.2	6.8%	Seine-Maritime	0.1%
Caen	0.1	0.7%	Calvados	0.0%
Rotterdam	12.8	10.3%	Zuid-Holland	2.2%
Antwerp	9.8	15.5%	Antwerpen	2.9%
Ghent	3.8	9.6%	Oost-Vlaanderen	1.1%
Amsterdam	1.9	1.9%	Noord-Holland	0.3%
Zeebrugge	0.9	2.7%	West-Vlaanderen	0.3%

Source: For Le Havre and Rouen: OECD calculations based on Eurostat data and the OECD Regional Database. For the other cities: OECD based on Mathys 2010 and Nijdam *et al.*, 2010.

Note: The value added of the different port clusters has been calculated on the basis of direct port employment and indirect port-related employment, differentiated according to economic sector. The regional productivity per sector was used to translate employment data into data on value added.

Compared with other large ports in northwest Europe, a smaller share of value added in Le Havre and Rouen derives from transport and storage and a relatively larger share from transport equipment and manufacturing. Coke, refined petroleum and chemicals present an important part of value added in Antwerp, Rotterdam and Amsterdam (up to a third in Antwerp), but only 9% in Le Havre and 13% in Rouen. The port cluster of Rouen has a larger share of its value added (10%) generated by construction. The port of Ghent has a very different profile from the other ports (although it bears resemblance to Rouen's profile), with only 12% coming from transport, storage and communication, and much more value added from other activities.

Figure 13. Shares of value added by sector in different northwest European ports (2005-2008)



Source: For Le Havre and Rouen: OECD calculations based on Eurostat data and the OECD Regional Database. For the other cities: OECD based on Mathys 2010 and Nijdam *et al.*, 2010.

The port clusters of Le Havre and Rouen have indirect economic effects via backward linkages. These effects can be expressed in multipliers, which indicate how much supply changes due to an increase in demand in the port cluster sector. A multiplier of 1.50 indicates that one euro extra demand in the port cluster generates EUR 0.50 of additional supply in the sectors that provide input to the port clusters. These multipliers can be derived from input/output tables in which the port cluster has to be defined as a separate entity in order to establish its inputs and outputs (its backward and forward linkages). This has been calculated for the year 2005, the latest year for which input/output-tables are available for France. The port cluster has been defined on the basis of direct port employment and indirect port-related employment in a variety of sectors (see Annex 2 for more explanations). The calculation of indirect economic effects and multipliers of the port clusters of Le Havre and Rouen has never been conducted in France, while in Belgium and the Netherlands these calculations are made regularly by the National Bank of Belgium and the Dutch National Port Council. The combination of these sources allows for comparison of the indirect economic effects for Le Havre and Rouen with those in major Belgian and Dutch seaports.

The multiplier of the port cluster of Le Havre/Rouen, measuring the indirect economic effects, is 1.57, which is higher than those in Dutch seaports, but lower than in Belgian ports (Table 6). This multiplier is only available for 2005, but comparison of multipliers in different port clusters shows that variation over years is relatively limited. The multiplier effects of the port cluster of Le Havre are particularly high for the transport equipment sector, in refined petroleum and financial intermediation, but several other economic sectors are also interlinked with the Le Havre port cluster (Table 7).

Table 6. Value added multipliers in selected northwest European port clusters (2005-2008)

	2005	2008
Le Havre/Rouen	1.57	-
Antwerp	1.85	1.90
Ghent	1.99	2.11
Zeebrugge	1.89	1.85
Rotterdam	1.40	1.44
Amsterdam	1.42	1.45

Source: for Le Havre and Rouen: OECD calculations based on Eurostat data and the OECD Regional Database. For the other cities: OECD based on Mathys 2010 and Nijdam et al. 2010.

Table 7. Value added multipliers for main economic sectors in the Le Havre/Rouen port cluster (2005-2008)

	Multiplier
Transport equipment	2.07
Coke, refined petroleum, nuclear fuels and chemicals	1.60
Financial intermediation	1.56
Other manufacturing	1.53
Construction	1.47
Mining, quarrying and energy supply	1.45
Wholesale and retail trade	1.39
Transport, storage and communication	1.38
Non-market services	1.13

Source: OECD calculations based on Eurostat data and the OECD Regional Database.

Most of the economic impact of the port cluster of Le Havre/Rouen is with Greater Paris (Ile de France) and the rest of France, but not with Normandy, where Le Havre and Rouen are located. The economic inter-linkages between the port cluster and the different regions in France can be identified by using multi-regional input/output-tables. For the purpose of this report, such a table has been constructed for the two port clusters (Le Havre and Rouen), as well as four different regions in France, namely Haute-Normandie (excluding the two port clusters), Basse-Normandie, Ile de France and the rest of France. On the basis of the inter-linkages reconstructed through this multi-regional table, it can be concluded that the port cluster of Le Havre/Rouen is only lightly embedded in the regional economy of Haute-Normandie and Basse-Normandie, as there are no multiplier-effects of the port cluster on these regions. The activities in the port cluster of Le Havre/Rouen have an indirect economic impact on the Ile de France, in particular in financial intermediation, wholesale and retail trade, transport, storage and communication. The largest

multiplier effects are spilling over to the rest of France, in particular to transport equipment, refined petroleum, other manufacturing and construction (Table 8). The limited integration of the port-related economy with the wider regional economy is a challenge for other port cities as well, including greater Rotterdam (Manshanden et al. 2002; Franc, 2010)

Table 8. Value added multipliers by sector and region for the Le Havre/Rouen port cluster

	Port cluster Le Havre/Rouen	Ile de France	Haute-Normandie	Basse-Normandie	Rest of France	Total
Transport equipment	1.00	0.07	0	0	1.00	2.07
Coke, refined petroleum, nuclear fuels and chemicals	1.00	0.03	0	0	0.57	1.60
Financial intermediation	1.00	0.28	0	0	0.28	1.56
Other manufacturing	1.00	0.05	0	0	0.48	1.53
Construction	1.00	0.03	0	0	0.44	1.47
Mining, quarrying and energy supply	1.00	0.13	0	0	0.31	1.45
Wholesale and retail trade	1.00	0.14	0	0	0.25	1.39
Transport, storage and communication	1.00	0.13	0	0	0.25	1.38
Non-market services	1.00	0.01	0	0	0.11	1.13

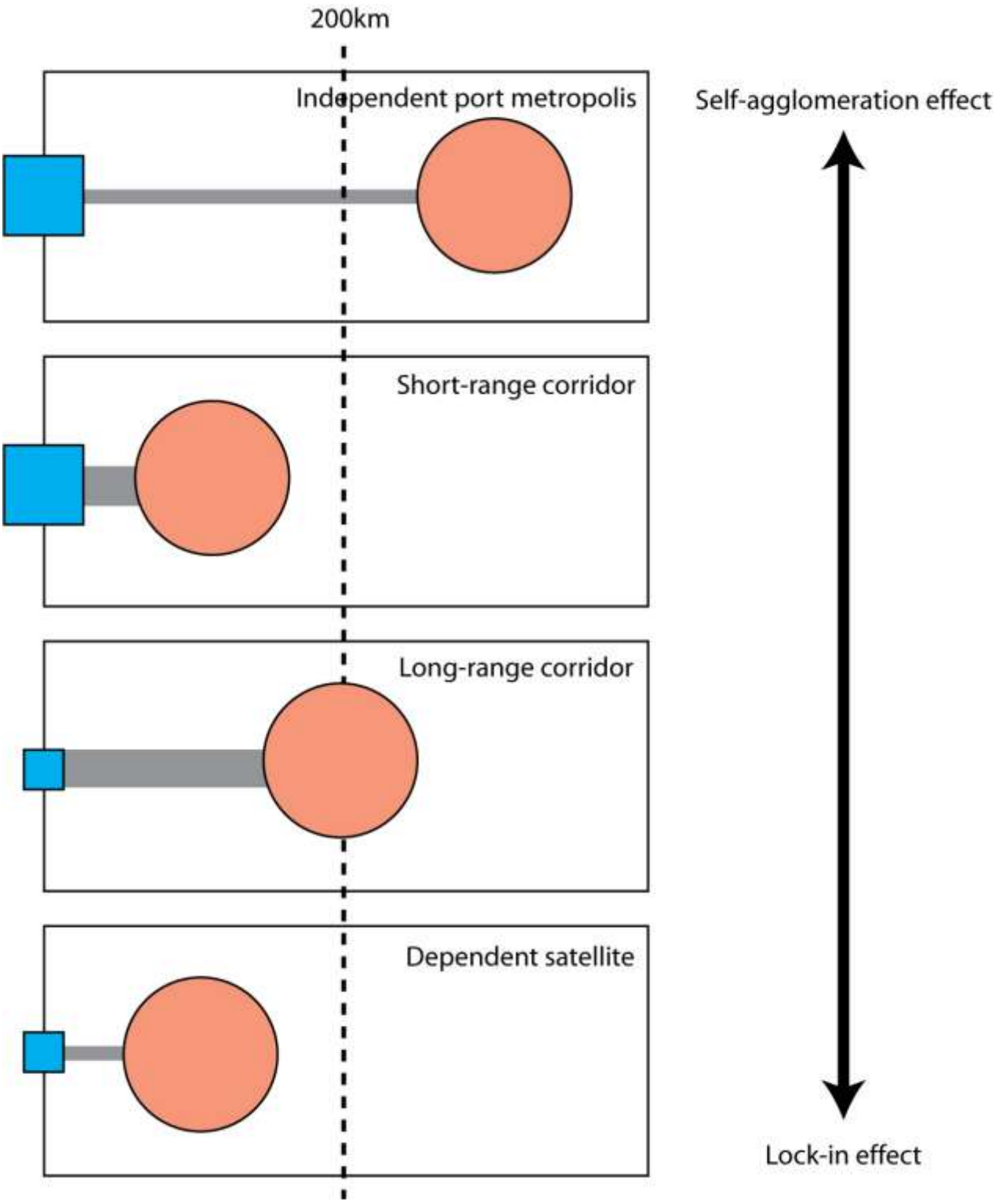
Source: OECD calculations based on Eurostat data and the OECD Regional Database.

Like its port cluster, the regional economies of Normandy are also predominantly oriented towards Greater Paris. The forward and backward linkages of the different economic sectors in Haute-Normandie and Basse-Normandie in almost all economic sectors represent less than 3% of the value added produced in that sector, whereas they amount to 20% in linkages with the Ile de France. For example, 23% of the inputs in the financial sector in Basse-Normandie come from the Ile de France. The links between economic sectors within the port cluster of Le Havre/Rouen are relatively limited in comparison with their relations with France and the rest of the world.

Economic impact of the spatial configuration of the Seine Axis

The spatial configuration of the Seine Axis port cities could be considered a long-range corridor. The Seine Axis consists of a large seaport (Le Havre/Rouen) connected to a large metropolitan area without a seaport (Paris). Such a configuration exists in several parts of the world, but has hardly been studied in the academic literature. For this report, a classification of port metropolises (including metropolises without a port, but connected to a port city) was undertaken (Annex 4). In this classification, four different constellations of port cities with non-port metropolises have been identified, based on the relative size of the port city and the distance between the port city and the non-port metropolis. Independent port metropolises, such as Durban and St. Petersburg, have a relatively large population compared with the non-port metropolis and are separated from them by a large distance. Port cities with a relatively large population but limited distance to the non-port metropolis could be considered short-range corridors (Antwerp-Brussels and Santos-Sao Paulo are examples of this). The relationship is different when the port-city has a relatively small population: when distances are large, they will be considered a long-range corridor; if they are close to the non-port metropolis, they will be considered a dependent satellite (Figure 14). The case of Le Havre/Rouen and Paris is considered here to be a long-range corridor. It is assumed that the four different constellations are characterised by differing degrees of independence from the main metropolis, ranging from independent with agglomeration effects stemming from the port city itself to lock-in effects by the nearby metropolis (in case of the dependent satellite). This assumption will be tested in this case study of the Seine Axis port cities.

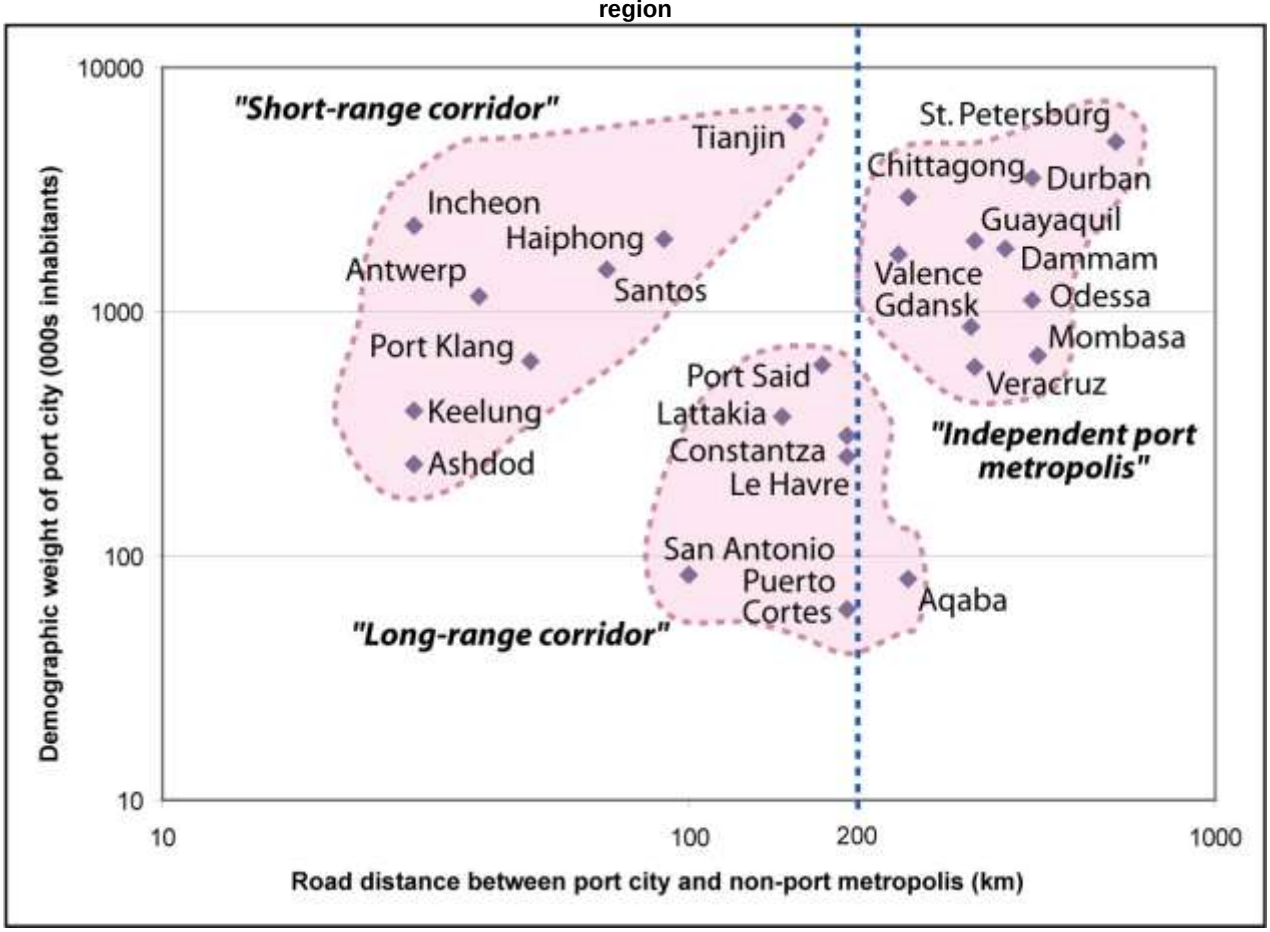
Figure 14. Classification of port-cities and their relation with non-port metropolises



Source: OECD.

The spatial configuration of port cities in the Seine Axis is relatively unusual worldwide. Other countries have similar long-range corridors, including Constanta-Bucharest (Romania), and Port Said-Cairo (Egypt), and interestingly enough, many, like Le Havre and Rouen, have another port city in close proximity, acting as competitor or complementary gateway: Galati for Constanta, and Alexandria and Damietta for Port Said. In this category, the nearest maritime outlet of the core region thus faces a double lock-in effect: from the core region itself, and from its neighbouring competitor. As these examples show, there are no examples of long-range corridors with the economic importance and level of development of Le Havre-Paris (Figure 15). In addition, the port-cities within this constellation all have a population size comparable to that of the metropolitan area. Le Havre, ranked 21st in France in terms of its urban population, is very small compared to its non-port metropolis (Paris).

Figure 15. Port city weight and distance to core metropolitan region



Sources: OECD based on World Gazetteer (2010), Containerisation International (2008), Journal de la Marine Marchande (2010)

Note: For reasons of comparability, this figure only contains port cities linked to non-port metropolises that have more than 5 million inhabitants or ports that carry more than 500 000 TEU per year. The other cases (of smaller metropolises) are included in Annex 4. As the fourth category in Figure 14 (the dependent satellite) only refers to port cities or non-port metropolises that are below this threshold, it is not included in this figure.

This spatial configuration has its impact on the economic specialisation of the different port cities comprising the Seine Axis. The economic profile of the Seine Axis port region is different from most other port regions in northwest Europe. The main port cities in the Seine Axis, Le Havre and Rouen, have more industrial functions and less "metropolitan" functions than most other northwest European port regions. Both Haute-Normandie and Basse-Normandie are specialised in manufacturing and construction, which is not the case for the other port regions (with the exception of Flanders). At the same time, both regions in

Normandy are underrepresented in finance and commerce, and wholesale and retail, which are economic specialisations in other port regions, such as Rotterdam, Hamburg and Bremen (Table 9). This picture is confirmed on a more fine-grained sectoral level, showing a range of economic specialisations in manufacturing sectors of Haute-Normandie and Basse-Normandie, while most of the more "metropolitan" functions in the Seine Axis are conducted by the Ile de France (Greater Paris). Port regions such as Rotterdam and (to a somewhat lesser extent) Hamburg are also specialised in metropolitan functions such as publishing, real estate, transport, storage and communication, post and telecommunications, and air transport (Table 10 and Annex 3). At the same time, they keep some form of industrial profile, limited to one particular sector (coke, refined petroleum, etc).

Table 9. Specialisations of port regions in main economic sectors in 2008 (index score of 1 = national average)

	Main ports	Agri-culture	Manu-facturing	Construction	Wholesale and retail	Finance and commerce	Public and social services
Haute-Normandie	Le Havre, Rouen	0.80	1.48	1.05	1.00	0.81	0.99
Basse-Normandie	Caen, Cherbourg	1.71	1.20	1.27	0.92	0.79	1.10
Ile de France	Paris	0.08	0.71	0.62	1.04	1.32	0.88
Vlaams Gewest	Antwerp, Zeebrugge	1.21	1.15	1.15	1.05	0.94	0.86
West-Nederland	Rotterdam, Amsterdam	0.90	0.69	0.96	1.13	1.13	1.00
Bremen	Bremen, Bremerhaven	0.25	0.91	0.65	1.60	0.88	0.89
Hamburg	Hamburg	0.19	0.57	0.52	1.48	1.31	0.84
London	London	0.07	0.36	0.64	0.94	1.51	0.94
South East	Southampton	0.73	0.76	1.03	1.11	1.10	0.94

Source: OECD calculations based on data from the OECD Regional Database.

Table 10. Specialisations of port regions in selected economic sub-sectors in 2008 (index score of 1 = national average)

	H-N	B-N	IdF	An	W-N	Br	H	L	SE
Port-related functions									
Water transport	3.14	0.69	0.51	1.51	1.45	4.20	15.13	1.08	1.75
Supporting and auxiliary transport activities	2.26	0.53	1.07	1.34	1.38	4.33	2.34	1.29	1.07
Transport, storage and communications	0.99	0.61	1.48	0.90	1.19	1.78	1.29	1.26	1.00
Metropolitan functions									
Publishing, printing and reproduction of recorded media	0.73	1.13	1.38	1.08	1.10	0.73	1.22	1.71	1.02
Real estate, renting and business activities	0.85	0.73	1.35	0.88	1.10	1.04	1.42	1.50	1.15
Post and telecommunications	0.22	0.23	2.82	0.24	1.19	0.53	0.26	1.24	1.12
Air transport	0.01	0.04	2.86	1.16	2.03	0.05	0.17	3.24	1.09
Industrial functions									
Manufacture of wood and of products of wood and cork, except furniture	0.69	1.60	0.13	1.16	0.57	0.33	0.12	0.25	0.74
Manufacture of paper and paper products	2.29	1.31	0.31	1.12	0.51	0.14	0.07	0.14	0.84
Manufacture of coke, refined petroleum products and nuclear fuel	7.19	8.15	0.34	1.36	1.56	0.62	7.28	0.06	0.57

	H-N	B-N	IdF	An	W-N	Br	H	L	SE
Manufacture of chemicals and chemical products	2.49	0.62	1.03	1.04	0.90	0.14	0.53	0.27	1.18
Manufacture of rubber and plastics products	1.77	0.91	0.20	1.36	0.46	0.16	0.35	0.22	0.65
Manufacture of other non-metallic mineral products	1.87	0.97	0.40	0.94	0.52	0.27	0.17	0.17	0.54
Manufacture of basic metals	1.43	1.34	0.28	1.09	0.76	0.62	0.22	0.18	0.58
Manufacture of fabricated metal products, except machinery and equipment	1.49	1.44	0.30	1.15	0.67	0.26	0.12	0.19	0.64
Manufacture of electrical machinery and apparatus	1.83	1.36	0.50	0.82	0.76	0.70	0.25	0.28	1.11
Manufacture of motor vehicles, trailers and semi-trailers	0.90	3.14	0.15	1.48	0.35	1.56	0.14	0.25	0.56
Manufacture of other transport equipment	1.05	1.19	0.67	0.88	1.01	4.36	5.49	0.12	0.79

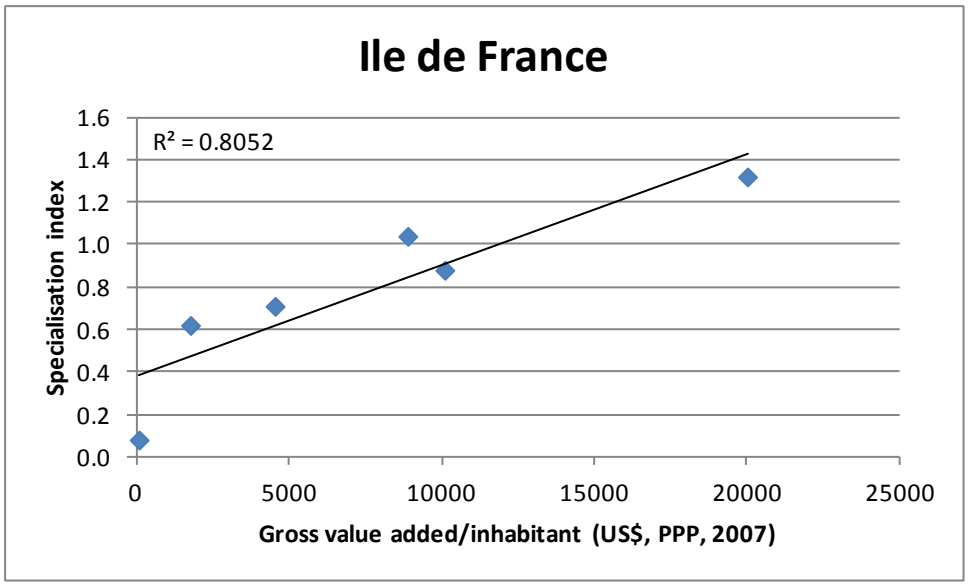
Source: OECD calculations based on data from the OECD Regional Database

Note: The regions indicated in the table are: Haute-Normandie (H-N), Basse-Normandie (B-N), Ile de France (IdF), Antwerp (An), Western Netherlands (W-N), Bremen (Br), Hamburg (H), London (L) and southeast England (SE).

The port region that most resembles the economic profile of the Normandy port region is Flanders, in which Antwerp and Zeebrugge are located. These two ports are specialised in manufacturing and construction, but underrepresented in finance and services. The port region of Antwerp is also the only one, with Basse-Normandie, that is specialised in agriculture. The configuration of London and port cities in the southeast, such as Southampton, is to some extent comparable to that of the Seine Axis: more of the services sector is concentrated in the core of the metropolitan area, whereas manufacturing and industries are more located around the port cities. However, in terms of economic profile, the UK's southeast more closely resembles the London economy than Haute-Normandie resembles the Ile de France: the UK's southeast is still relatively specialised in finance and commerce and underrepresented in manufacturing, as is London. However, Haute-Normandie has an economic profile clearly different from the Ile de France. This would suggest that metropolitan activities have spilled over from London to the southeast, which is less the case for Haute-Normandie in its relation to Greater Paris (Ile de France). The port regions in northwest Europe are generally not more specialised in tourism (hotels and restaurants) than the national average. However, Haute-Normandie, as well as Bremen, are considerably less specialised than the national average.

Most port regions in northwest Europe are specialised in high-value-added activities, and in the Seine Axis, most of these activities are performed by Greater Paris (Ile de France). This becomes clear from a glance at the relation between specialisation indexes of port regions and the gross value added per inhabitant in that economic specialisation. Greater Paris (Ile de France) is specialised in the economic activities with highest value added per inhabitant, in Haute Normandie there is no relation between specialisation and value-added activities, and Basse-Normandie is specialised in economic activities that generate the lowest value added per inhabitant in that region (Figures 16-18). A similar pattern can be seen in the UK, where London is most specialised in high-value-added activities and the southeast less so (although much more than Haute-Normandie). However, other port-regions in northwest Europe, in particular Hamburg, Bremen and to a lesser extent Rotterdam/Amsterdam, are themselves specialised in high-value-added activities (Annex 3).

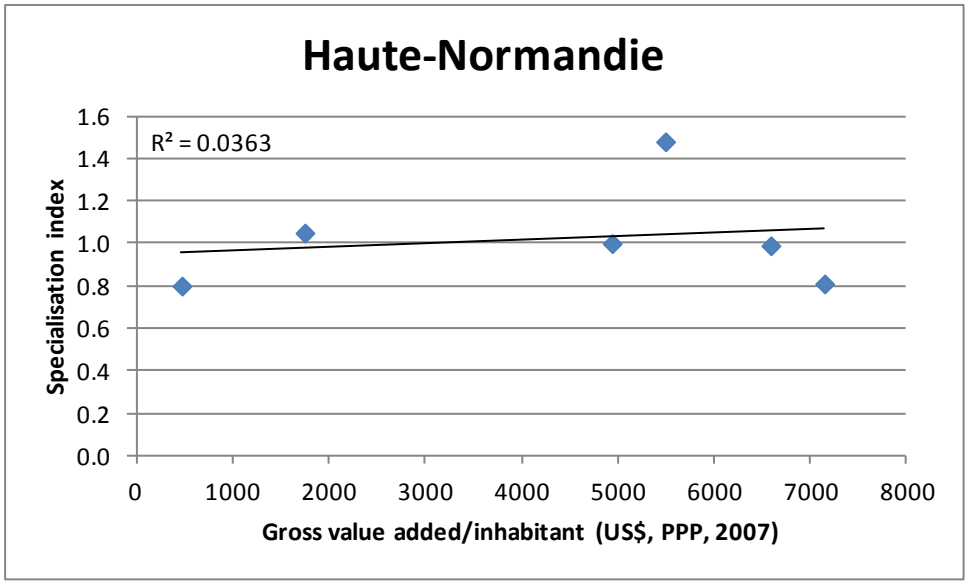
Figure 16. Correlation between specialisations and value-added activities in the Ile de France



Source: OECD calculations based on data from the OECD Regional Database.

