The Seaports of the Seine Axis Facing Contemporary Maritime Industry Mutations

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Maritime industry is constantly evolving and striving for increased innovation. Past years have been exceptionally interesting. Major trends like globalization and containerization have and continue to reshape the industry. These changes can be illustrated by strategic alliances between ship-owners trying to reshuffle circulatory and port maps. Thus, in its constant quest for optimization, maritime transport requires continuous modification of infrastructure. Due to the increasingly competitive environment, major seaports also tend to draw up new strategies to become more attractive. It represents a system of spatial and temporal interactions and the territorial implications of supply chains and transportation are not negligible. In this respect, the paper proposes to analyze a singular location: the Seine Axis. The axis is concentrating on its territory. It is France's leading port complex and the fourth largest in Europe. The area combines the maritime interface structured around the ports of the River Seine estuary with the metropolitan interface supplying the market of over 11 million inhabitants in the Ile-de-France region. This paper aims to qualify the port system of the Seine Valley in order to analyze the manner of its adaptation to recent, rapid and numerous changes in the contemporary maritime world. The paper will address the attractiveness and efficiency of ports in globalized economy, and the highly competitive European context. The paper is based on ports' statistics and in-depth bibliographical research. The paper will also integrate some results from the CIRMAR platform which is using the Automatic Identification System (AIS) to analyze maritime traffic.

KEY WORDS
~ Port
~ Seine Axis
~ Region
~ Maritime flows
~ Shipping

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1. INTRODUCTION

The seaports of the Seine axis (Le Havre, Rouen and Paris) are the main entry and exit gateways for the French international trade (Figure 1). Effectively, Le Havre is a global port and Paris a global city.

Le Havre, an estuary port, is capable of acommodating the largest ships and plays a major role in the French economy due to its importance and the diversity of its traffic. But for Paris and the "Ile-de-France" region, Antwerp or Rotterdam would do just as well. Due to being strong competitors of the Seine axis ports, the Northern range ports are constantly making a headway. Consequently, the Seine Axis ports face stiff competition from other ports in northwest Europe, such as Antwerp and Rotterdam. Despite good maritime connections, Le Havre is only a minor European hub, and its position in maritime networks has weakened over the last decade (Merk, 2011). In Europe, the ports of Le Havre and Marseille combined cannot even surpass the port of Antwerp, the second largest port in Europe. The French port complex, which nevertheless enjoys the benefits of an ideal location with exits on both the Atlantic and the Mediterranean, cannot fully exploit its location to attract the flow of goods (Vidil, 2015).