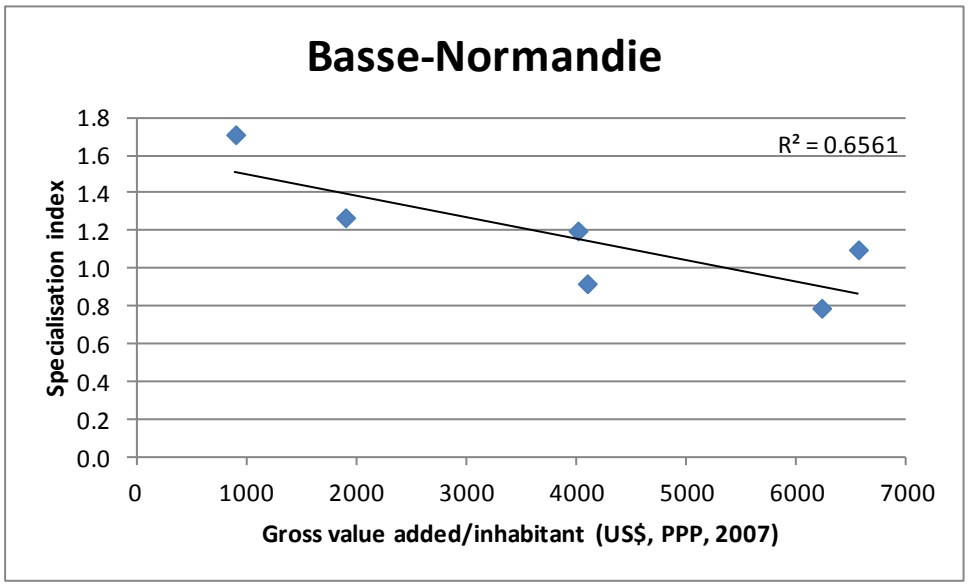
Note : Each point in the graph corresponds to an economic sector. The following six broad economic sectors are distinguished : 1) agriculture, hunting, forestry and fishing; 2) mining and quarrying, manufacturing, electricity, gas and water supply; 3) construction ; 4) wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods; hotels and restaurants; transport storage and communication; 5) financial intermediation; real estate, renting and business activities; 6) public administration and defense, compulsory social security; education; health and social work; other community, social and personal service activities; private households with employed persons.

Figure 17. Correlation between specialisations and value-added activities in Haute-Normandie



Source: OECD calculations based on data from the OECD Regional Database.

Figure 18. Correlation between specialisation and value-added activities in Basse-Normandie



Source: OECD calculations based on data from the OECD Regional Database.

Similarly, most knowledge-intensive services are concentrated in Greater Paris and not in the port city, which is not the case in most other northwest European countries. Approximately 46.5% of total employment in Greater Paris (Ile de France) consisted of knowledge-intensive services in 2008; the figure was considerably lower in Haute-Normandie (30.2%) and Basse-Normandie (38.3%). Port regions such as Rotterdam/Amsterdam and Hamburg have similar shares of knowledge-intensive employment. Knowledge-intensive employment shares in London are even higher (53.5%), which seems to have spilled over to the southeast region in which Southampton is located. The reverse is the case for high-tech manufacturing in both the Seine Axis and the Greater London axis: the core metropolises (Ile de France and London) are underrepresented in high-tech employment, whereas their port regions are specialised in these. The more industrial port regions (Antwerp) also score high on high-tech employment, whereas this is underrepresented in the more service-oriented economies of Hamburg and Rotterdam/Amsterdam (Table 11).

Table 11. Port regions and their shares in high-tech and knowledge-intensive services employment

	Main ports	High-tech employment (% of total employment, 2008)	Specialisation in high tech (as compared to national average = 1)	Employment in knowledge-intensive services (% of total employment, 2008)	Specialisation in knowledge-intensive services (as compared to national average = 1)
Haute-Normandie	Le Havre, Rouen	10.6%	1.74	30.2%	0.82
Basse-Normandie	Caen, Cherbourg	5.9%	0.97	38.3%	1.04
Ile de France	Paris	5.1%	0.84	46.5%	1.26
Vlaams Gewest	Antwerp, Zeebrugge	7.2%	1.16	37.7%	0.98
West-Nederland	Rotterdam, Amsterdam	2.4%	0.71	46.0%	1.08
Bremen	Bremen, Bremerhaven	10.6%	0.97	38.6%	1.09
Hamburg	Hamburg	6.9%	0.64	47.3%	1.34
London	London	1.9%	0.38	53.5%	1.25
Southeast	Southampton	5.7%	1.17	45.5%	1.07

Source: OECD calculations based on data from the OECD Regional Database

The case of advanced maritime services

Knowledge-intensive services closely related to ports are the advanced maritime services, in which Paris plays an important, though not dominant, global role. These services include shipping finance, maritime insurance, maritime law, surveying and inspection and maritime consultancy. On the basis of the World Shipping Register (WSR) and other databases, it is possible to identify the location and connectivity of cities in a global network of advanced maritime services firms that have more than one establishment (see Annex 5 for a description of methodology). Paris plays a relatively important role in these global networks: it ranks 13th among the top maritime service centres in terms of location of multi-office firms; with major competition in terms of advanced maritime services in northwest Europe coming from London (1st), Rotterdam (6th) and Hamburg (8th) (Table 12). In terms of interconnectedness (the connections through branches of the same firm in other cities), Paris scores high, with strong linkages with London, Hong Kong and New York (Annex 6).

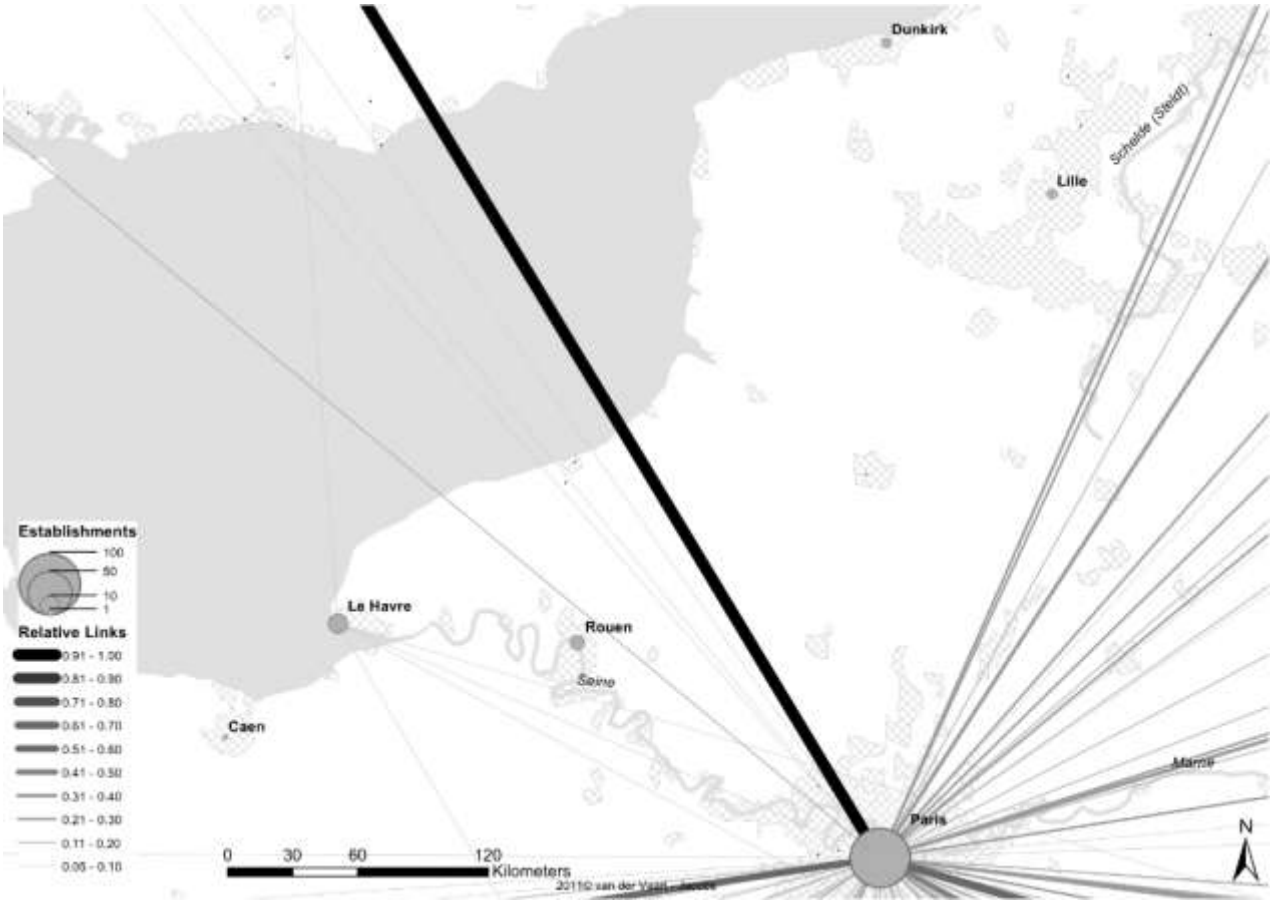
Table 12. Top 15 maritime service centres in terms of multi-office firms

	Total establishments	Weighted
London	406	536
Singapore	214	256
New York	166	201
Hong Kong	150	181
Piraeus	161	169
Rotterdam	131	155
Houston	96	127
Hamburg	109	121
Dubai	97	119
Tokyo	94	111
Panama City	95	107
Shanghai	94	102
Paris	67	94
Madrid	70	92
Mumbai	74	91

Note: Multi-office firms are weighted according to a methodology described in Annex 5.

Within the Seine Axis, advanced maritime services are primarily located within Paris and networks within the region are negligible. This configuration confirms the general picture that advanced maritime services tend to follow urban hierarchies rather than port hierarchies: the metropolitan effect is stronger than the effect of the port. Indeed, Jacobs et al. (2011) confirm that advanced maritime services tend to locate near their clients, most notably shipowners and the head offices of transport-related industries, and near advanced services in general because of labour-market effects. Locations with seaports (Le Havre, Rouen, Caen and Dunkirk) or with transport activity (Lille) do host some establishments of multi-office maritime services, but only to a limited extent.[15] The dominance of Paris with respect to advanced maritime services corresponds with the general dominance of Paris as compared to other French regions in advanced services, headquarter functions and research and development. A similar observation has been made with respect to Rouen and its relative lack of industrial headquarters (Dumont, 2006).[16] The reason that Le Havre hosts some maritime service centres is that for some activity, such as surveying and inspection, proximity to the physical activity of shipping is more important. However, for most advanced services, such as ship finance or insurance brokerage, proximity to physical flows is not relevant. Networks within the region itself are negligible (Figure 19), because firms usually service a particular region from one office only.

Figure 19. Location and connectivity of advanced maritime services in the Seine Axis



Source: OECD based on data from the WSR database

The most important linkages of Paris in advanced maritime services are mainly with the other major global centres of advanced maritime services, such as London, Singapore, Hong Kong. The top 15 of the most important global linkages in advanced maritime services in Paris are complemented by mainly continental European locations, such as Brussels, Dusseldorf and Prague (Annex 6). At a more detailed level, it can also be noted that Paris maintains a relatively large number of linkages with Africa, mirroring the relatively important linkages of the ports of Le Havre and Rouen with African ports.

Figure 20. The global network of Paris in advanced maritime services



Source: OECD based on data from the WSR database.

The dominance of the core metropolitan area as a location for advanced maritime services is similar in other important maritime gateways in the world. The Thames Gateway shows a configuration similar to that of the Seine Axis: advanced maritime services are located in the central city, London, and to a far lesser degree in seaport locations. The main seaports servicing the London metropolitan region, Southampton, Felixstowe and Tilbury, only host smaller concentrations of maritime services, but a number of firms are located outside London, in cities such as Reading and Basingstoke. Unlike Paris however, London is home to a maritime port with a considerable tonnage. Developments in main Chinese gateways are somewhat comparable, but start to diverge. The location pattern of multi-office maritime services in the Yangtze River Delta region is dominated by the central city of Shanghai. Other cities within the region where maritime services are located are Nanjing (a major river port and metropolitan region in its own right) and Ningbo (which has large container terminals and is a major competitor of the port of Shanghai). The main difference with the ports of Paris and London is that Shanghai also still acts as the dominant seaport of the region. In the Pearl River Delta, advanced maritime services and port activity are both still concentrated in Hong Kong, but the major port cities of Guangzhou and Shenzhen clearly emerge as secondary centres. This raises questions about the evolution of Hong Kong as a port city: to some extent it already, like Paris and London, shows the same tendency for port activity to concentrate in neighbouring port locations, just as Le Havre does for Paris or Southampton for London, while advanced services remain in Hong Kong. At the same time, Guangzhou and Shenzhen (much more than Le Havre), are emerging as true second-order maritime services centres (see Annex 6 for more details on the location and networks of Thames Gateway, the Yangtze River Delta and the Pearl River Delta).

Port clusters and innovation: the case of patents

Unlike other port regions in northwest Europe, Le Havre/Rouen is not one of the more innovative regions in the country. Port regions all over the world are spatial concentrations of innovative activities. One of the indicators for measuring this, albeit an imperfect one, is the share of patent applications coming from these regions. Patent applications express the willingness or intention of an inventor or firm to commercialise an invention and to protect the copyright on the application of this invention. As such, it can be an indicator of the extent to which inventions are applied and commercialised in a region. Since only the applications are registered, they do not guarantee that the invention is in fact applied, because a patent application might or might not be accepted. The fact that most patent applications originate in headquarters of firms introduces a bias in the findings to some extent, but patent applications are also registered according to inventors, and the differences between the two methods are relatively limited for the regions studied in northwest Europe. Despite these drawbacks, regionalised patent data remain interesting sources for the comparison of innovative activity in different regions. That said, the port-region of Le Havre/Rouen represented 1.7% of total national patent applications in 2007, slightly below its share of the national population (1.9%). However, other port regions in northwest Europe managed to get higher patent shares than their population share. Hamburg, Antwerp and Rotterdam all have considerably higher patent shares than their share of the total national population (Table 13), close to 50% more in Antwerp and Hamburg.

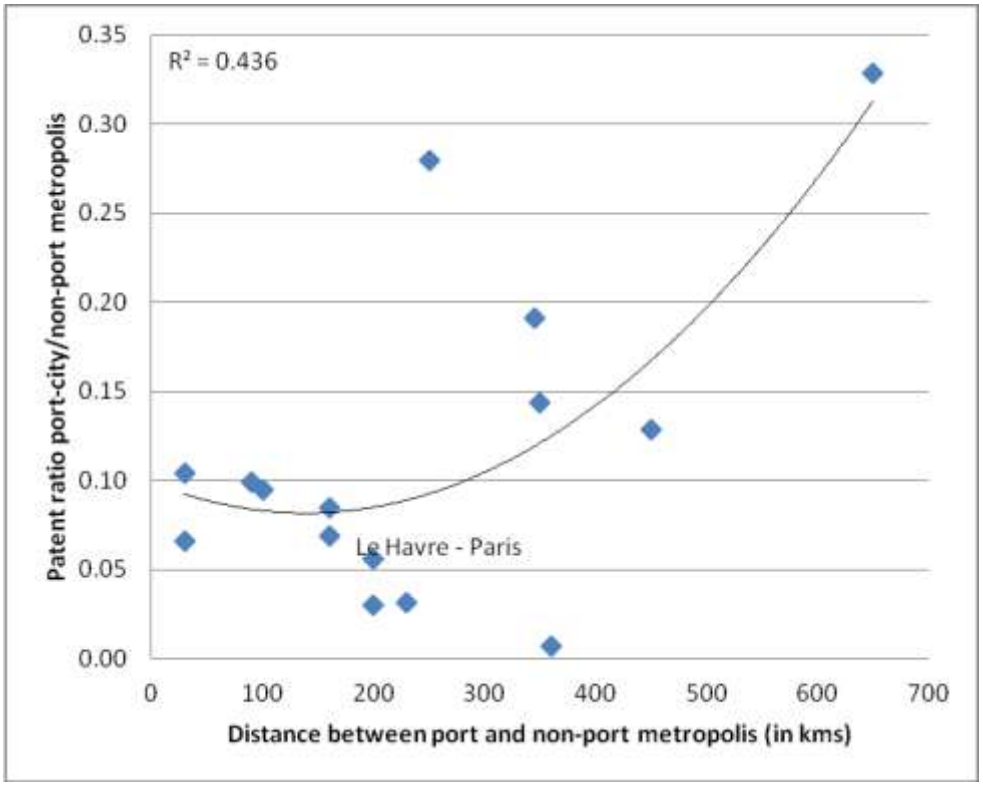
Table 13. Shares of national population and patent applications (2007) in selected northwest European port regions

	Le Havre/Rouen	Antwerp	Rotterdam	Hamburg
Population (as % of national)	1.9%	16.1%	21.1%	2.1%
Patent applications (as % of national)	1.7%	23.5%	23.2%	3.3%

Note: The regional demarcation applied in this figure is the OECD TL 3-region, which represents Seine-Maritime (Le Havre/Rouen), Provincie Antwerpen (Antwerp), Zuid-Holland (Rotterdam) and Hamburg (Hamburg).

The relatively weaker score of Le Havre/Rouen could possibly be explained by the spatial configuration of Le Havre-Paris. As mentioned before, the constellation of Le Havre-Paris is a case of a port city in relative proximity to a non-port metropolis. An analysis of similar constellations in countries for which regional patent data exist indicate that port cities with larger distances to the non-port metropolis manage to develop a stronger regional innovative position, as expressed in the share of patent applications in their region compared to those in the neighbouring metropolis (Figure 21). This is for example the case for St. Petersburg, Gdańsk/Gdynia, Durban and Veracruz, port cities that all managed to have a relatively high number of patents as compared with their main metropolitan areas of Moscow, Warsaw, Johannesburg and Mexico City. Figure 21 also shows that several port cities that are located in close proximity to the non-port metropolis (up to 100 kilometres away) have a relatively higher patent ratio than those slightly farther away (around 200 kilometres). This might suggest that proximity to the main metropolitan areas might lead to knowledge spill-overs, which occur less frequently as the distance becomes larger.

Figure 21. Correlation between distance between port city/non-port metropolis and patent ratio between them (2005-2007)



Source: OECD calculations based on data from the OECD Regional Database and OECD patent database.

The port region of Le Havre/Rouen has relatively large shares of patent applications in several port-related sectors, in particular those connected to industry and industrial processes. It has a relatively larger patent share in transporting, but not in ships, whereas the other large port regions in northwest Europe have an above-average concentration of ship-related patent applications. Other relatively high scores are in the petroleum and metallurgy sectors, as well as in some of the categories connected to industrial processes, such as conveying and combustion engines. Whereas the other large port regions are relatively more specialised in renewable energy patents, this is not the case for Le Havre/Rouen. In other green growth sectors, such as pollution abatement and water supply, its performance is better. It is surprising considering the strong position of the port of Rouen in agricultural products that Le Havre/Rouen does not have a stronger position in food-related patents; the port region of Rotterdam, a strong contender in this segment, clearly dominates the national scene for patent applications related to food and agriculture (Table 14).

Table 14. Patent applications in selected sectors (as a share of national patent applications) of main port regions in northwest Europe (2005-2007)

	Le Havre/Rouen	Antwerp	Rotterdam	Hamburg
Population share	1.9%	16.1%	21.1%	2.1%
Total patent share	1.7%	23.5%	23.2%	3.3%
Transport-related sectors:				
Transporting	2.2%	6.7%	17.8%	0.5%
Ships	0.4%	79.4%	53.4%	7.6%
Land vehicles	0.8%	9.0%	25.8%	0.9%
Railways	0%	20.0%	0%	1.3%
Industry				
Petroleum	9.8%	15.7%	17.3%	4.9%
Metallurgy	3.3%	13.0%	12.8%	0.5%
Construction	0.8%	24.7%	35.1%	0.7%
Industrial processes				
Conveying	14.3%	23.1%	18.0%	2.4%
Combustion engines	5.0%	8.2%	32.6%	0.3%
Machines and engines	1.4%	10.2%	36.9%	0.3%
Machine engines for liquids	1.0%	20.8%	31.4%	3.7%
Hoisting, lifting, hauling	0.7%	54.5%	38.8%	0.8%
Positive displacement machines	1.0%	31.1%	14.7%	0.5%
Green growth sectors				
Renewable energy	0%	50.9%	23.5%	7.2%
Pollution abatement, waste management	3.1%	25.0%	36.7%	0.9%
Treatment of water	0.6%	41.6%	15.5%	1.6%
Water supply	2.7%	17.6%	33.2%	1.7%
Food-related sectors				
Agriculture	0.3%	24.6%	29.8%	1.1%
Food and foodstuffs	0.8%	9.2%	41.5%	1.3%
Animal vegetable oils	2.4%	14.2%	37.5%	2.6%
Biochemistry	0.6%	10.6%	29.4%	1.5%
Fertilisers	0%	0%	12.0%	3.4%

Source: OECD calculations based on data from the OECD Regional Database and OECD patent database.

In terms of innovative co-operation, the port region of Le Havre/Rouen is heavily oriented towards the Seine Axis. This co-operation can be identified by looking at co-patent patterns. Co-patent applications are patent applications submitted by more than one agent, who can be located in more than one region. Because these co-patent applications are registered, they give valuable information about co-operation of the relevant actors (including inventors and firms) across regions. These co-patent links can be considered to be inter-regional linkages in innovation. In this respect, Le Havre/Rouen is well embedded in the Seine Axis: seven out of the eight TL 3-regions with which Seine-Maritime has substantial co-patent links fall within this Axis (Table 15). The international connections of Le Havre/Rouen (Seine-Maritime) with other regions in the world are relatively limited and not connected to its main maritime foreland or hinterlands, even if some are port cities (Amsterdam and Ghent). Port-related goods flows do not seem to relate to flows of knowledge and innovation (in inventions for commercialisation) in the case of Le Havre/Rouen.

Table 15. The main OECD regions in terms of co-patents with Le Havre/Rouen (2005-2007)

Region	Number of co-patent links	Country
Eure	67	France
Yvelines	34	France
Paris	30	France
Hauts-de Seine	29	France
Oise	22	France
Somme	19	France
Val d'Oise	14	France
Essonne	12	France
Haute-Garonne	12	France
Greater Amsterdam	9	Netherlands
Fort Wayne Huntington	8	United States
Dothan Entreprise	7	United States
Cheshire County Council	7	United Kingdom
Ghent arrondissement	7	Belgium
St. Niklaas arrondissement	6	Belgium
Brussels	5	Belgium
Province Brabant Wallon	5	Belgium

Source: OECD calculations based on data from the OECD Regional Database and OECD patent database.

2.2 Social impact

The port cluster of Le Havre/Rouen represents 9.5% of total regional employment, which is relatively high in comparison with other northwest European port regions. The province of Antwerp has a similar dominance of the port cluster (8.2%), but the port clusters in Rotterdam and Amsterdam are less dominant in terms of employment (4.1% and 1.2% in 2008 respectively). These international comparisons should be interpreted with caution, as the national (and local) definitions of port employment and port-related employment vary considerably. In total, the port clusters in the Seine Axis represent approximately 136 000 jobs, of which 41 000 are direct jobs and 95 000 indirect, port-related jobs (Table 16). These job figures originate from different sources and are not necessarily harmonised.[17] It is also clear that the figure is to some extent biased by the inclusion of the employment of the port of Paris and its related employment, which represents more than half of the employment but does not relate to maritime employment and employment related to seaports.

Table 16. Total employment (direct and indirect) of port clusters in Seine Axis (2006-2008)

	Le Havre	Rouen	Caen	Paris
Direct employment	16 400	3 200	931	21 000
Indirect employment	16 500	17 400	1 265	60 000
Total employment	**32 900**	**20 600**	**2 196**	**81 000**

Source: INSEE 2006 2010 PNA 2010, Ports de Paris

Table 17. Employment of port clusters in northwest Europe (as a share of regional employment; 2006-2008)

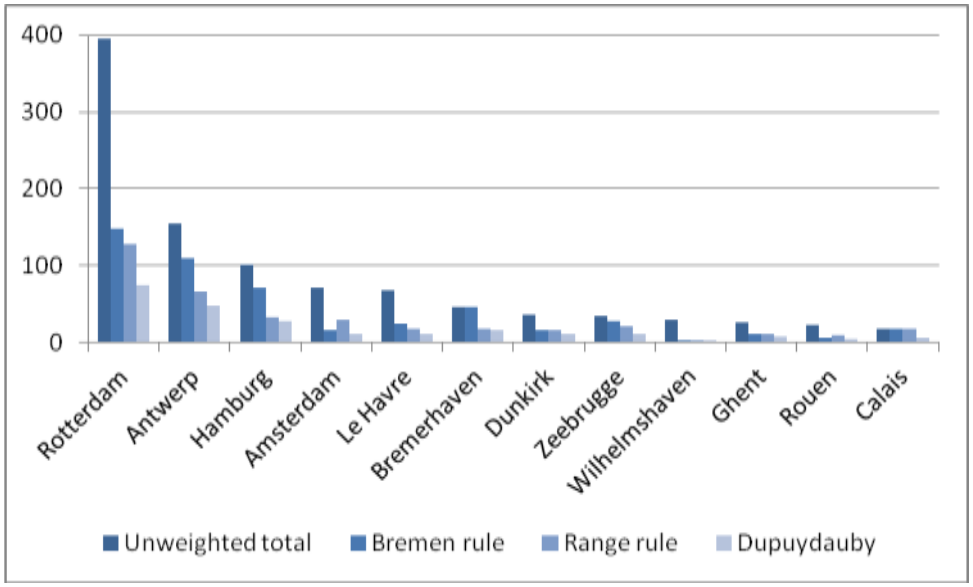
	Employment port cluster	% regional employment	Corresponding region
Le Havre/Rouen	53,500	9.5%	Seine-Maritime
Antwerp	64 004	8.2%	Antwerpen
Rotterdam	76 340	4.1%	Zuid-Holland
Amsterdam	17 394	1.2%	Noord-Holland

Source: For Le Havre and Rouen, OECD calculations based on Eurostat data and the OECD Regional Database. For the other cities, OECD based on Mathys 2010 and Nijdam *et al.*, 2010.

Note: Figures for Le Havre/Rouen refer to 2006; those of the other port regions to 2008.