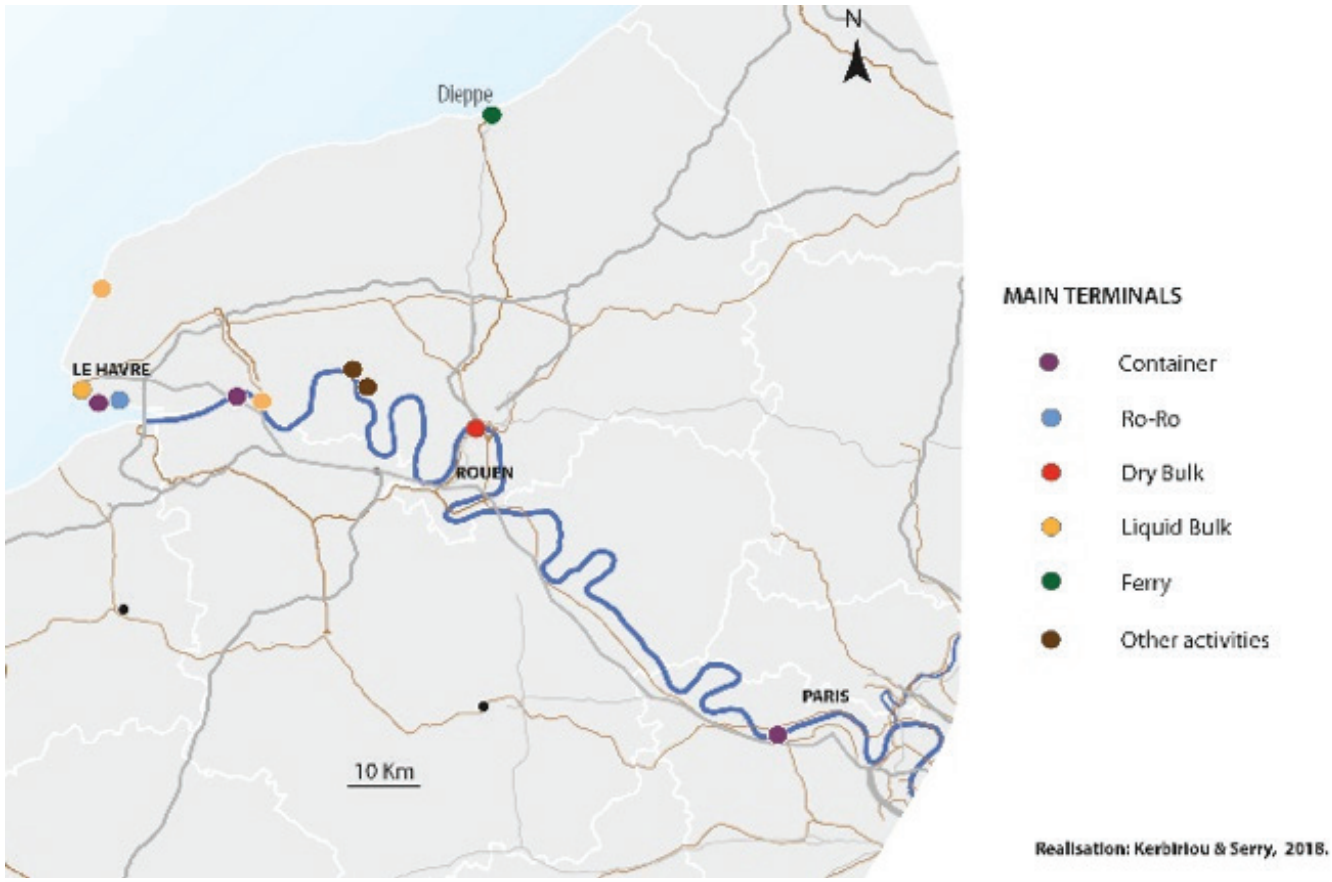

Figure 1.
The ports of the Seine Axis.

2. THE SEINE AXIS PORTS' ORGANIZATION

The term "Seine Axis" is increasingly used by developers, logistics professionals, politicians and academics, frequently to highlight the paradox between the potential and reality in terms of circulation of goods. The extended Paris region, also called *Greater Paris*, is a leading metropolis and represents a crossroads in Europe. It is linked to the world's major sea routes through the ports of Le Havre and Rouen at the end of the Seine route. However, this axis also appears in the contradictory context of a metropolis connected to a major traffic corridor in the form of a river, in which most of the traffic goes by road.

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

- Firstly, it is a market of 25 million inhabitants. The Paris Basin, especially the Ile-de-France region, is fourth in the world in terms of GDP. Its commercial flows are partially captured by foreign ports like Antwerp and Zeebrugge. The Normandy region transports more than 12 million tons of goods to Ile-de-France compared with 30 million tons dispatched by Belgium;
- The river remains underused despite of a recent increase in traffic owing to the need to reduce CO_2 emissions, which has encouraged the development of a modal shift from roads to waterways;
- Another component of this potential is the position of the port of Le Havre: it is the first accessible port for goods entering and the last for goods leaving the northern range, which gives it an advantage in terms of transshipment to ports on Europe's Atlantic coast.
- Finally, port reconstruction has developed a new capacity for handling container flows: six million TEUs for Port 2000, adding to the existing capacity of the port (two million TEUs) and the industrial port area (Serry and Leveque, 2014).