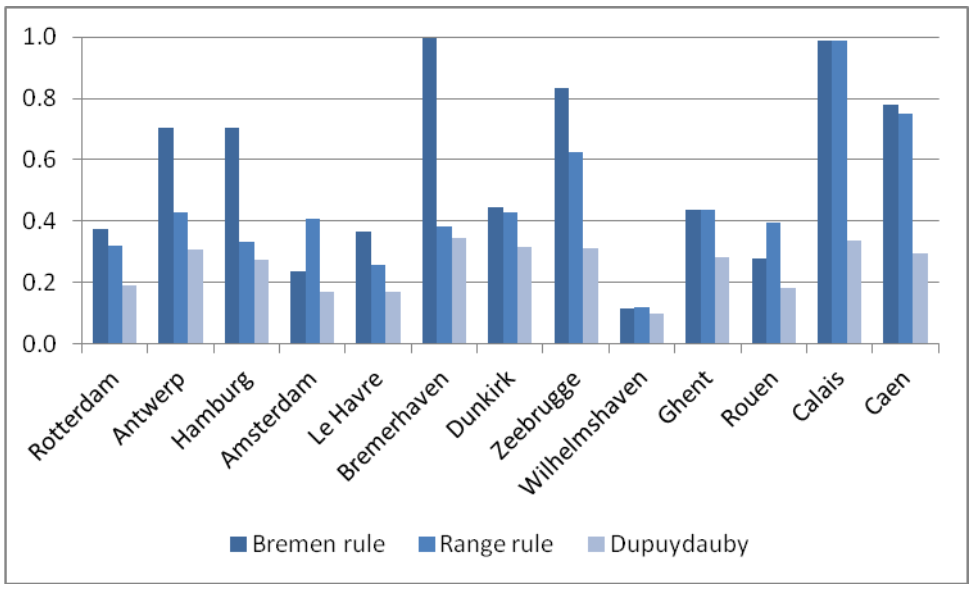
The port specialisations of Le Havre and Rouen have a relatively unfavourable effect on job creation by comparison with other ports in northwest Europe. This can be observed by weighing the total throughput of ports in northwest Europe, applying rules that weigh different traffic categories according to the employment connected to it (Figure 22). Although there are several of these rules, they agree on the assumptions that general cargo generates more value added in terms of employment than container traffic and crude oil, because the handling of general cargo and dry bulk is more labour-intensive than containers (partly automated) and crude oil (much of it via pipelines), two of the specialisations of the port of Le Havre. One of these weighing rules, the Bremen Rule, is relatively old and does not take the containerisation of general cargo into account, but is still often used, and is thus also represented in our analysis.[18] The different weighing rules together indicate the range of the extent of employment creation. Both Le Havre and Rouen are among the ports with low potential for creating employment, like Rotterdam and Amsterdam two ports that also have a large share of liquid bulk (oil) (Figure 23). The port of Wilhelmshaven scores worse in this respect, but several other large ports, such as Antwerp, Hamburg and Bremerhaven, have higher scores. In contrast to Le Havre and Rouen, the port of Caen creates more employment per tonne throughput.

Figure 22. Weighed traffic volumes according to different weight rules



Source: OECD on the basis of Eurostat data.

Figure 23. Employment creation potential according to different calculation methods



Source: OECD on the basis of Eurostat data.

2.3 Environmental impact

Port activities have a variety of environmental impacts on their territories, but the challenge is to monetise them. Main environmental impacts are related to maritime activities close to ports, port-related activities and port hinterland-related activities. Some of these impacts are measured, but many ports, including the Seine Axis ports, have not yet developed comprehensive measurement of the environmental impacts of their activities. Even when environmental data are available, it is difficult to determine the extent of this impact. A way to circumvent this problem is to monetise the environmental effects where possible. There are two ways in which this has been applied with respect to the environmental effects of the Seine Axis ports: *i)* external costs of freight traffic related to the port of Le Havre; *ii)* the effect of proximity to the port on house prices.

External costs of freight traffic

The external costs of freight traffic from the port of Le Havre amounted to approximately EUR 22 million in 2000, according to Haezendonck and Coeck (2006). Even if these calculations are dependent on the data quality and underlying assumptions, there is a growing academic literature underpinning such results (Maibach *et al.*, 2008). These costs could be reduced considerably if the share of lorry transportation was reduced to the shares in Antwerp, Rotterdam and Hamburg. These external costs include costs related to congestion, accidents, air pollution, noise and other external costs. These costs are relatively high in Le Havre, due to the high share of lorry transportation in the modal split (85% in 2000; 87% in 2008).

Effects on house prices

There is a growing field that uses the hedonic pricing model to measure the impact of environmental amenities and disamenities on real estate values. Hedonic prices are the implicit prices of attributes, which are revealed to economic agents from observed prices of differentiated products and the specific characteristics associated with them. This helps to explain house prices in terms of the house's

characteristics, such as the type of dwelling, age, floor area, neighbourhood and job accessibility. It can also explain the impact of undesirable facilities on house values due to perceived disamenities. Such concerns (for example, worries about air pollution, health risks and public image) can manifest themselves in property markets, as buyers are likely to pay more to reside in locations farther from perceived disamenities.

There is some evidence of negative effects on house prices due to proximity to the port-industrial complex of Port Jérôme, which is part of the Rouen port cluster. Hedonic price analysis, taking into account a house's intrinsic characteristics, shows that close proximity to this port-industrial complex leads to a price discount of approximately 12% of the average price for a similar house. Proximity to the Seine River leads to an even larger reduction, namely 38%; the Seine is thus not considered an asset in this area (Travers *et al.*, 2009). Another study has observed that house prices tend to be lower close to the port of Le Havre, which is associated with higher concentrations of social deprivation (Duplessis, 2006), but this in itself does not prove a negative impact of the port, as it is probably connected to other factors (education, qualifications, etc.).

These findings are not completely in line with the limited number of studies considering the effect of the proximity of ports on house prices. Similar studies conducted elsewhere have found negative price effects for industrial zones, but not necessarily for port areas. Proximity to an industrial site exhibits a statistically significant negative effect on the value of residential properties in the Randstad region (Netherlands), but the effect of closeness to a port area was found to be insignificant (De Vor and De Groot, 2010). Hedonic price analysis conducted on St. Nazaire showed no linear and univocal relation between proximity to the port industrial zone and housing prices, possibly explained by a positive effect of proximity to place of work or easy access to the transport network, which can offset air pollution or environmental risks (Maslianskaia-Pautrel, 2009). Similarly, close proximity of housing to a seaport was found to have an insignificant effect on individual well-being in Ireland (Brereton *et al.*, 2008).

3. POLICIES

The policy challenges, as identified in the previous sections, relate to the different fields involved at the various territorial levels (port, port city and metropolitan region). In the economic development field, the main challenges are to enhance port competitiveness and to ensure that the region benefits economically from port activities. Port competitiveness is closely linked to transport infrastructure, to inland connections and to labour-management relations, whereas regional economic benefits could be stimulated by innovation and high-value-added activities. The Le Havre-Rouen-Paris configuration is different from that of most port regions and poses challenges for territorial development all along the Seine Axis. The "greening" of port activities and traffic flows from the interior is not only an environmental challenge but also a potential competitive advantage. Recognising the port as part of the regional identity is essential for the future. The following sections will analyse policies affecting these different fields.

3.1. Economic development

Business strategy

The development of a pro-active business strategy is a key element for enhancing the competitive position of ports along the Seine Axis. This will require, first of all, deepening strategic knowledge, strengthening contacts with private enterprises and intensifying co-operation with universities and R&D institutes. At the same time, positions will have to be taken both in the pre-port systems and in the hinterland in order to generate additional throughput. This could, for example, take the form of investments in foreign ports and in inland terminals. The central government could also encourage the strategies by amending the VAT systems at the frontiers.

A sound business strategy must rely first of all on market intelligence, and this could be improved. It must be recognised here that there is a lack of strategic information on ports and on logistics: statistics and impact analyses are insufficient, and most of the data on French ports are not harmonised and are difficult to compare. The National Statistics Institute (INSEE) has done some studies on port-related employment in the case of Le Havre and Rouen, but they are rather dated and imprecise on the subject of indirect employment effects. The data on value added by the ports are very old. This report attempts to fill those gaps. In Belgium and the Netherlands, employment and value-added data serve as the basis for annual studies by the National Bank of Belgium and the Netherlands Ports Council. Statistics on foreign hinterlands are very approximate in the case of the port of Le Havre, although their quality is better for the ports of Rouen and Paris. Hinterland data were compiled by the customs services until 2005, but are now nonexistent. In this respect, Rotterdam presents a striking contrast, listing precise information by basic product at its web site, as does Antwerp to a lesser extent. Strategic information can be gathered from private firms, but it is largely missing in discussions about the future of ports and logistics systems in the region. In France, closer co-operation with university experts could refine understanding of the business strategy of the ports along the Seine Axis, as is the case for Zeebrugge, where researchers have been involved in preparing the long-term strategic plan (Verbecke *et al.*, 2008).

Collaboration with strategic foreign ports and participation in their capital or their governance is another component of proactive business approaches. For example, the port of Antwerp is co-operating with the port of Duqm in Saudi Arabia, with the Shipping Ports and Logistics Ltd. company of India, and is considering the possibility of investing in Brazilian ports. Similarly, the port of Rotterdam has a financial stake in the port of Sohar in Oman, and in 2009, it conducted a study on potential participation in the ports of Suape (Brazil), Sabah (Malaysia) and in India. Such ventures are managed by specific branches of the administration of these two ports: Port of Antwerpen International (PAI) and Port of

Rotterdam International (PORint). PAI also serves as a consultant for other foreign ports. Similar activities are undertaken by the port of Rouen: the port has developed engineering partnerships in Vietnam with the port of Phu My, for the construction of the first deepwater port in Vietnam, essentially for dry bulk, as well as in Congo and the Central African Republic with a shared maintenance system for the navigation waterways, and finally in Cameroun for the co-ordination of renovation works at the quays for dry bulk in Douala.

It is also important to pursue pro-active strategies with respect to the hinterlands. For this reason, several ports have taken equity interests in inland terminals or platforms. The ports of Le Havre and Rouen have invested in Paris Terminal. Similar strategies can be seen in the plans of Antwerp and Rotterdam for the terminal of Duisburg in Germany. Application of the VAT at the French border could be reconsidered to align practices with those of Belgium and the Netherlands, which are more favourable to importers, as they do not impose an immediate levy. This measure is part of the Grenelle package, and is in the process of being implemented in order to provide conditions similar to those of the northern European ports.

Diversification strategy (short sea shipping)

Recent experience with inter-modality at Le Havre suggests that the port might do well to consider diversifying its strategy by establishing a true maritime transshipment platform, which it does not have at present. This function is still monopolised by Rotterdam and Hamburg in northern Europe: their strength is that they combine this function with mass servicing of the European hinterland. Among the nearby ports, neither Antwerp (the closest continental competitor), nor Southampton or Felixstowe has adopted this option, for they serve the British hinterland.

Le Havre could transform its geographic constraints into an advantage, by allowing transshipment from mother ship to feeder ship. While not the most lucrative of port functions, transshipment is still profitable beyond a certain scale, and it does not require heavy additional investments in terms of infrastructure, beyond the presence of a short sea terminal such as that of Rotterdam. Modern infrastructure has in any case been in place since the launch of Port 2000. A recent call for tenders for a transhipment feedering service between Port 2000 and Caen goes in this direction, as well as a connection between Port 2000, Honfleur, Radicatel and Rouen that is currently being studied.

As has been noted in recent commentary, the introduction of feeder services linking Le Havre to the Iberian Peninsula (and also to the UK and Ireland) has been viewed positively by the major shipping lines. Short sea shipping is encouraged by Europe, as an alternative to the intensification of overland trucking. Finally, the "hub" maritime strategy is not entirely divorced from the territory, as it can have the effect of capturing additional cargo consolidation functions (Rodrigue and Notteboom, 2010), contributing value added that was hitherto missing. It makes it possible to take advantage of the low cost of sea transport (as well as its environmental advantages) and avoid the negative fallout from an overly large reliance on trucking. These possibilities of feedering services with the Iberian Peninsula (as well as the UK and Ireland) could be expanded. In general, with respect to feedering, it makes sense to look for synergies and complementarities between Seine Axis ports, with its different characteristics in Le Havre, Rouen and Caen. Rouen, at its Radicatel site, in immediate proximity to Le Havre, develops services to Ireland. It also seems interesting to reflect on feedering services between three different countries, in order to facilitate good flows.

Attraction strategy and urban economic development

The strategy of the Le Havre region is managed at the city level by *Le Havre Développement* (Le Havre Regional Development Agency), to the creation of which the city contributed greatly. The Le Havre Regional Development Agency has the task of attracting national and international investment, assisting

enterprises with their investment plans and promoting innovative entrepreneurship. The Board of Directors consists of the mayor of Le Havre, the president of the CCI and the head of the port of Le Havre. The development strategy in Rouen is implemented at the level of the local agglomeration by the Rouen Development Agency. Its strategic orientations are focused on eco-technologies, health and digital industries, development of creative industries and the development of industrial parks including a multimodal platform (road-rail-river), Seine-Sud, that is partly located on former industrial sites to be rehabilitated.

The strategies pursued seem however to be focused primarily on technological projects. The Le Havre regional development agency is involved in futuristic undertakings such as the European CO_2 sequestration project and investments in wind energy. While progress in these areas is useful, it would be counterproductive to ignore efforts to improve the competitiveness and productivity of traditional sectors. One reason why the ports of Antwerp and Rotterdam have won significant market share despite their limited domestic markets has been the emergence of European distribution centres in the Netherlands and in Belgium. Promotion campaigns and intensive marketing have accompanied these efforts. Such a strategy has never been pursued in France, but the Le Havre Regional Development Agency, the port and regional authorities could help support efforts to generate economies of scale that could justify certain modal shifts.

It is also open to question whether diversification is an objective of Le Havre's urban policy. It is true that the industrial zone at the port of Le Havre is characterised by a fairly broad range of activities, but they rely on conventional industries. Many port cities in northwest Europe have developed sectors that bear little relationship to port activity and logistics, but that have supported the prosperity and attractiveness of their cities: the fashion business in Antwerp, media industries in Hamburg, architecture in Rotterdam. The greater Le Havre community and the city of Rouen should consider this and launch a study to identify potential candidates. Lastly, the ports of Rouen and Le Havre are not sufficiently appreciated as marketable assets for attracting external investment and firms. The port authorities could invest more in external communication (see also the penultimate section).

Regional embeddedness of the ports of Le Havre and Rouen

Several sectors are well represented in the metropolitan zone, and in particular the automobile and electronics industries. The fine chemicals industry is consolidating in Le Havre and is becoming a competitive cluster by forging alliances with other sites and facilities in the Centre, the Loire Valley and Basse Normandie. The energy sector was prioritised in 2009 to support Haute-Normandie as the prime region for energy production in France: the energy sector is responsible for 10 000 direct jobs. The main orientations of the sector are energy efficiency, green growth and on-shore and offshore windmills. The region has launched a call for energy projects to favour innovation in this domain, mainly around energy diversification.

In these three areas, the Haute Normandie state and regional project (*Contrat de projet État-Région* Haute Normandie) has released funds (6.6% of the total) for boosting industries and co-ordination with regions of the Paris basin. These funds are necessary for linking public and private stakeholders in a co-operative network. Subcontractors, particularly in the automobile industry, are subject to heavy pressure from their prime manufacturers, which are tempted to offshore their production facilities. In the chemicals, biology, health and plastics sectors, projects have been designed to support dedicated local development projects, including Bio-Normandie Parc and the health safety microbiology laboratory in Rouen. Support for the regional potential in skills and jobs is targeted in particular at the MOVEO, Polymers Technologies and NOVALOG competitiveness clusters.

The port cluster, however, is not firmly rooted in the region, as shown in Chapter 2. The sectors of the port industrial zone have only loose links with Haute Normandie. As a result, there are heavy spill-over effects in the rest of the country. The Logistique Seine Normandie sector and the competitiveness cluster NOVALOG have been constructed with a regional dimension in order to favour synergies between actors and to promote logistics activities, but the question is whether traditional rivalries between Le Havre and Rouen, which were considered to be blocking similar initiatives in the past (Collin, 2006), have been transcended.

Similarly, potential exists for synergies between the port of Rouen and the logistics and agriculture sectors, but this has not been exploited. Rouen may be the leading French cereals port, but that creates almost no value added for the regional economy in its broader sense. On this point, thought should be given to what happens in the Rotterdam region. The port benefits from its proximity to a well-developed agro-industry cluster. It also relies on the presence of the airport, the availability of specialised knowledge and research facilities at the university, and on collaboration with the agrifood industry. The missing elements in its range of agricultural products (for example lemons) are imported to round out a full range of products and to satisfy German wholesalers. In the 1980s, a regional branch of the national institute for agricultural research left the region. In order to favour port synergies with respect to agricultural products, it would help to have more research-related activities in the region, as in the case of the recent regrouping of sites of the agricultural school ESITPA, which is now installed in the Mont-Saint-Aignan, a Rouen suburb.

Promoting the Seine Axis

For the maritime ports, the key is increasingly to sell global solutions in co-ordination with inland ports and in particular the port of Paris. This depends of course on the co-operation and synergies between the ports of the Axis. Rouen can operate independently from Le Havre because it has a stable clientele of cereals companies and automobile makers. Its position in north-south traffic to Africa means that it is chasing business along routes that are quite different from Le Havre's. Competition with the port of Caen is also low-key, given the respective sizes of the two ports and their areas of specialisation. Finally, competition with Paris is barely an issue, as the rapidly growing volume of traffic offers substantial opportunities to the six container operators.

So far, in the absence of a platform for co-operation or exploitation of synergies among the ports along the Seine, they seem to have developed in a more or less complementary fashion, but this is more by accident than by design. The ports of the Axis appear to have been in discussions the last year, and this is considered a great step forward. However, for some of the stakeholders, the current debate reveals a lack of systematic thinking and a greater concern for technology than for common strategies and the search for markets. Port systems and urban systems obey different organisational and sometimes opposing rationales: the attractiveness of metropolitan areas is based on "openness", whereas the attractiveness of port-industrial complexes is based on "closedness" (Box 5). This is a delicate balancing act, necessitating structural dialogue between ports, firms and local and regional governments. For this reason, several of the largest port cities in the world, including Singapore and Rotterdam, have economic development boards, in which the port and logistics sector is included, to advise on a balanced economic vision.

Box 5. The diverging priorities of port and urban systems

Spatial clusters could be classified into three different groups, with different characteristics of relations between firms and knowledge spill-overs (based on work by McCann and Sheppard, 2003; Iammarino and McCann, 2006):

- Pure agglomeration: metropolitan areas can be considered engines of growth thanks to economies of agglomeration: the assumption is that people and firms tend to cluster in metropolises because of the positive knowledge spill-overs that result from interaction between individuals. Firms in such a constellation typically have no market power, and will continuously modulate their interactions with other firms and customers in response to market arbitrage opportunities, leading to intense local competition. Loyalty between firms, and long-term relationships, are difficult to establish in these circumstances. The cost of the membership in this cluster is the local real estate market rent. There are no free riders, access to the cluster is open and the price that local real estate can command is a benchmark for the cluster's performance.

- The industrial complex is characterised primarily by long-term stable and predictable relations between the firms in the cluster, involving frequent transactions. In order to become part of a cluster, firms within it each undertake significant long-term investments, particularly in terms of physical capital and local real estate. Access is restricted by high entry and exit costs: the rationale for clustering is that proximity is required to minimise inter-firm transport transaction costs. In this constellation, a few large firms dominate the market; these firms often perceive that knowledge outflows to industry rivals can be extremely costly in terms of lost competitive advantage. These firms will thus decide to locate in industrial complexes characterised by stable planned and long-term inter-firm relationships.

- The third type of spatial cluster is the social network model. A key element of this model is mutual trust. These mutual trust relations will be manifested by a variety of features including joint lobbying, joint ventures, informal alliances and reciprocal arrangements. Relations of trust are assumed to reduce inter-firm transaction costs, because when they exist, firms do not face the problem of opportunism.

Although these models are theoretical ideal types, not intended to represent any particular location, it is tempting to apply this classification to ports and port cities, as they could clarify the challenges facing them. Large ports, especially those connected to heavy industries and specialised in containers and oil products, like Le Havre, mostly correspond to the industrial complex-model: an oligopolistic firm structure, high entry and exit costs and a relatively closed character, in order to avoid leakage of strategic knowledge. The metropolitan area of Paris would correspond predominantly to the pure agglomeration model: its attractiveness is determined by its potential for interaction and positive knowledge spill-overs. The city of Le Havre, like many port cities, is faced with a dilemma: between the closed culture typical of a large port-industrial complex and the openness required to create an attractive city. Whereas very large port-cities, such as New York, Singapore and Hong Kong, can combine these two imperatives, the situation is more complicated in smaller port cities such as Le Havre, and also to a certain extent in Rotterdam. Rotterdam has used economic diversification strategies, but still struggles with relatively negative perceptions of its urban attractiveness. The challenge for cities like Le Havre could be to compensate its relative "closedness" due to the port cluster by building regional networks, with Paris among other places, in order to develop a larger mass of "pure agglomeration" effects.

At this stage, for example, little attention seems to be given to the new project for the North Seine Axis. Only the port of Rouen has explicitly committed itself, by drawing up a project in the context of a platform on this canal. The port authorities see potential benefits in this area and possibilities for generating additional waterway traffic. The strategy published by the Ports de Paris (PDP) is cautious on this subject. The investment programme is driven by the downstream installations (40% of the proposed investments for 2011-25), and with Achères, it will have a rear gate on the canal (the Bruyères terminal will also offer a connection). In total, a co-ordination of the strategies of the three ports could encourage the emergence of a real port hub.

While the region has financing available, no coherent policy for articulating clusters and encouraging collaboration has as yet been designed for the Seine Axis. The intersection of different industries and clusters certainly show up on the maps, but apart from MOVEO and NOVALOG, which rely on the

Normandy and Paris regions, co-operation with the Ile de France is still limited (except for the NOVALOG/ADVANCITY convention, see below), whereas this region is home to eight clusters. The economic development policy for the Seine is relying for the time being on the accumulation of initiatives and piecemeal programmes to boost the clusters and encourage the creation of enterprises and employment. The outlines of a large-scale interregional plan (*Contrat de Projet*) have yet to be sketched out.

3.2. Transport

The CPER approach

The priorities announced by the state and the local communities for development of Haute-Normandie and the city of Le Havre are set out in the 2007-2013 *Contrat de projet État/Région* (CPER). Port equipment and infrastructure take up the lion's share of the agreed investment. They are the focus of the state effort and that of the *département* of Seine Maritime (40%), but they have lower priority in spending by the region (28%). In total, the emphasis seems to be more on modernisation (securing facilities, rehabilitating the old port, locks, extending the Grand Canal) than on expansion (four docking berths). The same tendency is evident at Rouen (dredging and dock rehabilitation, nautical access, extension of the container terminal).

In the other regions of the Seine Axis, the approach varies. In Ile de France, infrastructure investment is almost as important (with an allocation of EUR 388 million in the CPER),[19] but broken down into multiple sites[20] and thematic areas: reconstruction of dams, modernisation of locks, rehabilitation of the Oise, extension of several port platforms,[21] etc. Programmed expenditures in Basse-Normandie are obviously more modest and scaled to PNA activities (*Ports Normands Associés*, or EUR 12 million for port intermodality)[22] to which must be added more substantial expenditures in terms of passenger rail access and initial studies for the New Paris Normandy Line. This major investment could not only make for shorter travel times by train along the Seine Axis, but could also free up the conventional rail line for freight trains and thus, theoretically, expand cargo service substantially.[23] Initial assessments show, however, that the cost of the project is high (EUR 10 billion to EUR 12 billion). There is also some dispute as to its overall profitability.

Table 18. Maritime activities in the *Contrat de projet ÉtatlRégion* (CPER) 2007-2013 for Haute-Normandie

	State	Region	Départements	Total	Others
Waterway service	9	11	4	24	15
Port infrastructure	147.8	88	127.9	363.17	573
Port rail service	4.5	18.5	2	25	27
Logistics and ICT	6.3	7.9	3	17.2	
Total	167.6	125.4	136.9	429.9	615
% CPER	39%	28.4%	40.4%	35.5%	
Total CPER	431	441	339	1212	

Port infrastructure and modal shifts

The strategic plan (*projet stratégique*) 2009-13 of the port of Le Havre seeks to complete Port 2002 and upgrade the old port's container terminals so as to maintain and augment capacities (12 berths are called for in the initial plan). The effort also involves port access, with support for creating logistics platforms as well as developing modal shifts. Warehouse space totalling 600 000 square metres is to be built, and the big multimodal container-sorting platform now under construction at the foot of the Normandy bridge should be operational in 2012. This effort reflects an investment of EUR 696 million over five years, financed by the state and local governments. The financing consists of an initial tranche of

EUR 434 million from the CPER Haute Normandie and EUR 262 million from the national maritime recovery plan. After the multimodal platform, service improvement is the second major undertaking of the strategic project. As regards rail service, the port of Le Havre is particularly handicapped by geography and the saturation of the rail line to Paris, with trains travelling essentially at night.[24] Within the port itself, the positioning of the marshalling yards requires a great deal of manoeuvring. The strategic plan calls for creating long marshalling yards, securing certain access points, and improving the turnaround times of the three combined transport operators (Naviland, Rail Link and Novatrans).

The bulk of the financing, however, relates to the road-rail-river multimodal project (EUR 160 million), while rail modernisation accounts for only EUR 20 million under the CPER. It may be noted that the cost evaluation for this platform differs depending on the source, which suggests that the platform is not yet fully financed. In contrast to the northern ports (with the exception of Rotterdam), the rail aspect has been given a lower priority. Moreover, all the funding comes from government, whereas in Zeebrugge, for example, the financing is put up by the operators, with regional government subsidies (see Box 6). The port of Rouen has faced recurrent problems with the railways, especially when it comes to modernising freight connections to Paris, a standing priority for the port authorities in the region. However, the French railways, the *Société Nationale de Chemins de fer français* (SNCF), seems, however, to put more emphasis on safety issues and to give priority to passenger service. The connection to Le Havre was not included among the priorities of the Trans-European Network (TEN-T), limiting European funding. These negative developments are reflected in a 4% decline in rail freight, compared to a 14% increase in inland waterway traffic.

Box 6. The rail/waterway modal shift in the port of Zeebrugge

Despite historical disadvantages and geographic obstacles to access, the port of Zeebrugge has succeeded in significantly expanding the volume of rail servicing for its deep-sea container terminal. A number of factors explain this success, in particular the development of NARCON by the Belgian company B-Cargo (now NMBS/SNCB Logistics), an intermodal networking strategy designed to improve service between Belgium's seaports and its inland ports, and the award of a subsidy by the Belgian federal government (approved by the European Commission) for intermodal containers carried by rail. Moreover, after intense negotiations with port users in the period 2007-2009, it became apparent that the eastern part of Germany constituted Zeebrugge's natural hinterland for seagoing containers and that an intermodal rail link represented an interesting option. This led to a very favourable modal shift (excluding transshipment, 75% of deep-sea containers are transported by rail). Further deregulation of rail in Belgium has capped this success by boosting quality and expanding the range of services to customers.

The situation is less favourable for transshipment to barges, and the Germany-bound inland waterway services offered by PortConnect, an entity run by the port authorities, have been shut down. The main connection to the hinterland is now via the estuary of the Scheldt. This requires the use of special vessels, for which access to the sea and to the estuary may be restricted by weather conditions. There are also constraints on inland connections for small shipments.

All these operations rely on investments made by the operators. To encourage them, the Flemish regional government has decided to grant subsidies which have been referred to Brussels and approved. These subsidies are provided for the construction or improvement of vessels suited for navigation in the estuary. They also include an allotment per TEU (20-foot equivalent unit) carried to inland Flemish terminals and to the Rhine, and which is to run until 2017. Over the longer term, the plan is to construct a major waterway called the Seine-Scheldt West to link the port of Zeebrugge with the Ghent-Terneuzen Canal and thereby give the port greater access to the European inland waterway network, including the Seine-Scheldt North Canal. This project, which involves widening the existing waterway, should permit a substantial increase in barge traffic to and from Zeebrugge. In 2011, although the cost-benefit analyses are positive, the reaction of the communities around the port and along the canal remains highly negative, and the project is not yet under way. Nevertheless, it is still scheduled for completion in 2020. The share of container traffic carried by inland waterway should reach 35% by then, according to forecasts, which predict that new customers will be attracted by this link, as well as by future expansions of the port (ECSA, 2008).

As for inland waterway transport, the decision was taken to delay the construction to link Port 2000 to inland waterways. A lock between Port 2000 and inland waterways is planned, but has not yet been realised. The link between Port 2000 and the Europe terminal (the inland waterway container terminal) is provided via rail by the *Société d'Aménagement des Interfaces Terrestres du Port du Havre* (SAITH), and this tends to increase transshipment costs.[25] New service modalities (a self-propelled seaworthy barge) between the river and Port 2000 have been tried. A lock on the river to provide direct access to Port 2000 is under study. Financing has not yet been arranged, and is still under discussion. The port does not regard this link as a necessity in the short term, and in fact considers that the circulation of ships and barges should be kept separate. This is not the opinion of waterway operators, who note the extra costs imposed by this rail link between the waterway and sea terminals (EUR 52 per container)[26] and the additional time involved.

Increasing the share of the river mode in movements to and from the port complex is considered desirable. The volume of container traffic carried by the waterway has been growing steadily (except in 2008) and has doubled since 1997. If these trends continue, facilities on the lower Seine and in the Tancarville canal will eventually have to be modernised, as will those in Port 2000 (installation of the lock). The CPER has earmarked EUR 78 million for this issue. Consultations will be undertaken once the studies on the future of the river lock are completed.

On the whole, this roadmap reveals a number of weaknesses. The port of Le Havre is clearly striving to modernise its management and has identified a number of areas for future work, including studies on available freight handling capacities, a quality approach to rail freight pathways, adaptation of infrastructure to handle 1 000-metre trains, and the establishment of a local rail operator. However, although the port has expanded its capacity to take initiatives and to collaborate with other ports (for example Rouen and Caen),[27] it still relies on a top-down approach and has trouble pursuing innovations along the lines of those undertaken by the northern ports (see the discussion below on the strategy developed by the port of Antwerp). First of all, it does not seem capable of assembling a real port cluster or instigating further competition in port activities.[28] While it has a presence in some local superstructure bodies (Expansion Committee, Development Operations), it has difficulty putting together institutional structures, especially with the regional bodies for running economic development programmes. The port of Rouen is not an important player in the organisation of the supply chains.[29] Generally speaking, the port has no action plans for mobilising operators or co-operating with the private sector in ways that would ensure that its infrastructure and its materials are used to full capacity. There are however positive developments: the three ports have started a common marketing approach that is reflected in joint missions for trade exhibitions or commercial development.

Box 7. The port of Antwerp and its hinterland policy

This policy is based on three principles: a framework programme for barges, initiatives to facilitate rail service, and equity stakes in inland platforms (dry ports, trimodal centres):

- Preparation of the framework programme for barges began in 2006 and led in June 2007 to a roadmap for 2007-2018, comprising several projects needed to achieve the port's modal shift objectives. Since 1996, the share of trucking has been reduced from 70% to 55%, and a further reduction is scheduled, to reach 42% in 2020. Among the stakeholders in the operation are the managers of inland waterway facilities, the Inland Waterway Transportation Commission of the Association of Flemish Industries, the federal government and the regional Flemish bodies, the terminal operators, the port users Association (Alfaport), the agency for the promotion of barge transport (PBV) and the Flemish Logistics Institute (VIL). Twenty projects have been accepted for optimising operations, for incremental development of infrastructure, innovative practices and integrated co-operation with the inland network.

- The Antwerp Intermodal Solution project (AIS), focused on rail, is one element of a broader programme (Antwerp Intermodal Network, AIN) centred on the short and very short distance network (under 250 kilometres). This programme brings together 18 partners: ten Belgian, one German, three French and four Dutch companies. Its goal is to speed the modal shift (barge or rail). The programme is unique, as it relies entirely on the stakeholders involved in transportation services. With the AIS project,[30] it is important to remember that in 2005 less than 10% of container traffic was carried by rail and rail transport had been encountering difficulties since the 1990s. It was essential, then, that containers should be concentrated effectively in the port and that operators should have incentives to offer intermodal services to the interior. One project, called "intra-port rail solutions", was mounted to produce a specific port operator responsible for handling and repositioning containers, in particular from the right bank to the left bank and between the terminals. This project was also supported by the rail operator INFRABEL, which expanded its services for improving the interface between the national and local networks. In the context of AIS, studies were conducted on container transportation. They led to the establishment of a platform where shipowners and forwarding agents could interact with logistics suppliers and industrialists. They examined the possibilities of combining volumes on certain lines in order to feed shuttles serving several regions beyond Belgium, in particular North Rhine-Westphalia, central Germany, Bavaria and northeastern France. The operators followed up and established the links. AIS is a good example of a non-infrastructure project that takes account of the viewpoints and know-how of parties with no financial stake in the port. Similar projects have been developed in Rotterdam.

- From 2007 to 2009, the port of Antwerp also took part in several studies co-ordinated by the Flemish Logistics Institute, and sponsored by the authorities of the Flemish region in order to promote extended gateways. In each province, dominant logistics clusters were identified and strategies prepared for grouping and expanding flows to and from Belgian seaports. For each "hotspot", the type and positioning of logistics and distribution activities were defined and an action plan established in order to achieve growth objectives. Project managers were then recruited in the provinces adjacent to the port of Antwerp, charged with implementing the action plans flowing from the studies on the extended gateways. These plans are being applied in collaboration with the other stakeholders (i.e. the operators and local and regional development agencies responsible for the logistics zones). The port of Zeebrugge was also involved in a similar way in studies on extended gateways for the provinces of West Flanders and East Flanders.

3.3. Jobs and qualifications

In Le Havre, much attention has been devoted over the last few years to reforming the organisation of work, which was seen as responsible for the port's poor productivity record. The port costs monitoring authority (*Observatoire des Coûts du Passage Portuaire*, OCPP) noted that five years previously, the number of TEU handled per year per square metre of dock area, according to one study, was 400 in Le Havre and 1 300 in Antwerp. Crane operators and dockworkers were not covered by the same collective agreement or subject to the same chain of command, and this posed problems of co-ordination, as the docks were public and the equipment was private (apart from the bulk terminal, where both were public). With the 2008 reform, the organisation of the port of Le Havre has now been brought closer to European

practice. Some 10 000 employees, including gantry and jib crane operators and maintenance staff, will be transferred to the private sector. The negotiating process has only now been wrapped up, after three years of intermittent dialogue and a number of widespread strikes. It is difficult to tell how the port's image and its future activity will be affected.

Moving from the antagonistic labour relations of the past towards a more constructive social dialogue would help to strengthen the port of Le Havre's competitive position. The influence of the French trade unions on the port in Le Havre is relatively limited in comparison with those in Belgium, Germany and the Netherlands, where union membership is very high (70%-80%) and where the union's involvement in setting health and safety standards is larger (Turnbull and Wass, 2007). This does not appear to have compromised the competitiveness of the ports in these countries. Antwerp's employers acknowledge the many benefits of the port's systems of labour regulation and use it to their advantage; they acknowledge the contribution and recognise the status of their workforce. For their part, the unions have adopted a very pragmatic approach in contract negotiations, having as their main concern to keep employment in the port. In Le Havre, cargo consolidation and other value-added work were driven out of the port, to a significant extent, by the relatively high costs of dock labour and the unions' insistence that such work should be classified as "dock work", according to Barton and Turnbull (2007).

Employment policy could in fact be more targeted. In future, it will be based primarily on boosting volume and developing container traffic. In 2010, the government seemed to be banking on steady growth in this traffic through 2015, with the creation of 30 000 new jobs, some of them in Le Havre,[31] but these figures now seem optimistic, and are likely to be revised downward. Experience abroad shows that it is also possible to pursue policies to attract port customers into the city and to develop innovative services that create jobs. The city and the port do not seem particularly committed to this route.

In Le Havre, the qualification profiles in maritime and port activities differ substantially from those in the city's employment zones. Manual labourers are more heavily represented there, but they are also more skilled. The proportion of managers and executives is also much higher. Between 2000 and 2006, the rapid increase in container traffic (which rose by 46%) generated strong growth in the numbers of people employed as stevedores, forwarding agents, logistics and transportation personnel. In the future, with staff turnover and prospects for growth in traffic, demand for qualifications is likely to increase. For example, logistics jobs are forecast to increase by more than 10% by 2015. Training agencies and specialised schools could see a greater imbalance between supply and demand in courses related to logistics, maintenance, ship repair (maritime and river) and maritime activities.

Still greater pressure may build for training in the inland waterways sector, which has seen sharp growth over the last 10 years (container traffic carried over the Seine Axis rose by 16.6% a year from 1999 to 2009). Along that Axis, particularly along the downstream portion, port communities are expecting strong demand for a whole range of trades relating to inland shipping, vessel maintenance and waterway activity (particular technical functions: diesel engine mechanics, maintenance workers, logistics agents, etc.). The INSI, the national institute for inland navigation, located in Elbeuf under the aegis of the *Conservatoire National des Arts et Métiers* (CNAM), already offers higher education for inland river transportation. The gradual rediscovery of inland waterways will accelerate demand for in-service training and specialised courses. It would be advisable, then, for the Ministry of Education to review the available training and take steps to modernise the specialised schools[32] and adjust the programmes offered, especially in the Paris region (the technical *lycées* and universities) in order to prepare for the changes to come.

3.4. Research and innovation

It is important for the cities and ports along the Seine Axis to have a pool of qualified personnel not only to meet the needs of the labour market but also to maintain a sufficient level of research for modernising port infrastructure and implementing the port strategy. The CPER Haute-Normandie and Basse-Normandie therefore assigns an important role to research and education, with particular emphasis on establishing first-rate local R&D teams in key industries.

CPER, competitiveness clusters and the knowledge economy

The CPER HN has earmarked about EUR 34 million for restructuring university campuses as part of the drive to establish inter-regional competitiveness clusters. These funds are used to strengthen regional research facilities in the greater Le Havre area with the creation of an engineering and logistics centre at the University of Le Havre (UH), as part of the Interdisciplinary Logistics Resources Centre (CRIL), with a view to concentrating the university's technology and R&D resources in the Higher Institute of Logistical Studies (ISEL). As a whole, the state and the region are supporting investments in the logistics branch, and especially in the research and technology transfer programme implemented as part of the Grand Network for Transportation, Logistics, Information and Modelling Research. EUR 17.7 million has been earmarked for developing the network and encouraging firms to put forward proposals for joint projects, for example, in given industrial branches.

The creation of the NOVALOG[33] cluster, involving most of the major logistics players in France, represents the culmination of efforts on the part of the government and the private sector to make up for lost ground. The research there points in three directions: safety/security and risk management; cargo tracing and optimisation and sharing of information systems; and sustainable development. An agreement has been signed with ADVANCITY (the Paris cluster) for the joint pursuit of waterway logistics projects and development of the Seine Axis. Since its launch in 2005, NOVALOG has received government funding in the amount of EUR 29 million, slightly above the national average (EUR 22 million). This is a small-scale cluster (fewer than 60 enterprises) and of only moderate productivity (four patents filed and three articles published in 2009). It is beginning to play a bigger role internationally, and NOVALOG has been involved in three EU-financed Innovation and Environment Regions (INTERREG)[34] programmes in recent years.

All told, efforts to consolidate the knowledge economy in the Le Havre and Rouen region have been modest (less than 5% of the CPER HN) and are not likely by themselves to close the gap with competitors. Among the port cities of Europe and around the world, the University of Rouen (UR) ranks 1 035th for research,[35] slightly ahead of the University of Caen (UC), and UH does not figure in the rankings at all (see Annex 7, the Scimago classification, which lists 2 200 universities and research organisations around the world). The UR could indeed do more in terms of the index for promotion and intensity of co-operative research. The three universities could also pool their R&D efforts more effectively, but they have not yet succeeded in establishing a Research and Higher Education Centre (PRES).

Ports and R&D

Within the higher education institutions of Le Havre, there is some technical capacity in the field of port infrastructure, marine equipment and environmental analysis. The University of Le Havre has a chair on CO_2 emissions in the port, and ISEL offers some interesting engineering specialties. Local stakeholders, however, point to the lack of business-oriented R&D and weaknesses in socioeconomic and ecological analysis. There is little university-industry co-operation in these fields. It would seem on the whole that relations between the port and the university are not very carefully tended. The port of Le Havre (GPMH) strategic plan does not leave much room for research. It confines itself to announcing establishment of a

specialised team to work with local logistics providers and take advantage of synergies to pursue marketing and monitoring activities, value analysis, and turnkey projects.[36] Neither the university nor the schools would seem to be considered as local players. The port is involved as a partner in only two NOVALOG research programmes.

This state of affairs cannot be blamed entirely on the port. For the scientific community, logistics carries the negative connotations of consuming capacity, producing environmental waste (lorries), and yielding no value added. Researchers are few and they are highly specialised. In Le Havre, the idea of a marine university was launched several years ago, but the critical mass of research is difficult to achieve and the concept has been slow to materialise. Certain ports, such Rotterdam's (Box 8), have strengthened their links with the university and have developed the concept of the "knowledge port". The port of Le Havre does not seem to consider this a priority to pursue actively, despite a few dispersed activities.

Box 8. University initiatives on behalf of the port of Rotterdam

Although it has its sights firmly fixed on a global role, the Erasmus University Rotterdam has shifted its strategy in recent years and is now clearly committed to local and urban development. The economics department recently created a "Smart Port" Centre, bringing together training, research and consultancy services linked to the port's activities. Erasmus has also joined the "Generation R" Programme and the Rotterdam Climate Initiative, or RCIP (with financing for start-ups in the energy and climate sector). The university has been in charge of many impact studies for the Maasvlakte 2 programme and the westward move of the harbour. The university's Institute of Urbanism promoted the idea of the floating city, which is now in place in the downtown area. Similarly, the Technical University of Delft (TUD) has co-operated with the port authority in the field of computer modelling. It has a common interest with the city and the port in safety and security and transportation analysis. In this sense, the metropolitan area and the port can be considered a laboratory for research activities.

Like Le Havre, the port has developed on the strength of traditional activities, in particular chemicals and petrochemicals. The port industrial cluster has expanded with new international services, forwarding agencies and multinational company head offices. The fact remains that the majority of small and medium enterprises active in the port are engaged in logistics, transportation and trade, and involved primarily in the carriage of cargoes to and from their port of shipment. These firms have little interest in innovation. It is estimated that only 1% to 2% of the turnover of the port and industrial cluster is devoted to R&D. These are in fact mature industries that show clear signs of becoming ossified in routine activities.

To deal with these risks of "cognitive lock-in", local leaders have sought to reconfigure the city-port interface. Rotterdam University (university of applied sciences) has established a new campus for research, design and manufacturing (RDM) in one section of the old port. An incubator managed by the Technical University known as "Yes! Delft" has been established there. RDM Innovation Dock is part of the campus, Its goal is to connect practical research and entrepreneurship, by creating a degree of integration between higher education institutions, services and private industry. All these initiatives take place within an ambitious plan promoted by the city (City of Rotterdam Council) and the Port Authority, the goal of which is to redesign "Stadhavens Rotterdam" and make it a showcase for water management, by exploiting Dutch expertise in flood control and extending this know-how into the area of climate change. Beyond the RDM, the strategy relies on three other broad objectives: re-inventing delta technology in the context of the Rotterdam Climate Initiative, developing floating communities, and sustainable mobility programmes (the object being to halve lorry traffic). Rotterdam intends to become a knowledge port.

The situation is really no more favourable in Rouen. While the port is an equal partner with the university and several local institutions such as the Rouen Region Development Agency (ADEAR), there is little real co-operation among the two entities. The higher education system in Rouen has some strength in logistical R&D and in maritime law, concentrated at Rouen's National Institute of Applied Sciences (INSA), its business school (ESC), its engineering school (ESIGELEC) and of course at the University of Rouen. Strength is less evident in the case of maritime economics and port strategies.

At Caen, stakeholders express greater satisfaction with co-operation between the university and the port. They point in particular to the special "Liber" programme of the Management School of Normandy, a ports programme intended for French-speaking students that is of particular interest in the North-South context given the university's ties with African ports. The university's great openness to the port is recognised, and its research teams have established bilateral co-operation links with their counterparts in Le Havre. Ports de Paris, through its strategic plan, is giving thought to transportation and urban logistics and has undertaken studies and experiments (urban distribution of goods by crane boat, pooled logistics). It maintains relations with the French National Institute for Transport and Safety Research (INRETS). It also participates in developing new computerised tools for the management of import/export traffic and will be deploying the AP+ system already in use in the ports of Le Havre and Rouen, for the port of Gennevilliers.

Given the competitiveness problems facing seaports, it would be timely at this stage for them to look carefully at their relationships with research institutions and knowledge suppliers and to place greater importance on collaborative research, participate more actively in NOVALOG, and work more closely with European R&D programmes.

3.5. Spatial planning

The city and the city-port interface

As with other seaports, the city of Le Havre is trying to retrieve and regenerate the areas linking the city and the port. Some years ago, it undertook a European programme on city-port interfaces, "Hanse Passage" (2005-2007), conducted in Rouen and Le Havre, the slogan for which was "Build the City with the Port". The idea was to exchange information and identify good practices under the leadership of the *Association Internationale Ville Port* (AIVP). The programme served to highlight "cross-fertilisation" areas of activity such as culture and tourism, and it also stressed the importance of measures to eliminate or reduce certain port-induced nuisances.

A new approach, focused on neighbourhoods bordering the port, has received considerable support in the context of the *Contrat d'Agglomération* for 2009-2013 signed between Le Havre's Agglomeration Community (CODAH), the region and the department.[37] That contract calls for *i)* implementing a *Plan Nautique Havrais* (for EUR 36.8 million) and *ii)* creating a major cluster to promote a scientific culture for sustainable development (for EUR 91 million), with the port of Le Havre serving as the city's partner in both operations.

1. Promoting tourism is an important aspect of the contract. The "nautical plan" seeks to transform the Vauban docks into a pleasure-boat facility and to open a recreation and bathing centre ("*les bains des docks*"). Other urban basins (Commerce, du Roy, Anse Notre Dame) will be redeveloped. These investments should make it possible to accommodate 500 additional mooring berths. The pleasure boat harbour will be accessible to the sea via the Eure Bridge and Sas Quenelle lock. A nautical maintenance zone will be created along the Escaut bridge. The city also hopes to boost business by establishing the port as a home harbour for cruise lines, and adapting the necessary reception infrastructure.

2. The project to create an international Centre for the Sea and Sustainable Development is currently being studied for the Frissard Peninsula.[38] It will incorporate the architect Jean Nouvel's "Odyssey 21" tower, a museum and redesigned public spaces.

Many initiatives under the contract will support Le Havre's economic development and the programmes being implemented in the CPER. Among the programmes intended to strengthen the city-port interface and co-operation with the port is one that will support research through establishment of a first

cycle of Asian political science studies by the Political Science University (Science Po) in Paris (for which CODAH will construct a building in the southern district). An enterprise promotion centre will be established in the same area to boost business and employment creation. In addition, a contemporary arts cluster will be created, promoting choreographic, artistic and musical exploration, to enliven the port's periphery. The inspiration will be Bilbao, where transformation of former port areas through cultural regeneration programmes has resulted in an urban renaissance.

The southern neighbourhoods also have some abandoned areas, such as the Les Neiges ZUS ("sensitive urban zone", part of the Les Neiges district). Median incomes there are barely half the level of those in Le Havre as a whole, and the employment rate is 15 percentage points lower than the city average.[39] Without some major initiatives in this enclave, there is reason to fear that the large-scale redevelopments now leading to gentrification of some districts and basins will exacerbate disparities in the southern districts of the city.

Redevelopments of a similar kind are under way in Rouen, as part of the programme to reposition the city and the port. The city is re-establishing its riverbanks by pushing the port to the west. On the left bank, the former industrial zones are giving way to housing, shops and pedestrian promenades. The *Communauté de l'Agglomération de Rouen Elbeuf Austreberthe* (CREA) has an 80-hectare pilot project to rehabilitate the Flaubert area, planned to include 10 000 inhabitants by 2013. The recovery and rehabilitation of the docks is continuing on the right bank with the Quartier Luciline-Rives de Seine ("Future Cities" network), where 1 000 housing units are planned for construction.

In Caen, the abandonment of the former industrial port lands has freed up some large properties on the Caen Peninsula and in neighbouring areas, and urban renewal operations are now in full swing on 110 hectares in that area. The Rives de l'Orne project will add 25 000 square metres of offices, 28 000 square metres of shops and several housing developments. A regional-scale multimedia library, designed by Rem Koolhaas, is to be built. The central location of these facilities lends particular value to the developments in progress. Ports de Paris is attempting to generalise initiatives for sustainable integration of its sites with its territorial development partners. It is promoting the integration of platforms into the city in a fashion consistent with modal shift priorities. Open areas of scenic or ecological value are thus being reserved in sensitive zones (this has already been done, for example, at Bruyères sur Oise, and is planned at Triel and at Achères).

Spatial development and land reserves

French ports are often endowed with substantial reserves of land, but they are not unlimited. In Le Havre, the port had 960 hectares in reserves in 2009, of which 300 were already allocated to projects (industrial or logistics facilities, terminals or port infrastructure). The remaining 660 hectares were scattered in various places, and their potential use thus depended on their location. These figures still hold in 2011, and represent fairly significant capacity. Throughput forecasts have been revised downwards, and development pressures are unlikely to be greater than they were in 2009. The port might, however, have to turn down a proposal for a port activity if its need for land exceeds what is available for that type of activity. In the future, the maximum size and number of businesses that the port can accommodate could shrink, along with the amount of space available. To the east of the industrial zone, however, there is an area of nearly 500 hectares with only one tenant that leaves some possibility for expansion. Indeed, it represents a capital asset for the port's future development.[40]

All told, the ports of Le Havre and Rouen and Ports de Paris will in future have 14 000 hectares of land and reserves for industrial and logistic installations, according to a joint statement of the three institutions.[41] At the local level, however, supply may not correspond to demand, thus making the situation more difficult than the overall figure would suggest. The landholdings of the Ports de Paris currently

amount to around 1 000 hectares, embracing several large tracts. The port has 1 million square metres of warehouse space and plays a significant role in land use planning. It has a number of expansion plans, including those for Limay and the creation of platforms such as those at Achères and Triel. In the Ile de France, however, there is a tendency to push logistics projects outside a 100-kilometre radius of Paris. It is more difficult to achieve an ecological modal shift under these conditions. Integrating the projects of Achères and Triel-sur-Seine could raise the land potentially available for development to 500 to 600 hectares.

Local governments are increasingly insisting on being associated with these infrastructure programmes. In all the riparian cities, the development potential of port land needs to be better appreciated. Although urban development agencies are present on the ground, higher levels of government, whether in the ministries or at the level of the Interministerial body for Spatial Development and Regional Attractiveness (DATAR) seem to pay little attention to its potential. Along the Seine Axis, establishing an association of local governments would give them a better opportunity to make their voices heard.

3.6. The environment

Ports are often associated in the public mind with pollution, the destruction of biodiversity, and greenhouse gas emissions. Yet over the last decade or more they have stepped up their use of clean processes, they have committed to cleaning up areas at least equivalent to those they have industrialised, and they have become increasingly efficient at controlling waste emissions. The worldwide trend now is to use sustainable processes to derive competitive advantages rather than simply to correct for negative externalities. In this respect, the maritime parts of the Seine Axis are still lagging behind.

Construction and expansion of infrastructure

It is in this area that progress has been most notable. Construction of Port 2000, for example, was accompanied from the outset by numerous instances of consultation and co-ordination between the port of Le Havre, the Ministry of the Environment (DIREN) and environmental associations. The environmental component of this ambitious investment was initially set at EUR 46 million, but it was in fact exceeded by a wide margin, and ecological outlays are now close to 8% of the total investment. The rehabilitation of mudflats, ecological management of the preserved space, and improvement of the waterfowl resting area have been well programmed, but many projects have been incrementally added (storm runoff treatment, associated dredging, ecological research).

For the time being, the CPER 2007-2013 includes several initiatives for managing sites in the estuary that are included in the Natura 2000 network; for financing the overall ecological management plan, and for operation of the *Boucles de la Seine Normande* Park. In addition, new infrastructure work now includes programming modifications from the outset to deal with the environmental damage they cause. It should be noted that public hearings were held on the work planned for deepening the channel upstream from Rouen to permit the passage of vessels of greater draught. The intent was to assess the implications for the shoreline and to take regulatory measures to protect the landscape. After six years of discussion and information sharing, the issue seems to be evolving in a particularly positive way. At Le Havre, however, environmental associations have reported a decline in the number of waterfowl alighting in the estuary. They question how long the financing will be made available. Studies (for example Aulert *et al.,* 2009) have also shown that the measures taken in this area have not been proven fully effective.

Modal shift and levels of government

At the time of the *Grenelle de l'environnement* (Environmental Roundtable), which was the subject of a draft law in 2009, the stress was on port transportation and the modal shift towards rail or inland waterway transport as a way of reducing the greenhouse gas effect. The low share of container traffic carried by rail and waterway (14%) was contrasted with shares exceeding 30% for Hamburg, Antwerp and Rotterdam. The government gave commitments (doubling the non-road share in shipping),[42] which apply to the port of Le Havre as well as to that of Rouen. The national commitment on rail freight,[43] the establishment of the road eco-tax (now postponed to 2013) and the release of supplementary credits granted by the state to the major ports under the CPER, as well as the establishment of new multimodal platforms, are intended to encourage a switch to rail and waterways. With the underutilisation and poor condition of rail connections between Le Havre and Paris and the current organisation at the port, which is unfavourable to multimodal operation, efforts to shift away from trucking are being hampered, and the port authorities are being forced to rethink their servicing approaches.

The regional scale is also important. As several analyses have shown (Dooms and Hazendonck, 2004), strategic measures at this level favouring the shift to rail and waterway, such as new infrastructure, close collaboration with operators and lobbying for reforms, can accelerate the move to less polluting transport under satisfactory economic conditions. In Belgium, the Flemish government was quick to ease the costs of modal shift by granting subsidies to operators. It also contributed strongly to strategic thinking. In 2008, it launched the Flanders Port Area (FPA) concept for consolidating the competitiveness of the region's seaports. FPA is a network of port authorities and government agencies, such as the Flemish Port Commission and other stakeholders, to promote co-operation on such issues as building public support for seaports, integrating seaports sustainably into logistics chains, and enhancing their competitiveness. Other platforms, such as the Flanders Inland Shipping Network and Flanders Land Logistics, are now operational, targeted at specific problems of competitiveness.

France provides government subsidies for the stimulation of intermodal traffic, but institutional commitment of this kind at the regional level is lacking. In France, the regional instruments in use (the CPER) are more standardised. The Ministry of Ecology, Sustainable Development, Transport and Housing (MEDDTL) has recently launched a global maritime approach, but the concepts are still rather vague (Atlantic seaboard strategy). This absence of focus is a handicap for a large port like Le Havre.

Local governments in the port zones also have front-line responsibilities for environmental protection. Lorry traffic is a public nuisance and exacerbates urban congestion. The outcome of the *Grenelle de l'environnement* (2007-09) prompted a debate among the key stakeholders in the port of Le Havre and among the public, leading to the drafting of a charter for the estuary known as the *Grenelle de l'estuaire* (2009). That charter addresses transportation problems and proposes a new form of governance for local projects, one that respects specific territorial features. It takes into account the ecosystem (as a model and method of innovation), local issues (energy, climate, waste), health and environment questions, and biodiversity. It is however more of a guide to thinking than a framework for action.