There are 3 major ports in the Seine Axis: Le Havre, Rouen and Paris (Figure 1). These ports are quite different:

- Le Havre is the main seaport, the second largest French port by tonnage and the largest French port for containerized goods. It is also specialized in liquid bulk, in particular crude oil.

Liquid bulk represented 65 % of its traffic in 2010; and 43 % of the total throughput in tones was crude oil, which represented only 15 % of throughput in northwest European ports on average. The secondary specialization of Le Havre is container traffic, although its specialization rate is in line with the average of northwest European ports (28 %) (Merk, 2011).

- Rouen is also a seaport but has a different role due to its location in the bottom of the estuary. Located at the mouth of the Seine, the terminals of port of Rouen in the Seine valley are in the vicinity of the Paris region. Its traffic is mainly dominated by grain (Figure 2). In 2017, with 9.1 Mt of grains exported, regardless of type, the port of Rouen had its best grain season ever.
- The port of Paris is a river port (19,84 Mt in 2017) in a big metropolitan area. It is the leading river port in France and the 2nd biggest in Europe after Duisburg. In fact, it is maintaining and handling the commercial operation of 70 sites in the region.

Figure 2.
Grain handling in Rouen.

The ports are largely complementary and the differences between them offer a potential for synergies. Le Havre has important hub functions for containerized cargo, Rouen is an important player in the niche market of agricultural products, while Paris serves its metropolitan market.

The domestic hinterland is hugely important since approx. 89 % of land transport flowing out of Le Havre is linked to France (Notteboom, 2012). The vicinity of a dense market is a condition for the development of the port's supply. According to the port of Le Havre, only 48 % of container traffic to and from Greater Paris in 2010 came from or went to the port of Le Havre; these figures were 51 % for the west of France. The port of Rouen has a marginal market share outside Normandy. According to the port of Paris, more than 80 % of its hinterland in 2010 was located in Ile-de-France and Normandy.

One major explanation for the limited size of hinterlands other than France is the dominance of HGVs in freight transport from Le Havre. Moreover, the modal share of container barge

transport in ports is significantly lower than elsewhere: 9 % of TEU in Le Havre (32 % in Rotterdam and 33 % in Antwerp) (Lendjel and Fischman, 2012).

In fact the ports of the Seine Axis have difficulty promoting multimodal or combined transport solutions. The competitiveness of combined transport compared with road transport is also due to the commercial policy of combined transport operators. The involvement of the three main shipping lines, Maersk, MSC and CMA CGM in the implementation of waterway-road services on the Seine tended to improve the competitiveness of this mode of transport. In order for clients to shift from road to combined transport, prices must be 10 %-20 % lower (Frémont and Franc, 2010).

In reality, the comparatively 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 between 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 (Merk, 2011).

In reality, French ports are traditionally negatively perceived in several surveys on the preferences of port users. For instance, in a survey conducted by decision makers on port choice, 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 (Aronietis, 2010).

On the maritime side, the foreland of the port of Le Havre is globalized since it includes a significant number of ports located in major maritime facades like the US and especially Chinese coast. It is also the first port of call for the Northern Range, the main commercial interface between Europe and the rest of the world. The foreland of Le Havre port is not limited to this traditional pattern (Figure 3). Indeed, regular lines to South America are also highly developed

The port of Rouen, for its part, has a foreland that we can describe as regionalized or even "Atlantic" since the majority of weekly scheduled calls concern the West African coast and the Caribbean basin. Nevertheless, it is successfully integrated into the world's maritime networks through the practice of transhipment. Their maritime forelands are thus complementary.

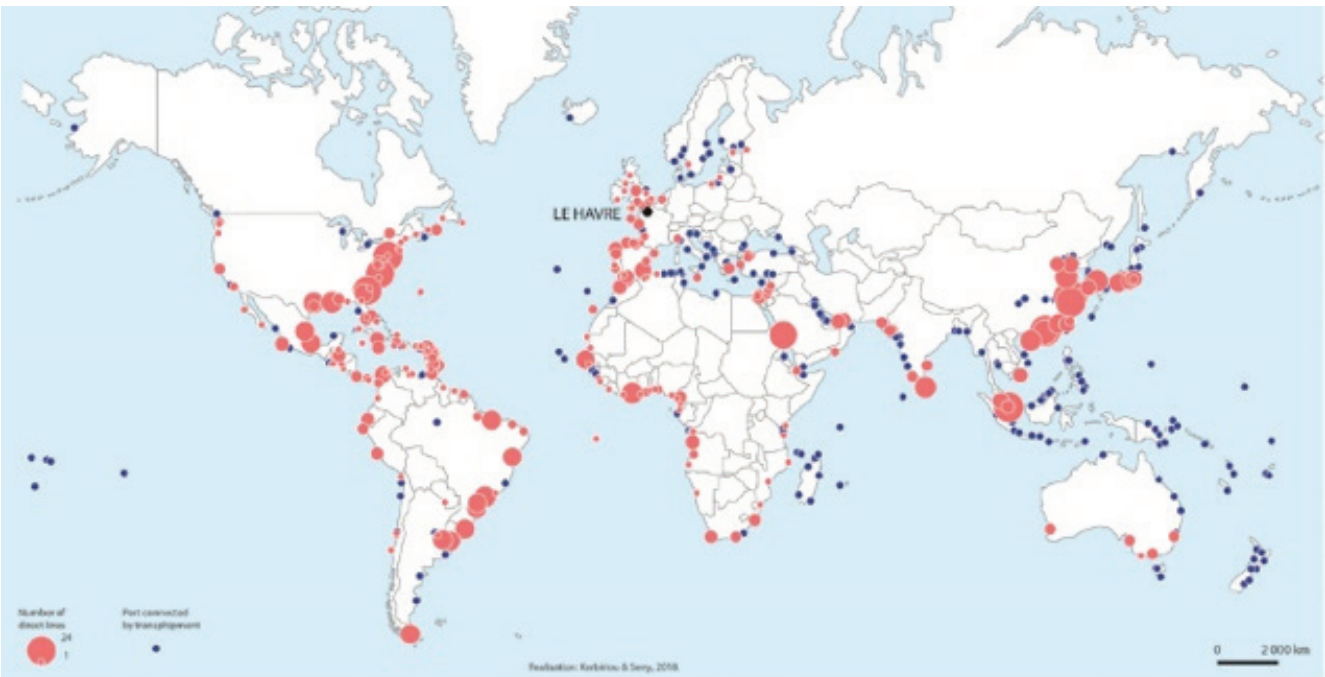

Figure 3.
Maritime foreland of Le Havre.

3. FACING THE CONCURRENCY: THE RISK OF DROPPING OUT

In Europe, port activity is characterized by the concentration of traffic in several major ports, the "main ports", including the preponderance of Rotterdam and Antwerp. The main European ports are for the most part multifunctional ports, although there are exceptions, such as the ro-ro ports of the Straits (Calais, Dublin or Rostock), or the oil ports such as Milford Haven.

At the French level, the ports of the Seine Axis, with 92,6 Mt of traffic in 2017, are leaders and more resilient to the situation than Marseille (GPMM). But it is the challengers like Dunkerque who have proven to be the most dynamic. In fact, growth rates in the ports of the Seine Axis have been disappointing over the last decade, which has led to a decline in their market share.

The reality of statistics is cruel. In both the long and the short term, the port of Le Havre is on a downward slope in comparison with its main competitors in the North-European maritime range, the ports of the Golden Delta, principally Antwerp and Rotterdam, and the German ports of Hamburg and Bremen. For its total traffic, Le Havre's market share has been eroding since the 2000s. In 2012, Le Havre accounted for only 5.3 % of the traffic in North-Europe, in comparison with 7.5 % in 2000.

Each year has its explanation: for instance in 2012, the decline in crude oil traffic. But, since the 1970s, containers have been the engine of port expansion with growth rates of 7-8 % per year. Container traffic is less captive than bulk traffic. It depends on door-to-door intermodal transport chains that allow for the low-cost transportation of goods. To cope with this trend and the increasing size of ships, in 2006, Le Havre inaugurated "Port 2000" (Figure 4), a new port entirely dedicated to container traffic.