"Green ports"

Along the Seine Axis, the four principal ports now view their ecological policy from several dimensions. In Le Havre, the port authorities have focused their efforts on waste management for ships servicing the port and on controlling port activity itself; the port of Le Havre took part in the European-applied research project "Effective Operations in Ports (EFFORTS),[44] while setting up a staff awareness-raising programme. A number of studies and programmes have been conducted to measure, for example, emissions from handling equipment, the carbon balance of different activities, and the functioning of the estuary and sedimentary stocks, in this last instance in collaboration with the port of Rouen. (Reference

was made earlier to measures taken during the construction of Port 2000).[45] In Rouen, the port has established a dredging monitoring committee and has launched projects to experiment with sediment immersion. In Caen, the port has focused its environmental protection policy on waste collection, management of hazardous materials and prevention. It has also issued an environmental statement. Ports de Paris has instituted an environmental management system to control the environmental impacts and risks from ports, to consider these ports in their environmental context, and to preserve the natural environment. It has also undertaken pilot operations to move towards ISO 14001 certification of terminal operations at Gennevilliers and the creation of new platforms such as those at Triel and Achères.

All these measures testify to the efforts being made by the ports along the Seine Axis to refine their impact analyses, assemble data and reduce environmental damage. Yet they represent a fairly passive approach to sustainable development. These ports could broaden their approaches in two ways:

i) By committing themselves to green energy production. Le Havre and Rouen, for example, have chemical and petrochemical plants and linkages to the agricultural industry. There are important assets that have led some commentators to suggest that large industrial port complexes could become future hubs for biofuels (Sanders *et al.*, 2009). The port of Rouen already seems well positioned in this field, with several plants for fabricating diester (Benabadji, 2006).

ii) By articulating strategies that would make the "cleanliness" of the port or its ecological dimension a factor of competitiveness.

On this point, the four ports, and in particular the sea terminals, could usefully and effectively improve their external communication and thereby boost their image as "green ports". This communication strategy should be designed to capture the attention of customers and investors, through the dissemination of appropriate indicators[46] and broad information on the ports' key programmes. The following box describes some examples that may be of interest to the port authorities of the Axis.

Box 9. Examples of programmes for greening ports

- The "e-Harbour" project: nine partner ports (including Antwerp, Malmö and Amsterdam) are co-operating to optimise their energy consumption in the manufacturing and logistics sectors.
- Air-quality programmes in US ports: conversion to hybrid or electric vehicles and handling equipment with lower emissions.
- Partnerships with local companies and universities to find solutions for contaminated dredging materials (Singapore).
- Reduced energy consumption at passenger terminals: programme for a 20% reduction at the port of Portsmouth, UK.
- Programme for optimising residual heat use and producing solar energy in the port of Morehead City, North Carolina, US.
- Discount of 7% to 17% on seaport dues for vessels awarded a green certificate at Amsterdam.
- Port sponsorship of environmental initiatives, for example bio-based products in the Mississippi Delta by Pemiscot County Port Authority.

3.7. Culture and tourism

Ports can benefit from active public relations strategiesInformation centres on port activities have been set up in Rotterdam, Antwerp and Genoa (Box 10). Visitors can be drawn by events that highlight a port's culture and identity. Experience in other countries shows that these events are of primary interest to schoolchildren and students, but they can also create sufficient interest to capture attention and generate financial benefits for the city. Rotterdam invites itinerant students to come up with innovative ideas for running port activities. The port rewards the best ideas and grants internships. La Coruña in Spain hosts competitions for students, businesses and the general public on environmental questions. In Ireland, Cork invites schools to compete in producing photographs and drawings of the port. Tacoma gets businesses to sponsor field trips for students to learn about the port. Vigo promotes the gardens of the Arenal. The Massachusetts Seaport Advisory Council has financed the 2-kilometre "Harborwalk" around the port in Boston.

Box 10. Genoa Port Centre

The Genoa Port Centre was created in 2009 to promote the port and highlight the economic and social role of the maritime industry. As such, it attempts to stimulate strategic alliances between the port, businesses and the general public. The exhibition centre facilitates the discovery of the port, its present and future and its role in national and EU strategies. The centre plays an important educational role, and aims to attract students, teachers and parents. It organises guided visits, lectures and workshops and has developed educational material and other information. The Genoa Port Centre also has a role in broader communication through specific cultural projects (seminars, conventions and technical meetings) and exploration of the port of Genoa, such as visits to the port and the various areas of the port itself, in close collaboration with the port operators involved in the partnership. The initiative has been promoted by the Port Authority, the province, the university and the Porto Antico company, which is responsible for property development in the old port of Genoa, where the Port Centre is located. The Genoa Port Centre builds on the experience of the ports of Antwerp and Rotterdam, which created their port centres in the late 1980s.

The contribution of the port of Le Havre to local tourism is at present limited to providing facilities for pleasure boats (see above) and cruise lines. The tourist terminal at Pointe de Floride received 70 liners and 130 000 passengers in 2010. This traffic has been growing steadily for more than a decade. For Rouen, it is expected that the cruise terminal will receive around 50 cruise ships in 2011. However, it must not be overestimated as a development option. If a hundred cruise ships call at Le Havre each year, carrying on average of 2 000 passengers, of whom 30% may visit the city and spend perhaps EUR 100 on food, souvenirs and miscellaneous items, this will yield modest income of EUR 6 million for the city and the region.[47] But these figures could increase if the New Paris Normandy Line is constructed. Caen opted some time ago to retain its passenger terminal. That strategy has been successful, primarily because of the port's particular "cross-channel" features (90% of passengers are British, and the service is also used by cars and lorries travelling to Spain). Traffic has been growing steadily, and more than 1 million passengers were transported in 2008. Ports de Paris is also interested in public transit of passengers in combination with river tourism. A "Voguéo" shuttle has been established with the port, whose economic impact is again modest for the time being. In 2009, Voguéo carried 350 000 passengers.[48] Cruise trips have been developed between Paris and Haute-Normandie, mainly to Honfleur via Rouen. An extension to Le Havre could be considered, if a comprehensive, co-ordinated package were proposed by the various metropolitan tourism offices. This could give a real boost to tourism.

3.8. Final observations

The foregoing analysis has attempted to show that, for reviving port policy along the Seine Axis and catching up with the ports of northwest Europe, changes will be needed in several strategic dimensions. The port administrations' focus has so far been on developing infrastructure and expanding capacities. A

pro-active business approach has largely been lacking. The lack of institutional innovation has held back the modal shift, and the ports have had little involvement in hinterland policies and the articulation of logistics chains. It is now essential to co-ordinate initiatives among the ports of the Axis, to give global players a firm local footing, and to promote co-operation among local enterprises, clusters and knowledge suppliers. As A. Frémont[49] notes, "a new balance must be struck between economic, social and environmental development, and this is surely more important than unimpeded growth in traffic alone. These new challenges imply a real cultural revolution on the part of port administrations, which will require changing the profile of port managers, which in France has been systematically characterised by an engineering monoculture."

4. GOVERNANCE

4.1. Port governance: port organisation and activities located in the port

The operating modes of France's ports were modernised in a July 2008 reform that was implemented 15 April 2011 with the signing of the single national collective convention. The reform was part of a long-term process for transforming French ports, marked in particular by significant changes to the labour regime in 1992 and the introduction of players from the private sector through the award of terminal operation contracts in 2000. The July 2008 reform, while making distinctions between ports of different sizes, was intended to bring some uniformity to port practices and organisation at the national level. The role of port authorities has since 2008 been refocused on representing the sovereign interests of the state. The aim is to move to the model of the "landlord port", under which port services, such as cargo handling, for example, are devolved to the private sector. The port terminals are entrusted by contract to private enterprises, which own the materials and tools and employ port workers. The statutes of the dockers and crane operators were unified by the 2008 reform so that they could work for the same operator at each terminal. Private cargo handling arrangements can be complicated: at the Port 2000 terminal, for example, these services are provided by enterprises constituted as partnerships between stevedore firms and the major shipping lines (CMA-CGM, Maersk).

The objective of the 2008 reform was to adapt French seaports to global and northern European competition. A number of reports and academic studies had criticised French ports for being uncompetitive and for failing to adapt at a time of rapid transformation and steady growth. A report issued by the *Cour des Comptes* (the French audit court) in July 2006 confirmed that French ports were "underperforming". It insisted that new ways would have to be found for involving the private sector, and that the role of the state in port affairs must be redefined. A 2007 report from the *Inspection générale des Finances* and the *Conseil général des Ponts et Chaussées* arrived at similar conclusions and called for modernising and transforming the status of the existing "autonomous port". The reform moved France closer to the northern European model of port management. France abandoned its traditional state-run approach to local industrial development and turned to a system that gave the private sector an essential role in providing port services and investing in materials and equipment. This was an important step towards greater efficiency.

Since 2008, two broad types of seaports have co-existed in France, differentiated by the roles played by the state and local government. First, the 2008 port reform created seven *Grands Ports Maritimes* (GPM), which retain their autonomy but in which the state has an important role as referee. These are the biggest ports in France, and their performance is deemed vital to the national interest. In Normandy, they include the ports of Le Havre and Rouen. Each is run by a *Directoire* (a management committee), under the control of a supervisory board (*Conseil de surveillance*). A development council (*Conseil de développement*) is responsible for providing an opinion on the decisions taken by management. The supervisory board consists of representatives of the state, local government and other "qualified personalities", and the development council also includes members drawn from business and labour associations and civil society. Among the state representatives, the *Commissaire du Gouvernement* (Government Commissioner) plays a key role in the development council and can wield a veto. Each GPM is expected to produce a "strategic plan" defining its broad intentions and objectives in light of the French national interest. The primary idea of this new way of organising the GPM is to group decision-making functions within a single body, the supervisory board, assisted by the *Directoire*, which implements the decisions taken. This is an organisational improvement on the old Autonomous Ports, which were run by a board of directors.

Generally speaking, the changes introduced by the 2008 port reform should bring greater efficiency to French ports: similar foreign experiments seem to justify the choices made in France. The 2010 study published by Ramon Nuñez-Sanchez and Pablo Coto-Millan on the impact that structural reforms have had on the performance of Spanish ports would seem to bear this out. It shows that the move from a "service port" model to a "landlord port" model has been an important factor in boosting the productivity of Spanish ports. Some observers, however, are critical of this reform and insist that the changes they purported to introduce were already under way. In particular, private sector involvement had been evolving gradually for some time, and they argue that the reform abruptly accelerated that trend.

In parallel to these GPMs, the status of "decentralised port" was also instituted by the July 2008 reform. This applies to smaller ports that are deemed essentially of local interest. Their management is entrusted to the local governments of the territory in which they are located. This status applies to the ports of Caen-Ouistreham and Cherbourg, which in 2008 were placed under a single decentralised port authority: they now belong to a mixed regional *syndicat* or association known as the *Ports Normands Associés* (PNA). This association comprises the *Conseil régional* of Basse-Normandie as well as the *Conseils généraux* of the *départements* of La Manche and Calvados. They report not to the central government, then, but rather to the local governments: like the GPMs, however, they are geared to a "landlord port" function. Port services, and freight handling in particular, are provided by the Chambers of Commerce and Industry. The idea behind the new status for the decentralised ports is completely different from that underlying the GPMs: it is to entrust the ports to local government. In this context, it becomes a more delicate matter to take into account interests extraneous to these local governments. Moreover, the grouping of Caen and Cherbourg was intended to create synergies, but it is questionable whether the two ports really face the same issues and have the same needs. *Ports Normands Associés* will indeed have to show flexibility in its management.

Finally, the Ports de Paris, which administers a river port located immediately upstream from Rouen and Le Havre, is a public institution responsible for managing the port platforms of the Ile de France. While it recently rebranded itself as "Ports of Paris", its status was only marginally changed by the July 2008 reform. At the same time, the Ports de Paris has been granted the port lands and can now, like the GPMs, develop sites that are not on its original territory, the Ile de France. Along with the changes to the Normandy port sector, it has refocused its activities on the first function – port development – and is planning to build new logistics platforms and to modernise existing ones.

4.2. Governing the port-city interface

The presence of a port within a city has many local effects and can give rise to some significant cohabitation issues. Port activities can have some positive spill-overs in terms of employment and economic development, but they also produce environmental degradation. Goods transport, land use and environmental damage are challenges that the port authorities and local governments must come to grips with. Urban projects sponsored by local governments may also sometimes run counter to the needs of the port. Resource-use conflicts can appear. Ports de Paris notes, for example, that the municipalities of the Ile de France are placing increasing emphasis on "returning to the waterway". Projects of this kind may sometimes find themselves in conflict with industrial or logistical uses that are already established along the banks of the waterway and that prevent redevelopment. Some local governments may also hope to convert lands situated near the heart of the city that are now occupied for port use. This is the case in Caen, for example, where the city is interested in a portion of the port near the city centre, known as the "Calix zone" (Debrie and Lavaud-Lettileul, 2010). That said, in many cities, these urban development projects go hand in hand with efforts to promote the city's maritime image. Cities are increasingly likely to play up their marine heritage and to restore and revive their old port areas as part of their identity.

It is important for the port and municipal authorities to forge partnerships and work together to resolve any problems of cohabitation. In the case of the decentralised ports, co-operation will have to involve the local authorities that manage the port: in Caen-Ouistreham, this is the Basse-Normandie region and the *départements* of La Manche and Calvados. With the GPMs, the link between the port authority and the city is more tenuous, but it is there. Although the GPMs have greater autonomy and the state has the final say, local governments are represented on the supervisory boards and, more importantly, on the development councils. Ports of Paris, for its part, can count on the involvement of local governments and on new forms of partnership for mobilising them. Orientation schemes, local consultation bodies, charters, contracts and action plans can be useful tools for working together in areas such as the environment and urban development.

4.3. The outlook for regional governance

Achieving co-ordination and co-operation among the ports of Normandy and Ile de France is the real issue. Worldwide, a process of port regionalisation is occurring; competitive advantages are created by ports that are good at managing their integration in regional systems of maritime and inland ports, multimodal platforms and logistics zones (Notteboom and Rodrigue, 2005). Other ports in northwest Europe have long been engaged in building regional initiatives to increase their competitive position (Baudouin, 2003). It is in this context that prudent attempts at regional co-ordination in the Seine Axis are taking place. The competition faced by ports in the Seine Axis poses challenges. The ports of Rouen and Le Havre rely on similar types of cargo. The ports of Caen-Ouistreham and Cherbourg are geographic neighbours. The fact that they are managed by the same port authority may be an advantage in terms of co-operation, but it can cause problems when it comes to defining priorities for development or investment. The *syndicat* that runs them does so in a compartmentalised way: the *Conseils généraux* of La Manche and Calvados look after the port located in their respective territory without concern for the affairs of the other port. Moreover, conflicts over use of space can arise because of their status as decentralised ports: the heavy involvement of local governments can lead the port management authorities to favour projects not directly related to port traffic but geared instead to urban development. The conversion of industrial lands into commercial or housing zones integrated into the city is one example of this phenomenon. Local and regional/national interests may diverge.

The creation of two differing statuses for French ports – decentralised ports and *Grands Ports Maritimes* (GPM) – also has important consequences for the ways they are managed. This could possibly become a disadvantage. The decentralised ports, in particular, could be confined to local roles. Co-ordination between the decentralised ports and the GPMs is certainly not made any easier by the difference in status, governance bodies and scale between the two models. The state does not have any real way of encouraging co-operation with the decentralised ports, which are not dependent on it. Finally, the economic situation of the biggest decentralised ports and the smallest GPMs is not all that different, and yet their organisational structure is fundamentally different.

The 2008 port reform called for creation of an Interport Co-ordination Council of the Seine (CCIS). This council was created by decree in May 2009 to ensure that the three ports of Rouen, Le Havre and Paris act in concert. It adopts a co-ordination document outlining the main developments, investment projects and port promotion. The document can propose ways to pool funding. The council is composed of representatives of the state (two members), the ports (three), local governments (five), as well as two infrastructure management institutions (RFF and VNF) and four individual experts (*personnalités qualifiées*). The council is tasked with establishing strategic guidelines and implementing co-operation protocols. Its work is progressing slowly and is focused on prioritising projects relating to the carriage of cargo to and from the ports. It does not seem for the moment to have produced any tangible co-operation or pooling of technical or administrative resources.

It must also be noted that the CCIS includes only the ports of Rouen, Le Havre and Paris, leaving out those of Caen-Ouistreham, Cherbourg and Dieppe. In other words, the focus of co-ordination is the Valley of the Seine. Co-operation between the ports of Haute Normandie, Basse Normandie (which have a quite different status) and eventually those of the north will have to take place outside the framework of the interport co-ordination council, probably through partnership or contractual arrangements. Thus, the GPMR and the PNA launched a study in October 2010 to "identify opportunities for the development of port activity".[50] This partnership should involve more particularly the ports of Rouen and Cherbourg. A similar partnership initiative has been launched between the port of Caen-Ouistreham and the GPM of Le Havre to establish a container shuttle service between the two cities. Le Havre and Dunkirk could pool efforts in some areas to their mutual benefit. It is clear that for the time being the reform leaves open the outlook for governance on a broader scale.

Joint projects between the ports of Normandy and the Ile de France can also take place outside the interport co-ordination council, of course, through organisations, companies and other bodies that embrace several ports. An example here is Paris Terminal SA, which is the terminal operator for the river platform at Gennevilliers (and for part of the platform at Bonneuil-sur-Marne) and is owned jointly by the port authorities of Le Havre, Rouen and Ports de Paris. Thanks to the July 2008 reform, the GPMs and the Ports de Paris are now authorised to invest outside their territory: this new mechanism could result in their taking a greater financial interest in regional logistics projects. The ports of Le Havre, Rouen, Paris and Dunkirk have expressed their interest in participating in structuring and governing the multimodal platforms foreseen along the Seine-Nord Europe Canal and have signed a protocol on this matter with VNF, which co-ordinates the project to study the role and conditions for the participation in development of these platforms. Indeed, it will be important that the ports seize the opportunities this mechanism offers to forge partnerships with the private sector.[51]

Local governments in Normandy and the Ile de France are highly fragmented and pose great problems of co-ordination. The regional landscape is characterised by multiple overlapping layers of government: region, *département*, commune and public institutions of intercommunal co-operation. Thus, the ports of Rouen, Le Havre, Caen-Ouistreham and Paris are located in three regions and 10 different *départements*: the GPM of Rouen has terminals in Haute Normandie and Basse Normandie (at Honfleur). The great number of public players can represent a problem when it comes to developing horizontal policies, where the layers of government concerned are numerous. The decentralisation instituted in France since the early 1980s has not resulted in the attribution of exclusive responsibilities to the different territorial levels. Many responsibilities are shared among several levels of local government. The re-thinking of French centralisation has sparked a reorganisation of public policies relating to transportation, economic development, environmental protection etc. The different subnational levels of government have gradually positioned themselves with respect to this reorganisation, but their roles and responsibilities are not yet fixed and uniform. Moreover, the various strategies at the subnational level are not automatically co-ordinated, in obedience to the constitutional principle that one local government is not subordinate to another, and the "general competence clause" (declared by the law of 5 April 1884) which authorises local governments to pursue policies in all areas where they deem the general interest to be at stake.

In the economic development field, for example, there are many public players involved: while the regions have an essential "co-ordination role", the *départements* and the communal governments also have responsibilities.[52] The communes and the *département* can provide direct financial subsidies, for example. Pursuant to article L. 5216-5 of the *Code Général des Collectivités Territoriales*, the *communautés d'agglomération* have responsibilities for economic development and they may engage in the "creation, planning, maintenance and management of zones dedicated to industrial, commercial, tertiary, artisanal, tourism, port or airport activities" in case of "community interest".[53] In fact, at Le Havre and Rouen the *communautés d'agglomération* (CODAH and CREA) have established and are running important enterprise zones. The *départements* play a less important role in economic development, but they too can

take initiatives in this area: the *département* of Seine-Maritime has created an economic expansion committee, Seine Maritime Expansion, with the status of an association under the law of 1901 and the mandate to assist companiesin carrying out their investment plans. The principal player in economic development, however, is the region. It has "competence to promote economic development [...] and planning for its territory". It is responsible for economic orientation and development planning, in particular through the *Contrat de Projet État Région* (CPER) that it signs with the central government. It is also important to note that some arrangements bring together several public bodies concerned with economic development: this is the case with the Le Havre Regional Development Agency described in the previous chapter.

Transport policies are the result of input from different levels of sub-national government. Road management, for example, falls to the *départements*, now that the regions have lost their responsibility for it. Rail and waterway transport, however, depends heavily on the state, which must decide on major projects and which, through agencies created for this purpose, manages the rail network (RFF) and the inland waterway network (VNF). Regional and interregional rail passenger service, however, is decentralised to the regions as the regulatory authorities, and it is they that decide which services will be offered. This competence also gives the regions power over rail freight, an issue that affects economic development and the environment. The regions are increasingly being asked to provide financing for infrastructure built on their territory, and the subsidies that they can provide have an influence on developments in a given sector (waterways, logistics, etc.). According to Dablanc, with few exceptions, the regions take little advantage of these possibilities for action affecting freight planning and management.[54] As a general rule, the regions prefer to intervene in specific cases or to focus on innovative or unconventional fields (for example intermodality). In the transport field as in the economic development field, the public policies instituted cannot be summarised as representing the will of a single political player. They are rather the result of choices by several institutions. Moreover, the "territorial layer-cake" that characterises France is undergoing reform, and opinions vary about the role that each level of government should play. For example, questions are being raised about the future of the *départements*, the new powers and new revenues that should be awarded the *communautés de communes* and *communautés d'agglomération*, a relatively new layer in France, and, in the specific case of Normandy, the proposal to merge the two component regions of Haute-Normandie and Basse-Normandie.

In order to work more effectively, local governments have instituted co-operative mechanisms based on the principle of the association. The *Association Normandie-Métropole* (Normandy Metropolis Association) the *Réseau Arc Manche* (Arc Channel Network) and the *Comité des élus de l'Estuaire de la Seine* (Committee of the Seine Estuary) are or were joint work projects that went beyond the normal structures of public governance. Some of them were clearly failures: the *Association Normandie-Métropole*, for example, has been dissolved. It ran into problems of divergent interests, different economic structures, administrative rivalries (particularly between the two regional capitals), and a lack of structural solidarity between the Norman metropolises in terms of transportation flows, for example (Ducruet, 2006; Guermond, 2007). These are the issues that must be addressed in current attempts at regional and supra-regional co-ordination: in order to be more effective, the co-operation initiatives currently in place are focusing on specific fields, such as transportation, logistics and maritime policy. Co-ordination is also being extended to a broader scale, by integrating the Paris metropolitan area.

In the wake of proposals by the architect and urban planner Antoine Grumbach concerning access to the sea front for the Greater Paris region, the cities of Le Havre, Rouen and Paris have launched a series of discussions on the structuring of the Seine Valley, following a relatively informal format (with no fixed administrative structure). An inaugural conference was organised by the three cities on 4 May 2010 to develop a common view of the region's future in terms of transportation, logistics, the environment and economic development. These ideas are being reviewed in the context of studies on the emergence of a "Greater Paris", but they also reflect the willingness of the seaports to work with their hinterland. The

model here is that of the Belgian and Dutch ports (the Extended Gateway of Antwerp, for example), which has succeeded in creating complete logistic branches in their surrounding regions (see the box discussing the strategy of the port of Antwerp, in Chapter 3). The objective is to create a network of multimodal clusters, logistics zones and inland ports where local economic players can develop and flourish. Given competition with northern Europe, it would seem urgent in the current context that stakeholders should commit themselves to creating informal structures and platforms for flexible co-operation and should seek as far as possible to avoid cumbersome new institutional reforms ill-suited to the functioning of markets.

Box 11. Governance and extended gateways at Antwerp and Rotterdam

The Flemish Institute of Logistics (financed by the Flemish government) has developed the concept of the "extended gateway". This seeks to define corridors into the port hinterland, equipped with multimodal capacities and inland terminals. These corridors must also have sufficient space to develop logistics parks. The parks will provide facilities to multinational firms and their logistics suppliers to build distribution centres. Creation of these corridors serves *i)* to reduce logistics costs by improving links between the port and appropriate sites in the hinterland, and *ii)* to maximise value added and employment through the creation of parks.

Management of these corridors at Antwerp and Rotterdam involves actions of various kinds:

- Management and prospecting. The ports are committed to action in three directions: *i)* they take equity stakes in inland platforms (long-term perspective); *ii)* they engage in active business prospecting with respect to inland platforms, for example by hiring the services of firms that have close links to platform operators (short-term perspective); and *iii)* they sponsor networks to improve co-ordination of transport links to the hinterland and to strengthen logistic chains (*cf.* the framework plan for waterway navigation at Antwerp, *Anvers Solutions Intermodales* (AIS), the Transferium concept of the port of Rotterdam, rail co-ordination at Rotterdam).

- Projects with regional stakeholders to promote logistics competitiveness. The central idea is to pursue co-operation with the port authorities, rail infrastructure managers, waterway network operators, regional development agencies, chambers of commerce and industry organisations. Such co-operation must have concrete objectives, and participants must commit themselves to a five-year business plan, which is overseen by a regional project management office.

- Development of a strategy endorsed by the central government and participating stakeholders for improving competitiveness of rail freight via a flexible but a thorough implementation of the European Commission's railway reform package. Progress is assessed on the basis of the IBM rail liberalisation index (LIB) and on capacities to achieve categories of excellence. Experience has shown that a good ranking on the LIB index corresponds to a good modal shift.

- Building close partnerships with knowledge suppliers, and in particular the universities and other institutes of higher education. In Rotterdam, the city, the port, the port company's organisation Deltalinqs and five institutes of Erasmus University signed an agreement in 2010 as part of the Smart Port project, designed to boost the competitiveness of the port cluster by adjusting the supply of and demand for specialised know-how. Research, consultancy and training services are provided within this framework. Co-operation between the Institute of Transport and Maritime Management, Antwerp (ITMMA) and the port of Antwerp is another example of a successful partnership.

Box 12. Regional port governance in the Yangtze River Delta

The Yangtze River Delta is one of China's three major port regions, the other two being the Pearl River Delta and the Bohai Rim. The Yangtze River Delta includes major ports such Shanghai, Ningbo and Lianyungang. Since 2007, Shanghai has been the largest container seaport in China, second in the world after Singapore. The Yangtze River Delta regional port system involves three different jurisdictions, the Shanghai municipality and Zhejiang and Jiangsu provinces. Although regional port governance has for long been fragmented (Comtois and Dong, 2007), with intense competition between the main ports, Shanghai and Ningbo, current developments point towards more regional co-ordination, which takes the form of co-ordinated planning, common institutions, co-ordinated finance and co-ordinated operations.

An impetus for co-ordinated planning has been given by the national government. In the National Strategy for the Yangtze River Delta, approved in May 2010 by the State Council, a section on the regional port system lays out development directions and detailed plans for the ports' development and co-ordination. The plan positions Shanghai as the international shipping centre, Ningbo-Zhoushan as the regional hub, supported by other extension and feeder ports in the Yangtze River Delta. Moreover, development plan outlines have been detailed for individual ports, e.g. to accelerate general container port infrastructure in Shanghai port, to provide better port infrastructure in Ningbo port, in particular for iron ore and crude oil transportation. Such development outlines have also been applied to inland ports in the region, e.g. to develop several feeder ports and transit hubs in Jiangsu to provide connections between Shanghai and hinterland upper stream in the Yangtze River.

Although similar visions in the past have encountered implementation difficulties (Wang and Slack, 2004), there appear currently to be more institutional mechanisms to follow up on this strategy. All container port operations in the Yangtze River Delta are co-ordinated by a single entity, the Shanghai Port System Management Committee created in 1998. The committee is represented by the deputy minister of Communications, deputy mayor of Shanghai, deputy governors of Zhejiang and Jiangsu provinces, as well as senior government officials in charge of economic development and transportation from Shanghai, Zhejiang and Jiangsu. Moreover, since 2006, a Port Management Committee has co-ordinated administration of two nearby ports (Ningbo port and Zhoushan port) in the Zhejiang province. The two ports have subsequently been merged, as reflected in a new name – Ningbo-Zhoushan port.

This institutional co-ordination has been supported by financial participations of the main ports in the area. The two major ports in the Yangtze River Delta, the Shanghai Port and Ningbo Port, set up a joint ventue in 2010, Shanghai Port and Shipping Investment Co., Ltd., to invest in transport, shipping and ports, energy and related areas. Since each side holds around 50% shares of the joint venture, investment carried out by this joint venture is perceived to benefit both ports.[55] According to news sources, the two ports <pls check edit>have started to discuss co-operation in more areas, such as co-ordination of future investments and operations.[56] Prior to that, Shanghai Port Group Corporation has invested since 2005 in several inland container terminals – Wuhan, Jiujiang, Nanjing and Chongqing, all upstream of the Yangtze River. As a result, container volume growth in cities such as Chongqing has been exponential (Notteboom, 2007). Closer links between the port of Shanghai and Ningbo have also been created due to the behaviour of private terminal operators. For example, the terminal operator Hutchison Whampoa has interests in Shanghai Container Terminals as well as terminals in the Ningbo Port.

Similar forms of co-ordination have been taking place in the Bohai Rim, which includes Qingdao, Dalian and Tianjin, among others. A co-operation agreement was signed in 2009 among three major ports in this Rim (Qingdao, Yantai and Rizhao), in order to create synergies and co-develop shipping and logistic industries in the region. The agreement envisaged developing the three ports as the international shipping centre for northeast Asia, in particular for container shipping. To this end, the plan proposed communicating mechanisms for port rates in order to avoid overly intense price competition and fixed meetings between ports leaders in order to facilitate smooth communication, etc.[57] This agreement was preceded by several joint ventures between the different ports. In 2005, the ports of Qingdao and Weihai in the Shandong province set up a joint venture to manage the container port in Weihai. Similar efforts have been carried by out by Qingdao and Rizhao to manage the container port in Rizhao, and by Dalian and Jinzhou to develop the coastal areas close to Jinzhou.

In the Pearl River Delta, which concentrates major ports such as Hong Kong, Shenzhen and Guangzhou, several efforts at regional port co-ordination have taken place. Examples of this are the 2008 Layout Plan for Coastal Ports of Guangdong Province and the 2010 co-operation agreement between Hong Kong and Guangdong. Despite these efforts, facilities are still competing, without overall co-ordination for port development in the area (OECD, 2010).

To round out the mechanism and give a boost to governance of the Seine Axis, on 21 April 2011 in Le Havre, President Sarkozy appointed Antoine Rufenacht as Commissioner for the Valley of the Seine (decree after Council of Ministers, 18 May 2011). He will co-ordinate housing and transportation policies as they concern this territory and its economic attractiveness. He will have a streamlined administration endowed with broad interministerial responsibilities. He will report directly to the president, and his position reflects "the full commitment of the state to the development of Normandy as a whole". A specific law is to be adopted if bureaucratic obstacles unduly delay the project.

4.4. The role of the state in port governance

Since the July 2008 port reform, the state has reasserted itself in the governance of the most important French ports. The *Grands Ports Maritimes* are in fact the successors of the Autonomous Ports, created between 1923 and 1965, which constituted an attempt to check the sway of local economic interests, and in particular the chambers of commerce, in port management. The intention to develop port industrial zones requiring massive investment justified the creation of "quasi-state ports". However, local economic interests were never totally excluded from strategic decision-making in the autonomous ports, and they were strongly represented within the boards of directors responsible for running those ports.

The transformation of the autonomous ports into GPMs marked a new stage in the process of the state takeover of the ports. Local private stakeholders and local governments are present in the management bodies, but the final decision-making power lies with the state. The central government presence is stronger in the supervisory boards (*conseils de surveillance*) of the GPM than it was in the boards of directors of the old autonomous ports: the state has five representatives (drawn from the regional prefectures and ministries or the central government), but above all it has a veto wielded by the Government Commissioner. Local economic players or representatives of civil society are more strongly represented in the development council, which has only an advisory role. Moreover, the "qualified personalities" who sit on the two governance bodies of the GPM are appointed by state entities. The "qualified personalities" on the Supervisory Board are "appointed by decree of the minister responsible for maritime ports, after consultation with the minister responsible for the economy",[58] while those on the Development Council are appointed "by decree of the prefect of the region",[59] The strategic plans of the GPM must also be endorsed by the state, which ensures that they are compatible with "national guidelines"[60] governing maritime and transport policy. In financial terms, disbursements from the state are also significant, particularly when it comes to covering maintenance expenses for existing infrastructure. The "cost of works for creation, expansion or renewal of infrastructure facilities"[61] are covered to the extent of 60% to 80%.

The logic behind this central role for the state is that the GPMs represent interests of national scope, which are not taken into account in the calculations of local governments or local economic players. The decision to give the state a preponderant role is positive in the sense that it allows for clear and swifter decision-making. It means that there is one player who has the last word and can prepare a strategy. The drawback of this system is that the adverse local effects of ports (real and potential) may be overlooked, and that local interests may be relegated to the background in favour of "national" interests.

In contrast to the GPMs, the decentralised ports are entrusted to local governments, at the expense of the state. Because they handle lower freight volumes and are of smaller size than the GPMs, they were considered of less importance to national interests when the 2008 port reform was being prepared. Thus, in the case of Normandy, the state withdrew from management of the ports of Caen-Ouistreham, Cherbourg and Dieppe and handed it over to the local governments. This decision was consistent with the move to decentralisation that had prevailed in France since the 1980s. Although the GPMs were exempted from that movement, the smaller ports were included in it, with the intention that they should become a functioning part of the local economic structure. The challenge for these ports will perhaps be, in contrast to the GPMs,

to reach the point where they can take into account national economic viewpoints and interests that extend beyond those of their controlling local context.

The new port organisation in France raises the question as to whether there really is a national ports strategy, and if so, what its regional dimension is (in this case, for the Seine Axis). Harmonising the country's overall maritime and ports policy is the task of the government, and in particular of the Ministry of Ecology, Sustainable Development, Transport and Housing. Yet the government has no obligation or even any incentive to formulate or present explicitly a detailed maritime policy. For example, there is no document synthesising such a policy. Some observers noted the absence of any forward thinking as to the future of the ports over a 10- to 15-year horizon. Moreover, the interport co-ordination councils established by the 2008 reform were concerned with co-ordination only at the regional level: they were responsible for a single stretch of seacoast or a single waterway. This absence of a national strategy contrasts with the choices adopted in other European countries, such as Belgium or Germany.[62] It is also noteworthy that the state made no distinction in terms of status between the different GPMs, despite their varying situations. The *Cour des Comptes*, for example, had suggested in its 2006 report that the ports of Marseilles and Le Havre deserved in particular to be upgraded, but that option was not adopted by the 2008 law.

4.5. Potential roles for the private sector

The private sector role in port governance has been less important since the July 2008 reform. As noted in the previous section, the development of the major French ports has historically taken place under the supervision of local economic interests, represented most often by the chambers of commerce. The creation of the Autonomous Ports already represented a break with these origins; the 2008 reform creating the GPMs and the decentralised ports took the process a step further, limiting the role of economic stakeholders in strategic decision-making. In fact the economic players who were well represented on the boards of directors of the old autonomous ports now have few members on the supervisory boards of the GPMs, where they are represented only by "qualified personalities". In the GPM of Le Havre, for example, four of the five "qualified personalities" are drawn from professional circles: there are two representatives of firms with marine interests (Michelin and Fouré Lagadec & Cie), plus the president of the Chamber of Commerce and Industry of Le Havre and the president of the *Union Maritime et Portuaire du Havre*.

Rather than the supervisory board, it is the development council that really represents the interests of the business world (and also has several representatives of local governments). The businesses and economic interests that make up its membership are relatively diverse: freight handlers (*Générale de Manutention Portuaire or Terminaux de Normandie au Havre*), representatives of the transport sector (*Syndicat Rouennais des Commissionnaires de Transport* in Rouen), institutions responsible for piloting in the port, shipping lines (MSC France in Rouen), and industrial firms located in the port (Total Raffinerie de Normandie, Lafarge Ciments in Le Havre, Sénalia-Céréales in Rouen, etc.). The development council has only an advisory role, however, and in this way keeps economic players removed from executive functions, an arrangement justified by the need for effective decision-making.

When it comes to the decentralised ports, such as Caen-Ouistreham, private economic players are again held at arm's length. The key players in terms of governance are the local authorities. The chambers of commerce and industry have a less important role than previously. At Caen-Ouistreham, for example, the Chamber of Commerce and Industry of Caen merely manages the port: it no longer collects port fees, which now flow to the *syndicat mixte*, *Ports Normands Associés*.

In terms of governance, private stakeholders can also influence public players through the institutions responsible for representing their interests. Even if it is only informal, this role can be decisive and must not be overlooked. The main players here are the chambers of commerce and industry, to which all businesses must belong. The role of these chambers is to express their business members' needs and

viewpoints. They produce important studies and analyses and they publish positions on major economic issues. They also contribute to public debates. In November 2009, for example, Le Havre's Chamber of Commerce and Industry declared its support for the project to extend the Grand Canal, releasing its announcement while public meetings and debate were being held during the consultation process.

In addition to the efforts of the chambers of commerce and industry, *ad hoc* associations have sprung up to defend and represent the interests of particular economic groups. In the port of Le Havre, one example is the *Union Maritime et Portuaire* (UMEP), in which some 600 firms have joined together "to create an environment for the attraction and optimal movement of cargo at Le Havre". Such associations will have varying degrees of influence. The UMEP has a representative on the port's Development Council, and it is presented in the port's publicity materials as part of a "community of players" interested in the development of port activities. In Rouen, the *Union Portuaire de Rouen* (UPR) unites the different port professions and represents around 120 firms. The UPR promotes their activities and defends their interests: it provides different services for training, human resources and working conditions, port information and sector-specific information, mainly with respect to tariffs.

Private stakeholders have a much greater part in the operations of the ports of Normandy today than they had in 2008, however. To a large extent, port services have been delegated to them, despite the fact that they are largely excluded from governance. Services previously delegated to the public sector have been transferred to private companies, which now have full control over the port workforce and are responsible for investment in material and equipment. The ports' terminals have been turned over by concession to private handling companies. The objective of the 2008 reform was to guarantee terminal operators more control in order to make port services in France more efficient. The model is once again that of the "landlord port", in which the Port Authority removes itself from areas that can be contracted to private firms (pilotage, towage, cargo handling, storage, etc.). At the same time, there has been a change in the forms of partnership between the public and private sectors. The use of subcontracts is becoming more common, and the tools available to the public port authorities are increasing: Ports de Paris, for example, is now more willing to enter into equity arrangements, joint ventures and other forms of public-private partnership.

Many private economic players are themselves undergoing transformation. Terminal operators, for example, are becoming concentrated and globalised. The largest among them now control ever-greater market shares, and they often have links to major global shipping lines. Today nearly a third of worldwide terminal operations are in the hands of four big companies: PSA, APMT, HPH and DP. The bargaining power of these companies with public authorities is thus greater than in the past. They also have significant investment capacities. All this helps to explain the inroads that the big international stevedore firms and world-scale shipping lines have made in French ports. For example, Dubai Port World and the shipping lines CMA-CGM and MSC were selected to run the Port 2000 terminal at Le Havre. MSC operates in the ports of Le Havre, Rouen and Caen-Ouistreham, as does the stevedore company Sogena (which, by contrast, is a strictly national company). Their presence in the three ports offers potential for synergy and co-ordination. Faced with the number of new international arrivals, however, it is apparent that local economic players have managed to maintain a preferential position in the regional ports of Normandy. Terminal contracts organising the delegation of port services have often been awarded to firms already operating in the ports. International players often gain entry through partnership with a local firm. Arrangements of this kind benefit from the economies of scale and the working methods of large international groups and, at the same time, from the local resources and experience of firms long-established on the ground.

Non-commercial stakeholders also play a role in the governance of the Norman ports. In institutional terms, civil society players are represented on the development councils of the GPMs, although they wield less influence than do the businesses and local governments that are also represented. Many of these

players consist of environmental groups or local residents' associations. The *Code des Ports Maritimes* stipulates that representatives of recognised environmental associations must account for at least one-quarter of the "qualified personalities" who constitute 30% of the development councils' membership. The ports of Le Havre and Rouen have three associations of this kind represented on their development councils: *SOS Estuaire et Maison de l'Estuaire* at Le Havre, South Estuary and *Association pour la Sauvegarde et Mise en Valeur de la Boucle de Roumare* at Rouen, and *Haute-Normandie Nature Environnement* in both ports. These associations carry relatively little weight because of their low number (only 3 out of a total of 31 members of Le Havre and 30 at Rouen).

Associations representing the interest of local residents and environmental concerns are also included in the governance process in preparing infrastructure and investment projects. The legal requirements for consultation on major projects have been made progressively more stringent, culminating in the "Barnier" law of 2 February 1995 on environmental protection, which requires public debate on any infrastructure project. That law was employed for the first time during preparations for the new container terminal for Port 2000 at Le Havre, when the now-familiar consultation procedure was introduced: independent studies and public hearings hosted by a national commission (*Commission Nationale du Débat Public*). A similar public hearing took place in Rouen 2007-2008 for the project for improving maritime access to the port of Rouen. This consultation procedure is frequently criticised on the grounds that it takes place only after the project itself has been decided upon, and can only be brought to bear on the details of its implementation. The process is thus seen more as a way of getting residents and associations to sign on to a project in its downstream phase, rather than of involving them in its design.

4.6. Governance of the port hinterland

The last few years have seen a deliberate political decision to develop transport by waterway and rail at the expense of trucking. This has been inspired by environmental reasons as well as for considerations of efficiency and balance, the aim being to reverse the decline in rail cargo traffic and to continue to support the development of waterway transport. The July 2008 port reform thus championed rail and waterway transport as ways of improving the movement of freight to and from seaports. This initiative is reflected in the *Grenelle II de l'Environnement* law of July 2010, which sets the goal of doubling the modal share of waterway and rail in the servicing of ports by 2020. The law of 3 August 2009 on implementing *Grenelle I de l'Environnement* also called for a national infrastructure scheme, which is now in process. This will treat the servicing of ports as an important element in the selection of infrastructure projects for financing.

The 2008 port reform also instituted measures for integrating rail and waterway facilities into port structures. The jurisdiction of railway tracks located within port precincts has been transferred to the GPMs, and waterways will soon be added. The ports' governance bodies now include representatives of the rail and waterway operators (RFF and VNF), and some of the "qualified personalities" are also drawn from these two institutions. The director general of VNF sits on the supervisory board of the port of Rouen and on the development council of the port of Le Havre, while RFF is represented (by its president-director general and its regional director) on the supervisory board of the port of Le Havre and the development council of the port of Rouen. It is an open question, however, whether such measures in favour of these bulk transport modes will be enough to achieve the Grenelle goals. While the political will is clearly there, the structural reforms themselves are modest, and few financial incentives have been offered to support rail and waterway transport. In the trade-off that carriers must make among the different modes of transport, financial considerations are paramount (although regularity and security also weigh in the balance). This suggeste that waterway and rail transport will not flourish in the long term unless their cost can be brought below that of road transport.

An important issue in the servicing of port hinterlands is the structuring of a solid logistics supply chain. In the first place, it is important for the Norman ports to become directly involved in the land and

waterway networks that they service. By comparison with the principal ports of northern Europe, the French ports show some logistical weakness. The establishment of inland logistics terminals, storage and distribution centres and multimodal platforms is an essential element for structuring a hinterland and for constituting significant sources for creating value added. Ports de Paris plays a central role here, since it is responsible for the development of a great many multimodal logistics platforms that will structure the hinterlands of the ports of Le Havre, Rouen and even Caen in the future. The influence it commands within the Interport Co-ordination Council and its ability to collaborate with the VNF and with the local authorities where it is installed will therefore be essential. The objective of co-operation in the Seine Axis is also to enlarge the reach of the different ports beyond the Ile de France and ensure that it can become a gateway to the European continent.

The role of private transport and logistics providers is also crucial. Road and waterway transport firms in the Paris basin and Normandy have traditionally been of modest size. The companies navigating the Seine basin, for example, generally use equipment of lower quality than those plying the Rhine. They are less well organised and have fewer financial resources, and many have only one or two vessels in their fleet. Modernising the inland waterway transport business, then, will be a key issue for the years to come, particularly as the Seine basin is to be opened up with construction of the Seine-Nord Europe Canal. The building of a real waterway logistics chain will depend on the ability of local players to modernise and to become stronger and better organised. A movement of this kind seems to be starting, and some major maritime shipping lines are now moving into the Seine basin (e.g. CMA-CGM, Marfret). At the same time, the smaller and more antiquated traditional waterway operators are gradually disappearing and making way for larger transport companies.

In the rail transport sector, the presence of private firms is a very recent phenomenon, and is not yet solidly organised. The French rail network was opened to freight competition only in March 2006, under the pressure of European legislation. The operational separation of network ownership and rail service is of recent origin: RFF was created only in 1997. For the time being, the traditional publicly owned operator, Fret SNCF, still carries the bulk of merchandise traffic, although the share of private operators is rising rapidly. It jumped from 4.7% in 2007 to 12.5% in 2009, and the trend seems to be continuing.[63] According to Ruby and Zembri there were eight new entrants in the rail freight business in 2008. Not all these companies are servicing the ports of Normandy and Ile de France, however. In the case of Le Havre, there are three operators: Rail Link Europe (in partnership with CMA-CGM and Veolia), Naviland Cargo (a subsidiary of SNCF) and Novatrans (a combined transport operator owned by SNCF and trucking firms).[64] Ruby and Zembri report that while the new entrants are financially sound, thanks to their principal shareholders, they nevertheless face administrative and technical hurdles. Their relations with RFF can be difficult; it has been particularly hard for the new operators to secure routing for their trains. The procedures are time-consuming and difficult, and it is not easy to tell in advance which services will be offered. These factors are at present holding back the development of private rail freight. The challenge for the rail freight sector is to reverse the growing gap with the road haulage mode, as the waterways sector is now doing. Over the medium term, the efficient servicing of seaports will depend largely on the capacity of private rail and waterway companies to modernise and to offer satisfactory service.

CONCLUSION

The performance of the Seine Axis ports presents some paradoxes. Their performance has been lagging, but they have great assets, such as well-developed infrastructure and nautical access (in the case of Le Havre), which could be turned into decisive competitive advantages. Recent reforms have removed obstacles and brought port governance in line with European practice, but it is clearly too early to see its full effect. In all likeliness, this will translate into a more positive perception of port clients, greater efficiency and possibly halt declining market shares. But these are first steps, and there is no reason for complacency. The Seine Axis ports are operating in a competitive environment, contending with ports such as Antwerp and Rotterdam that have managed to capture parts of the French hinterland. The completion of the Seine-Nord Europe Canal will intensify this competition. The port authorities have become more pro-active and commercial, but are still falling behind most of the largest ports in northwest Europe in this respect.

An essential element for improving port performance is increased regional co-ordination. In many places worldwide, a tendency toward port regionalisation has made the design of the supply chain critical. It includes the alignment of different seaports, inland ports, multimodal platforms and logistics centres. Such a process has been set in motion along the Seine Axis, facilitated by national legislation that stipulated an inter-port council for the Seine ports. There are compelling reasons why this is not only desirable but also possible: there are common interests and complementarities, because the different ports have different functions and different specialisations.

However, in addition to co-operation, regional co-ordination is called for. The ports' different commodities can be linked to regional economic activities; synergies can result from closer co-ordination between ports and other economic actors in the Seine Valley, for example with respect to value added logistics, energy and the car industry. This study found that the port cluster in Le Havre/Rouen is not deeply embedded in the regional economy; this is a missed opportunity for the region. In contrast to most other port cities in northwest Europe, the flows 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; concrete projects could be designed to increase the current impetus towards regional co-operation. This study gives many examples of other port cities, most notably its direct competitors in northwest Europe. The Seine Axis has its own characteristics, culture and context, and the intent is not to offer these benchmarks for slavish imitation. Instead, they could provide the basis for further discussion on how port performance could be improved and yield net benefits for the Seine Valley.

ANNEX 1: LIST OF INTERVIEW PARTNERS

Adam, Philippe	RFF, *Ligne Nouvelle Paris Normandie*
Aline, Jean-Marie	Vice president, CREA
Alonso, Sylvain	Project manager, RFF
Auzou, Philippe	Port of Caen-Ouistreham
Baraté, Thierry	RFF, Haute et Basse-Normandie
Bapin, Thierry	Mov'eo, Haute-Normandie
Barbet, François	AUCAME – CE Environnement
Barbou, Pauline	Cabinet of the mayor of Achères
Baudouin, Thierry	Research sociologist, CNRS/Université Paris VIII
Benmehrez, Malia	Researcher, CNRS/AUS/LAVUE
Berthier, Laurence	Director, Caen-Métropole
Beulaygue, Pierre	AUDAS
Bitaud, Christiane	AUDAS
Boret, Daphné	Conseil Général des Yvelines
Bourreau, Thomas	AUCAME
Bouvier, Claire	CRITT
Brett, Tiphaine	DREAL Haute-Normandie
Chartier, Hélène	APUR
Chedot, Cyril	GPMH
Collette, Hervé	VDH
Collin, Michel	President, CCI de Caen
Collin, Michèle	Research sociologist, CNRS/Université Paris VIII
Creismeas, Jeannie	DRIEA Île-de-France
Crescent, Denis	Director, *Calvados Stratégie*
David, Michel	Director, Paris Terminal SA
Debrie, Jean	Researcher, IFSTTAR
Deiss, Philippe	Director, GPMR
Delaunay, Gérard	Vice president, CCI de Caen
Delbos, Frédéric	Deputy director, AUCAME
Depierre, Didier	Ports de Paris
De Saint-Vincent, Didier	CESER Île de France/CODEV Seine Aval
Deysine, Philippe	General delegate, NOVALOG
Dhervillez, Dominique	Director general, AURH
Duny, Patrice	Director, AUCAME
Duplessis, Christian	Deputy director, DREAL BN
Duszynski, Juliette	AURH
Dutarte, Eliane	Adviser, DATAR
Foraison, Karl	Project manager, CRITT
Fouchier, Vincent	Deputy director general, IAU Île-de-France
Fourquet, Gérard	Director general, Caen la Mer
Franck, Alain	AURH
Frémont, Antoine	IFSTTAR
Galitzine, Anne	CRCI

Garcia, Jean-Michel	City of Conflans-Sainte-Honorine
Gouvernal, Elisabeth	Director of research, IFSTTAR
Gressier, Claude	President, Inter-port Council of the Seine
Grumbach, Antoine	Architect, *Antoine Grumbach Associés*
Guentcheff, Florence	Director general, *Logistique Seine Normandie*
Guézennec, Loïc	Director, GIP Seine-Aval
Laille, Jean-Philippe	Director of Terminals, Rouen, Rubis Terminal
Larsonneur, Christelle	GPMR
Laude, André	Group director general Senalia
Le Bas, Jacques	President, *Maison de l'Estuaire*
Le Bonniec, Patrick	Head of port affairs, Haute-Normandie region
Ledran, André	Mayor of Ouistreham/Vice-president of Caen-Métropole
Legrand, Hélène	Project leader, SYNERGIA
Lelouard, Yann	AURBSE
Lemaire, Olivier	Director general, AIVP
Lepine, Véronique	Senior manager, HAPAG-Lloyd
Levieux, Sylvain	GPMH
Liotard, Martine	IAU Île-de-France
Louis, Stephan	Commune d'Ouistreham
Mace, Bertrand	City of Le Havre
Marceau, Stéphane	DREAL Haute-Normandie
Martel, Hervé	Director general, Ports de Paris
Mionnet, Antoine	Le Havre Développement
Moreno, Laurent	Director general, AURBSE
Ni, Jincheng	SNCF
Obiegly, Bastien	CCIV
Pastant, Didier	Région Haute-Normandie
Pernot, Nicolas	VDH
Philippe, Edouard	Mayor of Le Havre, president of CODAH
Poitou, Pascal	GPMH
Poncet, Jean-Damien	CODAH
Pote, Robin	Projects supervisor, CRITT
Potier, Jean-Luc	Regional delegate, SNCF Geodis
Preterre, Emmanuel	Project manager, development, CRITT
Raffini, Jean-Paul	Chief of mission, *Grand Port Maritime du Havre*
Reveillon, Etienne	CREA
Ribault, Hugues	President, AUDAS
Rigal, Jean-Christophe	Director, AUDAS
Rigaudiere, Jérôme	CRCI de Haute-Normandie
Rol-Tanguy, Francis	Director, APUR
Roudier, Daval Prune	Ville de Conflans-Sainte-Honorine
Rufenacht, Antoine	President, AURH
Santos, José	AUCAME
Soenen, Régis	GPMR
Sueur, Colin	President, AUCAME, Vice president, Caen La Mer
Thomas, Philippe	Derichebourg
Tostain, Jean-Pierre	Secretary general, PNA
Tourret, Paul	Director, ISEMAR
Troletti, Marc-Antoine	President, *Socore Troletti Travaux Publics et Industriels*
Verrier, Thierry	Director general, *Rouen Seine Aménagement*
Vinot-Battistoni, D.	Vice president, Caen La Mer

Vuillet A Ciles, Marc	Director of planning and development, CCI du Havre
Wiecek, Mariusz	Ports de Paris

ABBREVIATIONS

AIVP	*Association Internationale Villes et Ports*
APUR	*Atelier Parisien d'Urbanisme*
AUCAME	*Agence d'Études d'Urbanisme de Caen-Métropole*
AUDAS	*Agence d'Urbanisme et de Développement Seine Aval*
AURBSE	*Agence d'Urbanisme de Rouen et des Boucles de Seine et Eure*
AURH	*Agence d'Urbanisme de la Région du Havre*
CESER	*Conseil Économique, Social et Environnemental de Région*
CNRS	*Centre National de la Recherche Scientifique*
CODAH	*Communauté de l'Agglomération Havraise*
CRCI	*Chambre Régionale de Commerce et d'Industrie*
CREA	*Communauté de l'Agglomération Rouen Elbeuf Austreberthe*
CRITT	*Centre Régional d'Innovation et Transfert de Technologie*
DATAR	*Délégation interministérielle à l'Aménagement du Territoire et à l'Attractivité Régionale*
DREAL	*Direction Régionale de l'Environnement, de l'Aménagement et du Logement*
DRIEA	*Direction Régionale et Interdépartementale de l'Équipement et de l'Aménagement*
GIP	*Groupement d'Intérêt Public*
GPMH	*Grand Port Maritime du Havre*
GPMR	*Grand Port Maritime de Rouen*
IAU	*Institut d'Aménagement et d'Urbanisme*
IFSTTAR	*Institut Français des Sciences et Technologies des Transports, de l'Aménagement et des Réseaux*
ISEMAR	*Institut Supérieur d'Économie Maritime*
MEDTT	*Ministère de l'Écologie, du Développement durable, des Transports et du Logement*
PNA	*Ports Normands Associés*
RFF	*Réseau Ferré de France*

ANNEX 2: METHODOLOGY FOR MULTI-REGIONAL INPUT-OUTPUT ANALYSIS

Input-output analysis is a quantitative technique, originally developed by Leontieff, used to describe, analyse and explain economic structures, dependencies and changes. An input-output table describes deliveries from one industrial sector to another, to consumers, government and abroad (export). The corollary concept is that if one industry develops rapidly, the industries that deliver to that growing industry will experience more demand and will also grow. The resulting impact can be expressed by a multiplier. For the purpose of this case study on the Seine Axis, a multiregional input-output table was constructed.