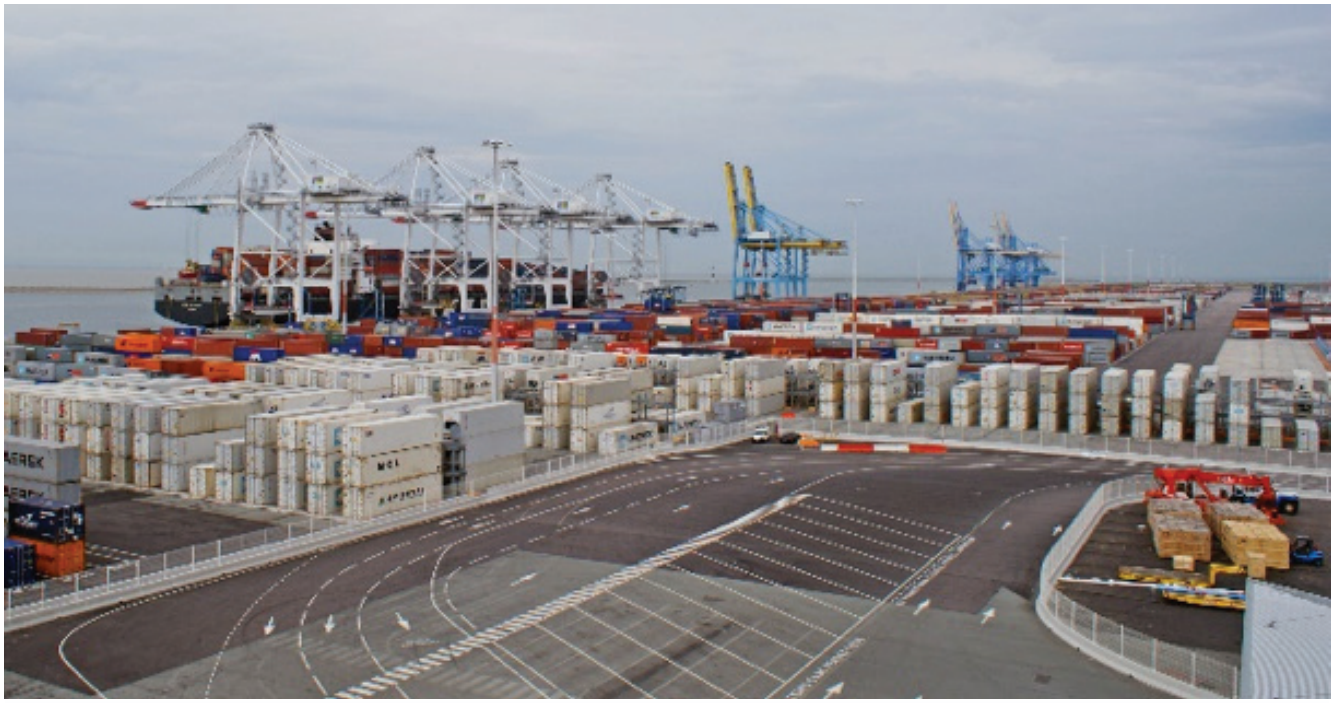

Figure 4.
Port 2000 in Le Havre.

In spite of over one billion euros of investment into traffic increase, it stagnates, while that of competitors continues to increase (Frémont, 2013). If in 2017, Le Havre's market share in the North-Europe row was 9 %, comparable to that of the early 1990s, 3.6 million twenty-foot equivalents (TEUs) would have been treated in Le Havre, compared with only 3 in fact. But, for container traffic, adaptation to international standards of port organization has been long and out of step with its competitors. Yet, it is essential for the loyalty of global shipping operators, ship-owners, cargo handlers, freight forwarders and shippers who mutually compete for ports.