The basis of the multiregional input-output (IO) table for Le Havre/Rouen is formed by a 15-sector national IO-table for France from 2005, available on the INSEE web site. Regional and sectoral NUTS 2 (Nomenclature of Territorial Units for Statistics) data with regard to employment (production), value added, wages and population, available in OECD databases, were used to redistribute the IO-table for France to a four-by-four multiregional IO, in which the inputs and outputs of the regions of Haute-Normandie, Basse-Normandie, Ile de France and the rest of France were distinguished. Highly localised data on employment per activity (related to the port of Le Havre and Rouen, as well as port-related employment) were used to split Haute-Normandie into the port cluster of Le Havre/Rouen and the rest of Haute-Normandie. The result was an IO-table with five different regions: the port cluster of Le Havre/Rouen and the regions of Haute-Normandie, Basse-Normandie, Ile de France and the rest of France.

ANNEX 3: ECONOMIC SPECIALISATIONS OF PORT-REGIONS IN NORTH-WEST EUROPE

Figure 24. Correlation between specialisation and value-added activities in Hamburg

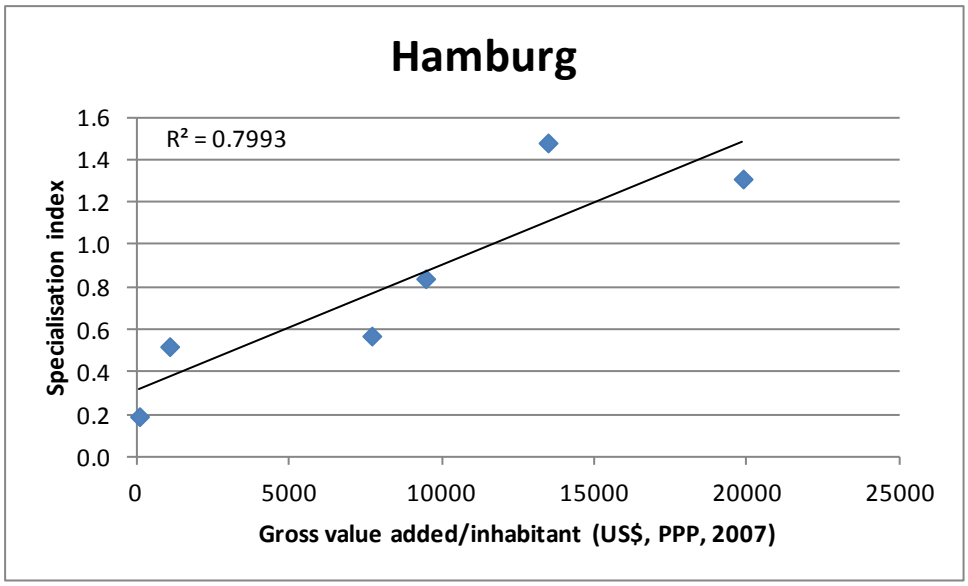


Figure 25. Correlation between specialisation and value-added activities in Bremen

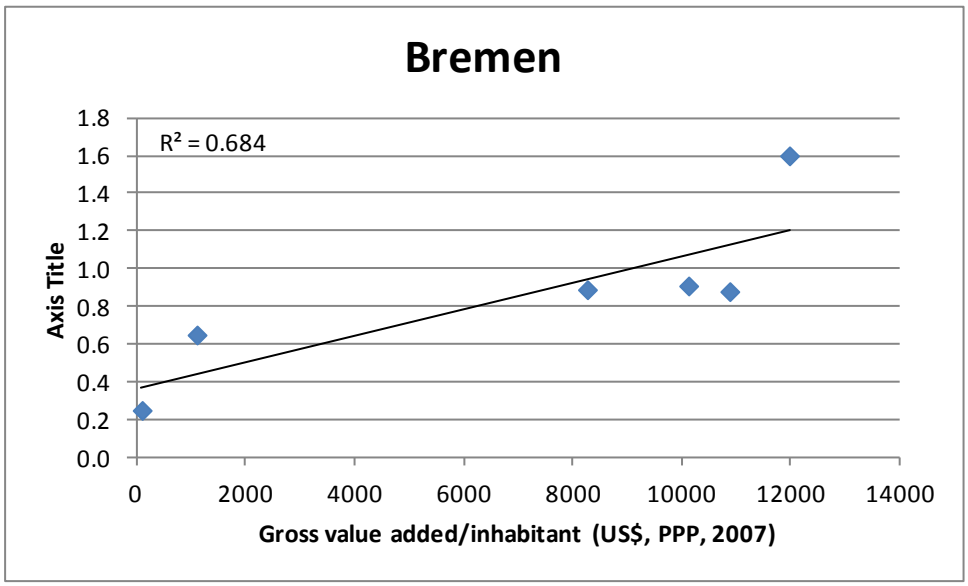


Figure 26. Correlation between specialisation and value-added activities in West Netherlands (Rotterdam/Amsterdam)

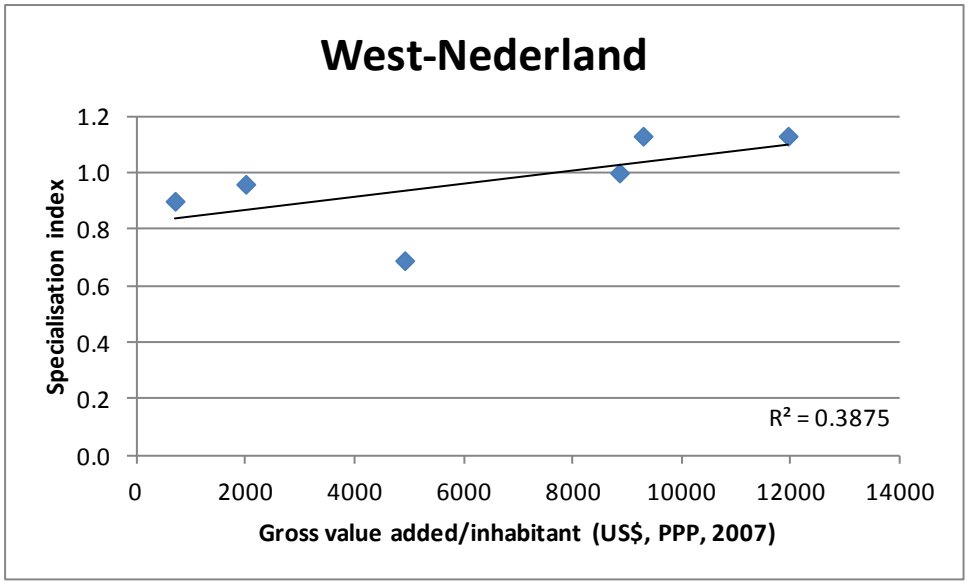


Figure 27. Correlation between specialisation and value-added activities in Flanders (Antwerp)

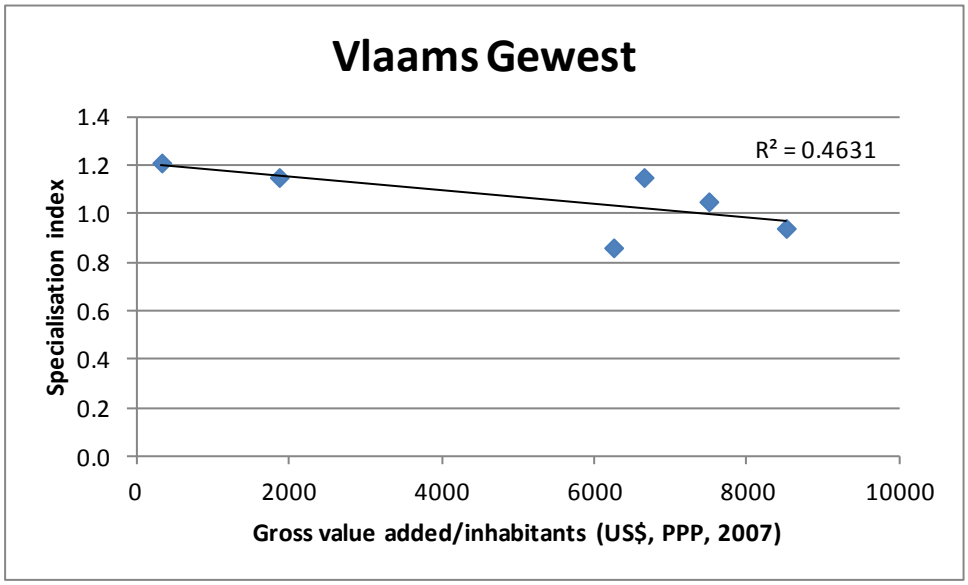


Figure 28. Correlation between specialisation and value-added activities in London

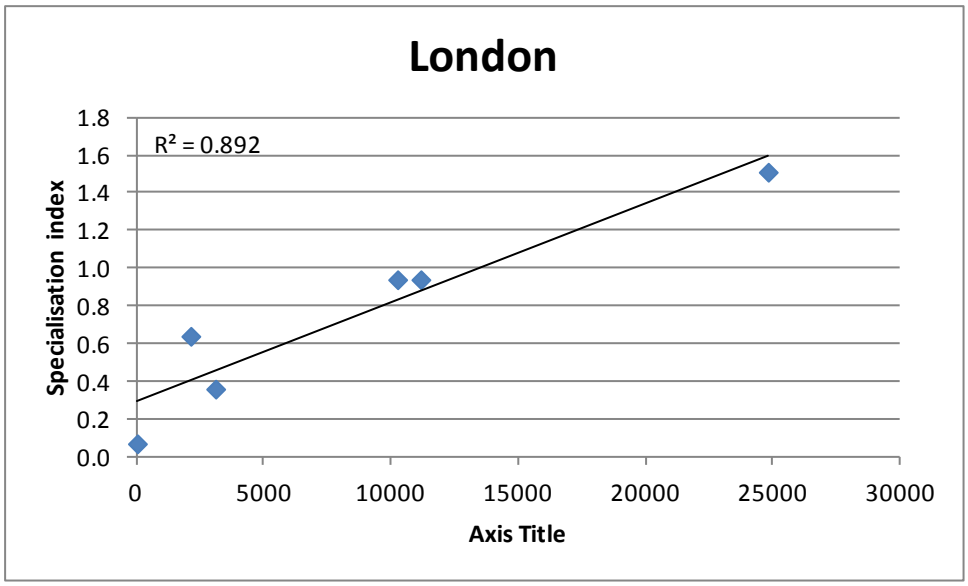
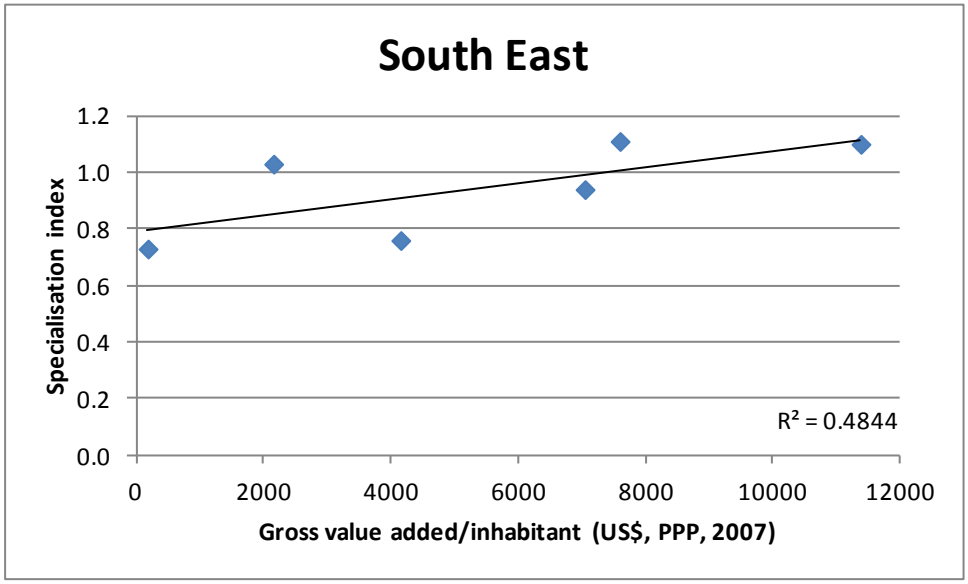


Figure 29. Correlation between specialisation and value-added activities in southeast England



ANNEX 4: CLASSIFICATIONS OF PORT METROPOLISES

Our typology of port metropolises based on spatial criteria identifies several attributes:

- cities that are the main market of a given port;
- ports that are the main gateway of a given city;
- whether the main city is adjacent to the main port;
- whether there is competition and/or complementarity among multiple cities and ports;
- the respective urban size of cities linked with ports, and the distance between them.

Four main spatial configurations of port cities are likely to cover the multiplicity of real-world situations:

- monocentric metropolitan areas with a single port;
- polycentric metropolitan areas (several urban cores) with a single port;
- polycentric metropolitan areas with multiple ports;
- metropolitan areas without ports.

Monocentric metropolitan areas with a single port

This category is perhaps the most common, although it covers a wide variety depending on the topographical site (e.g. bay or estuary) and on the spatial agency and level of port activities with regard to the urban space. Every port city can be defined by the proximity of a seaport and a coastal city. The adjacent urban centre is the immediate hinterland of the port.

Monocentric metropolitan areas with multiple ports

While small and medium-sized port cities often have a single port, larger cities have deployed several port sites across or near the metropolitan area. Three factors may explain such a trend: the shift of modern terminals towards deep-sea locations, as in the case of the European estuaries of London, Bordeaux and Nantes (Bird, 1963; Brocard *et al.*, 1995); the creation of a "new port" along the coast near several major Asian port cities, for instance with Busan, Mumbai, Karachi (Eliot, 2003); or the scattering of port terminals with different functions that serve a dominant city (e.g. Athens-Piraeus). Terminals located in the inner city still handle cargo, if to a more limited extent than new terminals. Another example is Shenzhen (China), which includes several container ports often separated in official statistics even though they are located in the same urban area (Yantian, Chiwan, Shekou and also Nansha), which causes congestion of cargo flows due to cross-city trucking on one main artery (Ducruet, 2010). Vance has another model for spatial patterns of port-related urban systems (1970) distinguishing between "home" urban systems (upstream dominance) and "colonial" urban systems (coastal dominance).

Polycentric metropolitan areas (several urban cores) with a single port

Many situations exist in this category. The most common is a large non-port city linked to a smaller port city by urban sprawl at a distance of no more than 10 kilometres away (e.g. Athens-Piraeus, Lima-

Callao, Lagos-Apapa, Accra-Tema, Jakarta-Tanjung Priok, Surabaya-Tanjung Perak). The port city is administratively a distinct urban entity, but is physically and functionally enmeshed with the non-port city. Another instance is two large neighbouring cities of which only one has a port, such as Oakland-San Francisco and the Liverpool-Manchester conurbation. When longer distances separate the non-port city and the port city, they cannot be considered a single entity on a local level, respectively falling into the first and fourth categories.

Polycentric metropolitan areas with multiple ports

This last configuration differs from the others because it involves at least two port cities in contiguity or proximity, forming a coherent entity in which cities and ports are managed by distinct municipalities and authorities. Continued urbanisation and high density are criteria that also help to define such cases. Examples of coastal conurbations with at least two adjacent port cities include: Gdynia-Gdańsk (Poland), Los Angeles-Long Beach, Seattle-Tacoma, Miami-Port Everglades, Portsmouth-Norfolk-Newport News (US), Osaka-Kobe, Tokyo-Chiba-Yokohama (Japan) and Lisbon-Setubal (Portugal). Sometimes such contiguity leads to administrative merger (e.g. Copenhagen and Malmö) or to a division of labour in terms of traffic (e.g. Fukuoka and Kitakyushu). Depending on the geographic scale, different port cities in proximity may or may not be considered as forming one single polycentric entity despite internal discontinuities, such as the megalopolises of Tokyo-Osaka and Boston-Washington, the Pearl River Delta, the polycentric region of the Randstad (i.e. Rotterdam and Amsterdam), Bremen and Hamburg in Germany, Southampton and Portsmouth in the UK. There is, however, no recognised international benchmark defining such coherent "port regions".

Metropolitan areas without ports

In this category, the non-port metropolis is defined as a main city of a given country that does not have a seaport due to its inland location. The definition may be further extended to any large inland city without a seaport, whether or not it is the biggest in the country. The main issue of non-port metropolises is efficient access to the sea via land transport. The non-port metropolis can be considered to concentrate the main portion of the port city's hinterland. Another issue is the identification of the maritime gateway of the non-port metropolis. Due to the fact that several non-port metropolises are connected to sea transport via several possible maritime outlets, a choice has been made to retain only the nearest maritime outlet (port city). Many port cities operate as a gateway for inland corridors, which implies that their port not only serves the local market but also other cities that are more or less distant from the coast. Although it is relatively easy to identify which main inland city is the core market area of a given seaport (e.g. Paris for Le Havre, Sao Paulo for Santos), it is not always so clear which seaports are the gates of a large inland city (within or across national boundaries), because of the lack of detailed data on landward port-related transport flows at disaggregated (inter-city) level. Based on such criteria, we propose a list of about 50 identifiable cases worldwide (Table 1), regardless of their political and developmental circumstances. Among these, a set of subcategories are distinguished based on the spatial configuration of the relation between port city and non-port metropolis.

Several indicators are used for testing the validity of the chosen sample that we discuss in terms of their relevance for the study (see Table 1):

- *Closest maritime access of the non-port metropolis*: In some cases, multiple port cities serve the main non-port city at a comparable distance, such as Santiago (Valparaiso, San Antonio/San Vincente), Cairo (Alexandria, Damietta, Port Said), Quito (Manta, Guayaquil), Riyadh (Jeddah, Dammam), Guatemala City (Puerto Barrios/Santo Tomas de Castilla, Puerto Quetzal), Bogotá (Buenaventura, Santa Marta, Cartagena) and San Jose, Costa Rica (Caldera, Puerto Limón). The closest port city does not always handle the highest volume of traffic, because the shortest distance to the core market is not

the only criterion, despite the higher cost of land transport versus sea transport. Many factors distort the figure, such as the quality and efficiency of port infrastructure, hinterland accessibility and the importance of transhipment flows in port traffic. For instance, although Dammam (Saudi Arabia) and Buenaventura (Colombia) are not far from Riyadh and Bogotá, their container traffic is much less heavy than that at Jeddah and Cartagena respectively. Those ports generate substantial transhipment flows thanks to their central location within maritime networks and their proximity to strategic canals (Suez, Panama).

- *Road distance between the port and the non-port metropolis*: This distance has been calculated based on the shortest road link between the two cities, measured in kilometres. This indicator is used as a proxy for transport cost between gateway and core market, although infrastructure quality and elevation are not included. We can hypothesise that distance to and from the core region has a direct impact on the development capability of the port city, as expressed in some New Economic Geography models dealing with the "lock-in effect" of large urban concentrations on port cities (see Fujita and Mori, 1996).
- *Demographic versus economic weight of cities*: Demographic weight is the most widely available indicator for comparing cities. Here we use the number of inhabitants of the urban agglomeration (continuous urbanised area). We multiplied this number by GDP per capita figures at country level as a proxy for economic weight, since demographic numbers in different countries might not express the same economic reality.
- *Total tonnage versus total containers*: Containers and total throughput are listed separately in order to test their relationship with the configuration of urban systems.

Four types of situations appear:

- *The port city has a relatively large population in relation to the non-port metropolis, and is separated from it by a large (over 200 kilometres) distance (**independent port metropolis**)*. This is the case of St. Petersburg and Moscow, Johannesburg and Durban, Odessa and Kiev, Mombasa and Nairobi, Pointe Noire and Brazzaville, Dammam and Riyadh. Those at a shorter distance but with a similar profile include Valencia (Spain), Gdańsk, Douala, Chittagong, and Tianjin (although it is only 160 kilometres from Beijing). Such port cities have benefited from being the most direct maritime access for the country's core region, while the long distance from the latter has allowed substantial autonomy (self-agglomeration and hub effect) locally. Distance has encouraged the establishment of intermediate functions as well as additional control functions around the port area, thereby limiting the lock-in effect exerted by the core region.
- *The port city has a relatively large population in relation to the non-port-metropolis and is separated from it by a shorter (less than 100 kilometres) distance (**short-range corridor**)*: This category is characterised by a "corridor effect" or spatial dilution of economic activities and continuous spread of urbanisation between the core region and port city, which in many cases (especially in developing countries, where urban development has been faster over recent decades) has produced one single large urban entity. Nevertheless, such corridors differ from the aforementioned "monocentric metropolitan area with a single port", due to the greater efforts needed to transfer cargoes to and from the coast, especially along a densely populated and urbanised axis where multiple flows are concentrated. Explicit cases include Antwerp-Brussels, Taipei-Keelung, Haiphong-Hanoi, Port Klang-Kuala Lumpur, Santos-Sao Paulo, and Incheon-Seoul. Spatial proximity to the nearest outlet in the latter case may be misleading, since Busan concentrates 90% of the nation's seaborne container flows, thanks to its proximity to major shipping routes and despite its location 400 kilometres from Seoul.
- *The port city has a relatively small population in relation to that of the non-port-metropolis, and is separated from it by a large distance (**long-range corridor**)*: The reason why the size of the port city

has remained low compared with the core region can be explained by two principal causes. First, a very good landward access between port city and core region is seen by Fujita and Mori (1996) as a negative factor for local port-related urban and economic growth, since higher-level decisions tend to be made at the core region. This explains why this category is defined by moderate distances that do not impose huge constraints on regular lorry shipping between port city and core region, restricting the port city to basic daily freight transit functions (O'Connor, 1989). Second, there is often another port city in close vicinity (at a similar distance from the core region) acting as competitor or at least as a complementary gateway. Examples include Rouen for Le Havre, Galati for Constanta, Alexandria and Damietta for Port Said, Varna for Bourgas, etc. In this category, the nearest maritime access of the core region thus faces a double lock-in effect: from the core region itself, and from the neighbouring competitor. Such tensions are exacerbated in a context of regional integration, notably in Europe, since about 40% of French exports pass through Antwerp and other Benelux ports instead of other French ports, while the share of the port of Le Havre in French exports of containers is about 30% in volume and 20% in value (Gouvernal *et al.*, 2010). The share of Greater Paris (Ile de France) in the container traffic of Le Havre port is about 33%, according to the Le Havre Port Authority. Le Havre is more likely to be grouped with port cities such as Constanta, Bourgas, Port Said, Klaipeda and Rostock, although its urban weight relative to Paris is the lowest in this category. Indeed, Rouen concentrates a large share of the port region's economic activities, having a more diversified profile than that of Le Havre.

- *The port city has a relatively small population in relation to the non-port-metropolis, and is separated from it by a small (less than 100 kilometres) distance (**dependent satellite**)*: This is the case of many small port cities (in absolute and relative terms) that have not been able to develop further due to the absence of the corridor effect. Traditionally in Chile, the main gateway of Santiago is Valparaiso, but San Antonio is closer and now handles more containers, explaining the limited urban size of San Antonio; the corridor effect has historically been more intense towards Valparaiso. In several cases, the nearest maritime outlet has been bypassed by the core region, whose freight was more likely to use more distant ports despite the cost of land transport (e.g. Naples and Genoa for Rome). Other causes are simply a sign of limited economic development in recent decades, lowering port-related growth locally (as in Bar, Montenegro; Koper, Slovenia; Massawa, Ethiopia; Caldera, Costa Rica, and Acajutla, El Salvador).

- *Exceptions*: Bandar Khomeini and Buenaventura have a very limited urban weight, although they are located far from the country's main city. This is probably because of their remoteness from major trade routes compared with other ports in the same country (*cf.* Shahid Rajaee, Cartagena), which may be farther from the main city but have better access to shipping routes and are preferred for international trade and landside services towards inland regions.

Table 1. Nearest maritime gateways of non-port metropolises

Country	Non-port metropolis		Port city					Distance (km)
	Name	Population	Name	Population	Rank	Containers	Tonnage	
Albania	Tirane	570	Durres	180	2	N/A	N/A	30
Bangladesh	Dhaka	9912	Chittagong	2941	2	1070	28198	260
Belgium	Brussels	2227	Antwerp	1164	2	8664	189390	40
Brazil	São Paulo	17833	Santos	1474	12	2675	81058	70
Bulgaria	Sofia	1205	Bourgas	193	4	37	4500	360
Cambodia	Phnom Penh	999	Sihanoukville	17	23	259	2058	200
Cameroon	Yaounde	2298	Douala	2101	2	270	7068	200
Chile	Santiago	4658	San Antonio/S.V.	83	26	1292	30788	100
China	Beijing	9862	Tianjin	6042	6	8500	356000	160
Colombia	Bogotá	7735	Buenaventura	292	16	743	9252	900
Dem. Rep. Congo	Kinshasa	8900	Matadi	291	15	N/A	2050	300
Republic of Congo	Brazzaville	1217	Pointe Noire	693	2	321	N/A	450
Costa Rica	San Jose	1724	Caldera	40	5	170	3465	75
Croatia	Zagreb	691	Rijeka	143	3	169	12392	160
Ecuador	Quito	1399	Guayaquil	1952	1	566	12489	350
Egypt	Cairo	16429	Port Said	607	6	3202	31084	180
Eritrea	Asmara	1304	Massawa	49	4	N/A	N/A	70
France	Paris	11174	Le Havre	254	21	2489	79809	200
Georgia	Tbilisi	1314	Poti	47	5	210	8080	300
Germany	Berlin	5076	Rostock	201	27	N/A	27200	230
Guatemala	Guatemala City	2318	Puerto Quetzal	8	63	279	6979	100
Honduras	Tegucigalpa	2317	Puerto Cortes	60	7	572	8527	200
Iraq	Baghdad	5402	Basrah-Um Qasr	1914	3	N/A	N/A	450
Iran	Tehran	13236	Bandar Khomeini	70	102	N/A	30412	700
Israel	Tel Aviv	3412	Ashdod	237	5	828	15399	30
Italy	Rome	4022	Civitavecchia	50	114	25	6912	50
Jordan	Amman	1036	Aqaba	80	9	583	16952	260
Kenya	Nairobi	3000	Mombasa	665	2	616	16410	460
Lithuania	Vilnius	542	Klaipeda	192	3	373	29880	250
Madagascar	Antananarivo	1783	Toamasina	225	2	143	N/A	250
Malaysia	Kuala Lumpur	4428	Port Klang	631	3	7974	152349	50
Mexico	Mexico City	19125	Veracruz	592	26	716	17223	350
Montenegro	Podgorica	146	Bar	15	4	N/A	N/A	50
Namibia	Windhoek	233	Walvis Bay	42	3	171	3031	260
Nicaragua	Managua	1837	Corinto	16	25	59	1918	130
North Korea	Pyongyang	3270	Nampo	471	4	5	1261	60
Poland	Warsaw	2260	Gdansk-Gdynia	865	4	796	33248	345
Romania	Bucharest	2279	Constanta	310	3	1381	61838	200
Russia	Moscow	14188	St. Petersburg	4957	2	1987	59945	650
Salvador	San Salvador	1700	Acajutla	28	14	156	4436	90
Saudi Arabia	Riyadh	4087	Dammam	1797	3	1247	23596	400
Slovenia	Ljubljana	258	Koper	23	6	354	16050	90
South Africa	Johannesburg	8153	Durban	3512	3	2642	41402	450
South Korea	Seoul	18318	Incheon	2230	3	1703	141815	30
Spain	Madrid	6050	Valencia	1706	3	3602	59425	250
Sudan	Khartoum	10082	Port Sudan	579	2	391	8401	660
Syria	Aleppo	3468	Lattakia	371	5	570	9300	150
Taiwan	Taipei	8511	Keelung	390	10	2055	91261	30
Ukraine	Kiev	2982	Odessa	1121	5	572	34500	450
Venezuela	Caracas	3400	La Guaira	23	50	437	585	25
Vietnam	Hanoi	2749	Haiphong	1984	3	790	13800	90
Yemen	Sanaa	2079	Hodeidah	471	4	270	N/A	140

Sources: OECD based on *World Gazetteer* (2010), *Containerisation International* (2008), *Journal de la Marine Marchande* (2010).

ANNEX 5: METHODOLOGY ANALYSIS OF GLOBAL NETWORKS OF ADVANCED MARITIME SERVICES

The data is extracted from the World Shipping Register (WSR) database, available online. The database is compiled by WSR, a private company, and is based on information provided by port authorities, shipping companies and classification societies. WSR provides up-to-date information on companies involved in the shipping industry, including the type of firm and the location of its establishments on a city level. Based on a detailed classification, we distinguish the following categories of maritime service firms: maritime law, P&I clubs, fixed premium insurers and insurance brokers, classification societies, consultants, surveyors and inspections and maritime branch associations. This has been complemented by the office locations of the 37 largest ship-financing banks in the world (e.g. HSH Nordbank, Nordea, BNP Paribas, etc.). We remove double counts and update information on the location of each maritime service establishment, using companies' web sites and annual reports. The database included 5 036 advanced maritime service firms and 10 782 establishments located in 2 569 cities. The 739 firms with more than one establishment are particularly interesting for our analysis.

To measure the relations between establishments participating in the global network, Taylor (2001) argued that only the location and hierarchical structure of a firm (and its establishments) is needed to study world city network formation. The starting point of the network analysis is a matrix with the so-called service values of firm j in city i. With respect to this service value, we assume the more important the establishment is, the higher the service value v will be. We largely adopt the methodology of Taylor et al (2002) to determine v, with some adjustments. When there is no office of firm j located in city a, j zero is assigned. When there is a normal subsidiary (establishment) of a certain firm located in city a, a score of 1 is given. Headquarters of firms with 15 or more establishments will get a score of 5. Regional headquarters of such firms will score 3 points. Headquarters of a firm with 8 to 15 establishments will get a score of 4, between four and seven establishments a score of 3 and headquarters of a firm with two or three establishments will score 2.

Then the "elemental interlock link" r between two cities a and b, for firm j is:

$$r_{ab,j} = v_{aj} \cdot v_{bj}. \qquad (1)$$

The aggregate city interlock link is the total of relations between a and b of all establishments located in city a and b. This is defined as:

$$r_{ab} = \sum_{\forall j} r_{ab,j} \qquad (2)$$

We divide this city interlock link by the highest city interlock (in our case Hong Kong-London) to arrive at the relative city interlock link. Based upon these findings, we can construct a global network of maritime services. For the purpose of benchmarking, we make a selection of four particular regions: Seine Axis in France, Thames Gateway in the UK and the Pearl River and Yangtze River Delta Regions in the People's Republic of China. We have selected the relevant locations within these regions from our dataset and mapped the global interurban networks for each region individually by removing all other links not connected to the region in question.

ANNEX 6: LOCALISATION AND GLOBAL NETWORKS OF ADVANCED MARITIME SERVICES

Table 19. Strongest links in advanced maritime services between cities

City link	City interlock	Relative city interlock
Hong Kong-London	273	1.000
London-Singapore	266	0.974
London-New York	208	0.761
London-Paris	180	0.659
Dubai-London	165	0.604
Hong Kong-Singapore	142	0.520
London-Shanghai	128	0.469
London-Tokyo	126	0.461
Houston-London	119	0.436
Hong Kong-Paris	118	0.432
Frankfurt-London	117	0.429
Amsterdam-London	110	0.402
Dubai-Singapore	110	0.402
Brussels-London	107	0.392
Hamburg-London	107	0.392
Hong Kong-New York	106	0.388
Houston-Singapore	106	0.388
New York-Paris	101	0.370
London-Piraeus	100	0.366
New York-Washington DC	98	0.359
Hong Kong-Shanghai	95	0.348
London-Moscow	95	0.348
London-Oslo	95	0.348
Shanghai-Singapore	95	0.348

Figure 30. Localisation and connections in Thames Gateway

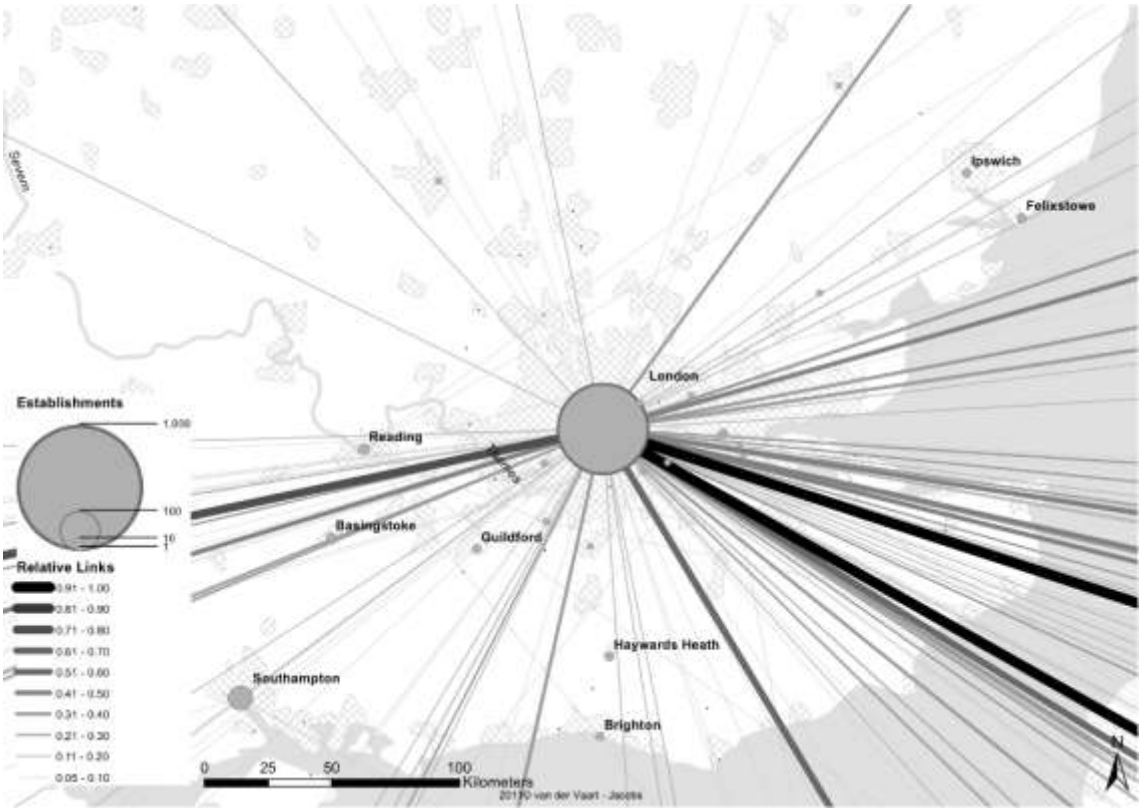


Figure 31. Global network of London for advanced maritime services



Figure 32. Localisation and connections in the Yangtze River Delta

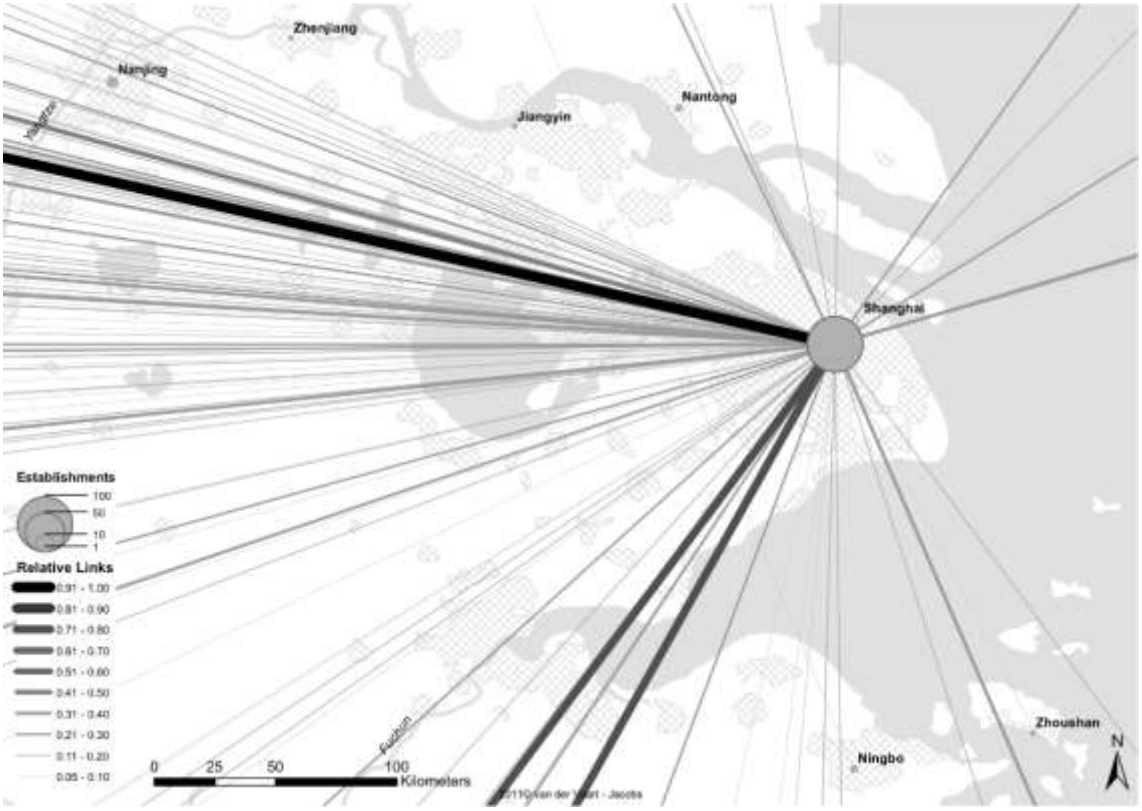


Figure 33. Global network of Shanghai for advanced maritime services



Figure 34. Localisation and connections in the Pearl River Delta

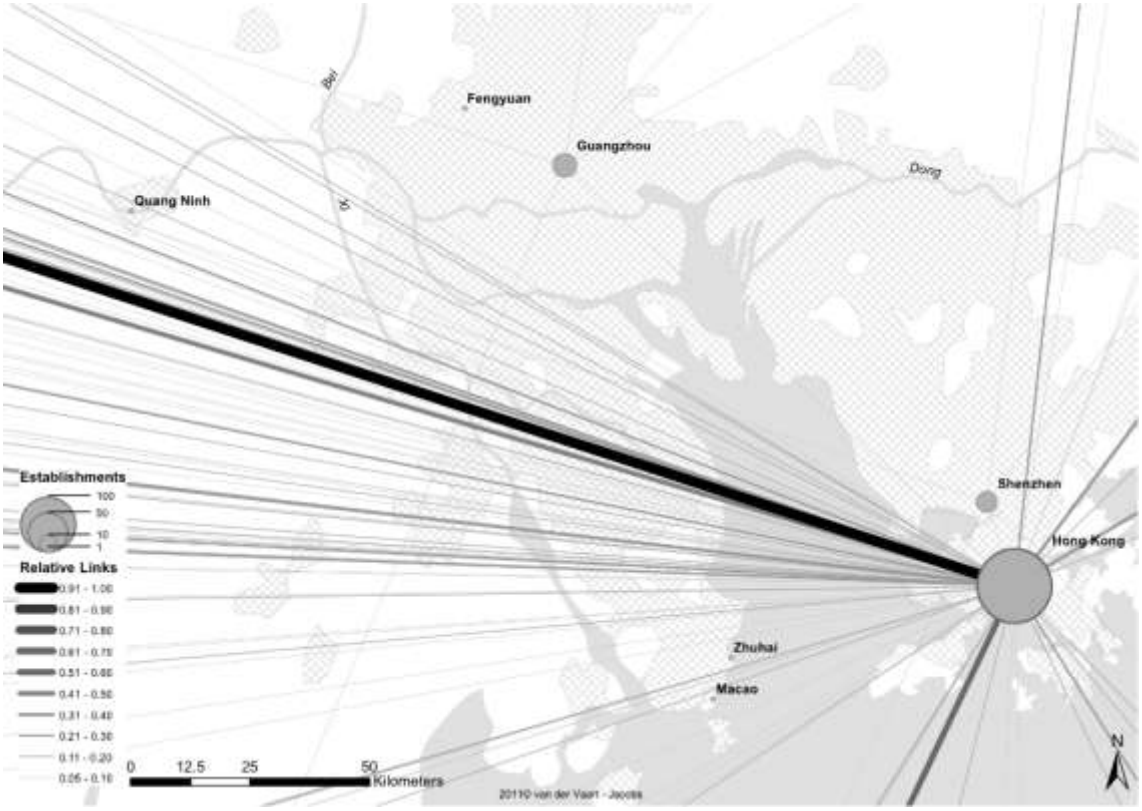


Figure 35. Global network of Hong Kong for advanced maritime services



ANNEX 7: THE SCIMAGO RANKING OF UNIVERSITIES

Table 20. Universities in different European port cities

Institute	Global ranking	Ranking among European port-cities	Publication index	Quality index	Intensity of co-operation	A	B
UVA Amsterdam	53	1	20608	10.51	42.3	1.07	1.73
Universitat de Barcelona	127	2	12584	8.18	43.18	1.06	1.35
Universitat Autonoma de Barcelona	179	3	10444	6.37	43.6	1.04	1.27
VU Amsterdam	227	4	8812	9.28	48.41	1.06	1.54
Universitat de Valencia	238	5	8538	7.21	44.78	1.03	1.26
Erasmus Rotterdam	253	6	8172	12.24	38.85	0.98	0.84
TU Delft	256	7	8156	5.27	41.6	0.93	1.56
Universität Hamburg	288	8	7544	8.52	48.57	1.05	1.31
Polytechnica de Valencia	406	9	5458	4.62	29.72	0.96	1.22
Universität Bremen	539	10	4150	5.55	45.33	0.97	1.28
Universität Antwerpen	639	11	4793	7.84	59.09	1.05	1.39
Université de Rouen	1035	12	1903	5.57	42.41	1.03	1.03
Université de Caen	1196	13	1474	5.6	37.52	1.03	1.06
Jacobs University of Bremen	1421	14	1041	7.75	53.89	1.05	1.6

Source: Scimago database

Note: The universities are ranked according to their volume of publications (column 3). The fourth column is an indicator measuring the quality of the articles published by using a citation index. Column 5 indicates the share of articles produced in co-operation with foreign higher education institutes. « A » indicates the relative importance of journals that publish the articles of a university. « B » compares the average scientific impact of an institute compared to its average global impact.

NOTES

1 www.elysee.fr/president/les-actualites/discours/2009/discours-sur-la-politique-maritime-de-la-france.5493.html (viewed online 2 June 2011); http://www.elysee.fr/president/root/bank/pdf/president-11204.pdf (viewed online 2 June 2011).

2 The study was commissioned by the *Agence d'Urbanisme de la Région du Havre et de l'Estuaire de la Seine* (AURH), the *Agence d'Études d'Urbanisme de Caen Métropole* (AUCAME), the *Atelier Parisien d'Urbanisme* (APUR), the *Institut d'Aménagement et d'Urbanisme de la région d'Ile de France* (IAU IDF), the *Agence d'Urbanisme et de Développement de la Seine Aval* (AUDAS), the city of Le Havre, the *Communauté de l'Agglomération Havraise* (CODAH), the *Communauté de l'Agglomération Rouen-Elbeuf-Austreberthe* (CREA), the port of Le Havre (GPMH), the port of Rouen (GPMR) and Ports de Paris.

3 This canal will link the Seine (and the Oise) river with the extensive inland water network of Belgium, the Netherlands and Germany.

4 In order to avoid double counting, the throughput volumes of the port of Paris are not taken into account in this figure, but the volumes of Le Havre, Rouen and Caen are included.

5 Figures for 2010 include the first two quarters due to availability of comparable data; figures for 2010 are extrapolated on the basis of this.

6 Greater Paris is here defined as the French departments in the Ile de France, as well as Oise, Eure et Loire, Loiret, Yonne, Aube and Marne. Western France consists of the departments of Seine-Maritime, Eure, Calvados, Orne, Manche, Sarthe, Mayenne, Ille et Vilaine, Côte d'Armor, Morbihan, Finistere. The central east of France is here defined as the departments of Cher, Nièvre, Cote d'Or, Haute Saône, Doubs and Jura. The north east is here defined as Meuse, Moselle, Meurthe et Moselle, Haute Marne, Vosges, Bas Rhin and Haut Rhin. The north is here defined as Pas de Calais, Nord, Somme, Aisne and Ardennes.

7 The fact that detailed hinterland statistics do not exist for the port of Le Havre is telling. Both the port of Rotterdam and Antwerp have very detailed hinterland information, categorised by mode, commodity and by country.

8 Data provided by the port of Rotterdam.

9 These findings need to be interpreted with some caution, because they are based on KOMPASS employment data, which could be considered approximations rather than officially confirmed employment data.

10 This commodity diversity index is comparable with the relative diversity index proposed by Duranton and Puga (2000) and has for the first time been applied to seaports by Ducruet *el al.* (2010). It allows for correcting and comparing differences in commodity shares at the European level.

11 These possibilities have been well documented recently and receive rather pessimistic results from scholars. These can be explained by the negative perception of such opportunities by ocean carriers (Lasserre, 2011), low economic benefits, as well as the problem of geopolitical control (e.g. Russia), despite the theoretical advantage of reducing time and distance between Europe and Asia (Liu and Kronbak, 2010).

12 These are growth estimations for 2020 as compared to the base year 2000.

13 Web site of *Rotterdam Climate Initiative*, on 31 May 2011. www.rotterdamclimateinitiative.nl/en/about_rotterdam_climate_initiative/rotterdam_climate_initiative/mission_ambition

14 The value added of the different port clusters has been calculated on the basis of direct port employment and indirect (port-related) employment figures, differentiated according to economic sectors. The average regional productivity per worker has been used to translate these employment figures in value added.

15 Only multi-office firms are included in the dataset and linkages weaker than 0.05 are excluded, so these locations are in reality likely to host more firms.

16 "*Rouen a le poids industriel d'une métropole européenne sans en avoir les structures de décision qui, pour l'essentiel, sont à Paris… Rouen se présente donc comme une lointaine banlieue industrialo-portuaire de Paris*" (Dumont, 2006).

17 Employment figures for Paris originate directly from the Port of Paris authorities and have not been subject to objective, outside scrutiny.

18 The Bremen Rule states that the value added created by one ton of general cargo (conventional cargo, RORO and containers) equals the value added of three metric tons of dry bulk and 12 tons of liquid bulk. The Dupuydauby Rule attributes the following co-efficients to the different traffic categories: 12 to crude oil, 9 to liquid bulk, 6 to dry bulk, 3 to containers and RORO and 1 to conventional cargo. The Range Rules uses the following co-efficients: 1 for RORO; 1 for conventional cargo; 3 for containers; 5 for dry bulk; 2 for liquid bulk; and 18 for crude oil. See Haezendonck *et al.*, 2000.

19 Around 7% of the CPER.

20 The waterway network of the Ile de France comprises 500 kilometres of navigable routes on the Seine, the Marne and the Oise, 170 kilometres of canals and 70 ports.

21 Including Gennevilliers, Bonneuil, Limay, Evry, Bruyères sur Oise, Montereau, Achères, Triel and others.

22 EUR 6 million in the PER envelope and EUR 6 million outside the envelope (primarily FEDER).

23 Experience on the Paris-Marseilles line, however, shows that this is not guaranteed.

24 See the Blum report (2010), *La desserte ferroviaire et fluviale des grands ports maritimes.*

25 La *Société d'Aménagement des Interfaces Terrestres du Port du Havre* (SAITH) is an association of cargo handling and rail operators. It also handles transshipment operations at Port 2000.

26 Blum, *op.cit*.

27 The port of Le Havre signed an agreement with the port of Rouen and RFF at the end of 2009 for the development of rail freight traffic and industrial zones and associated logistics. The port of Le Havre will supply computerised data access for the rail operators and will help establish an information exchange platform between transport and loading operators. As part of the efforts to develop feedering and cabotage, the port signed a partnership agreement in December 2010 with *Ports Normands Associés*, the management authority for the ports of Caen-Ouistreham and Cherbourg. It will set up a seagoing container shuttle service between the ports of Caen and Le Havre, thereby reducing road haulage of containers and putting the port in a position to capture a portion of traffic from the west of France.

28 With respect to tugboat operations, for example, the local subsidiary of Kotug in Le Havre failed to win approval from the French authorities for its work organisation. It recently withdrew, and Abeille/Beluga resumed its monopolistic position in the port of Le Havre.

29 As far as inland waterway transportation is concerned, these operations have traditionally been dominated by the shipping lines.

30 The AIS project was launched at the initiative of the port authorities of Antwerp in co-operation with the terminal operators PSA, HNN and P&O Ports. The project was also strongly supported by INFRABEL.

31 See the prime minister's speech at Marseilles in 2010.

32 For example the *écoles de la batellerie* (inland waterway shipping schools) at Barentin and at Conflans Sainte Honorine.

33 The members of NOVALOG, the country's only logistics cluster, are divided into three *collèges*: *i)* "Enterprises", including *Logistique Seine Normandie*, *Union des Ports de France*, *Grand Port Maritime du Havre*, *Chambre Régionale de Commerce et d'Industrie de Haute Normandie*, *Grand Port Maritime de Rouen*, VIALOG, SETEC INDUSTRIES, IBM, SOGET, AGORA Consult, *Club Tic de Normandie*, Robert BOSCH France, France TELECOM/ORANGE, LA POSTE, *Buffard logistique*, Ports de Paris, PST; *ii)* Research and teaching, including the University de Rouen, INSA, CRITT T&L, IDIT, ESIGELEC, CETMEF, the University of Le Havre, Rouen Business School and *iii)* local governments (*collectivités locales*), including the *Conseil Régional de Haute-Normandie*, Dieppe Maritime (*Communauté d'Agglomération de la Région Dieppoise*) and CODAH.

34 These are: INTRADE (IV B Nord Ouest), intelligent transport system demonstration project; CAMIS (integrated strategy) France Manche and PROPOSSE (new routes).

35 This ranking, however, covers all fields of research, not only marine research.

36 GPMH, Strategic Plan 2009-2013, revised version, July 2010.

37 This contract, signed in 2009, was 84.5% financed by CODAH, 9.2% by the region, and 6.3% by the *département*. At EUR 879 million, it doubled the amount of the previous contract.

38 The *Centre de la Mer et du Développement Durable* seeks to demonstrate the modern nature of international maritime navigation, the technical complexity of large ports, the economic and industrial dimension of port lands and estuaries, as well as the fragility of the littoral zones of estuaries and oceans in their relationship with the economic activities concentrated along the seacoasts.

39 Figure for 2006.

40 *Cf. Projet d'extension des infrastructures portuaires et de prolongement du Grand Canal du Havre, Débat Public, Dossier du maître d'ouvrage.*

41 *Conférence sur les réalités de l'Axe Seine,* Paris 2010.

42 This goal relates only to the portion of traffic that concerns the carriage of goods to and from the port.

43 The state is planning to invest EUR 7 billion in years to come under the measures decided in September 2009. The goal is to modernise the freight network, develop railways, establish the rail operator in the ports, and improve the reliability of routings. The plan initially called for transferring personnel between the French national railway, SNCF, and its freight branch. It now seems to have given up on these transfers. The plan is proving difficult to implement and is advancing very slowly.

44 The European EFFORTS project seeks to improve the safety of navigation in seaports, to reduce annoyance caused to nearby residents by port activities and to provide training for this.

45 In the case of new projects for the multimodal platform and for expansion of the Grand Canal, the emphasis is on ecological mapping by differentiating zones as a function of their environmental wealth. This has been measured in these two cases by the local density of rare or protected species.

46 In its annual report, the port of Rotterdam provides a number of environmental indicators, including its CO2 footprint. The port of Antwerp has just published its first report on its contribution to sustainable development.

47 See the IMPACTE study financed by the European Commission in 2006, "Working package: Impact of Cruise Traffic in Zeebrugge and Ostende".

48 See *Projet Stratégique de Ports de Paris* (November 2010).

49 See *Futuribles*, December 2009, No. 358; *Service Public: le défi de l'innovation: L'avenir des ports maritimes.*

50 *Ports Normands Associés* – press release, *Le GPM de Rouen et PNA s'engagent pour un développement intelligent*, October 2010.

51 Under the reform, private port interests can become involved in the port hinterland. Thus, Limay Terminal, which operates the terminal at the river port of Limay, is a subsidiary of *Société Havraise de Gestion et de Transports* (SHGT), a stevedore company located at the port of Le Havre, and of the *Société Co-opérative de Transport Fluvial* (SCAT), a river carrier specialised in container traffic.

52 OECD Territorial Reviews, *France 2006*.

53 *Code Général des Collectivités Territoriales,* Art. L. 5216-5.

54 Laetitia Dablanc, "*Le fret vu par les régions*", in Marianne Ollivier-Trigalo (dir.), *Six régions à l'épreuve des politiques de transport, Décentralisation, régionalisation ferroviaire et différenciation territoriale*, February 2007.

55 Ningbo Port Corporation Limited (2011), open announcement for related party transactions in 2010 and 2011 (stock market listing code 601018), in Chinese.

56 China Shipping and Trading Network (2010), "Ningbo Port Explains Competition and Co-operation with Shanghai Port", interview with Weiping Huang, spokesperson of the Ningbo Port Group Corporation on 30 July 2010, www.snet.com.cn/106/2010_7_30/3_106_228615_370_5_1280457003231.html, accessed 10 May 2011, in Chinese.

57 NDRC (National Development and Reform Commission) (2009), News release on the strategic alliance among Qingdao, Rizhao and Yantai ports, www.ndrc.gov.cn/dqjj/zhdt/t20090423_274365.htm

58 *Code des Ports Maritimes* – Art. L102-1.

59 *Code des Ports Maritimes* – Art. L102-26.

60 *Code des Ports Maritimes* – Art. L103-1.

61 *Code des Ports Maritimes* – Art. L111-6

62 ISEMAR – Marie Douet and Emmanuel Gambet, *Note de Synthèse n°121 – La Réforme des Grands Ports Maritimes de 2008 – Premier Bilan – 2008.*

63 Yves Crozet in *Club parlementaire HERMES Mobilité et Transport durables*, "*La contribution du fret ferroviaire à la mobilité des marchandises en France et en Europe*", February 2010.

64 *Grand Port Maritime du Havre* web site: *www.havre-port.fr,* 21 March 2011.

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