The weaknesses can also be explained by hesitation to abandon the French-French system, powerful and coherent in its time but now lacking. To face this, the operating modes of France's ports were modernized in a July 2008 reform. The aim is to transition to the "landlord port" model. The objective of the

2008 reform was to adapt French seaports to global and northern European competition (Cariou, 2014).

Another answer is that ports decided to gather their organization under one unique brand, with the ambition to compete with the biggest European hubs, in terms of capacity and performance; this new brand sustains commercial, environmental, territorial and institutional purposes. HAROPA, is the alliance of the port of Le Havre, the seaport of Rouen and the port of Paris. It was created in 2012 with the aim of forming a port system with an European dimension. So, HAROPA is an instrument at the service of the three major ports of the Seine Axis. Beyond the traditional assignment of port facility management, it seeks to promote a customer-oriented approach to improving the range of services necessary for developing industrial and logistic activities along the Seine Axis.

With a 6 % increase in overall seaborne trade and over 15 % in container traffic, HAROPA reported the best figures among North-European ports for the year 2017. For the first time in its history, it handled 3 million TEU of imports and exports in a single year, proof of its customers' confidence. This result is the fruit of an overall development of the logistics sector of HAROPA which combines paying special attention to the shipping offer, high-performance cargo transit, developing connected logistics zones and multimodal inland transport services. According to our estimations, its share increased from 5.86 % in 2011 to around 7 % in 2017, which is a 1.1 point increase.

With this in mind, we must not succumb to fantasies: the ports of the Seine Axis cannot take over the traffic of German or Golden Delta ports due to Europe's geography. The Rhine corridor is the center of gravity of the European economy, the location of main industrial and population concentrations in the EU. In the Rhine-Scheldt delta, where European distribution centers for brands and major retailers are located, a high proportion of container traffic is generated by the region surrounding the ports. Within two hours of road transport, the equivalent of 79 billion of GDP can be accessed from the port of Le Havre or Rouen. For an equivalent travel time, this value reaches 500 billion for Rotterdam and 640 for Antwerp. This reflects the differences in the location of ports in the Northwest range, i.e. the outlying position of HAROPA compared to the European backbone.

4. NEW CHALLENGES

4.1. New Shipping Industry Organization

When it comes to the adaptation of ports to contemporary economic changes, the central process concerns the allocation of port concessions for the operation of terminals. Since 2006, it has resulted in the domination of the three largest world armaments, the Danish Maersk Line, the Italian-Swiss MSC and the French CMA-CGM in the handling possibilities of Le Havre. They each have their own terminal in Port 2000. For Le Havre, their presence is an opportunity, provided it does not turn into an oligopoly of fact. Of course, their terminals are open to the customers of other companies. But the port did not choose to welcome, in addition to the three previous ones, another large international and generalist cargo handler able to guarantee total independence with regard to the customers and thus intensify the competition (Frémont, 2013). This question has become paramount with the emergence of new alliances between ship-owners in the spring of 2017.

Since the 1990s, shipping lines have been involved in container terminal operations to better control their business and squeezing costs. The new ocean carrier shipping alliances have been fully operational since April 2017 (Figure 5). These three carrier alliances account for nearly 80 % of global container trade and roughly 90 % of container capacity on major trade routes. With the carrier's market concentration, port competition will be strongly affected (El Kalla, Zec and Jugovic, 2017).

Maersk (including Hamburg Sud) and MSC have the combined capacity of about 6 million TEUs, i. e. approx. 33,4 % of the overall global market share in container capacity. For ports, the situation is nowadays complicated: if such an alliance does not choose to make their ships call to your port, the traffic can rapidly decrease. Moreover, these alliances are pragmatic arrangements, which means that their compositions change every few years.

Speaking of the Seine Axis, since April 2017 HAROPA has accommodated three alliances, "2M", "Ocean Alliance" and "The Alliance", grouping together all shipping lines on transatlantic and Asia-Europe trade routes. In addition, since "The Alliance" has just announced the arrival, in April 2018, of a new Asia-Europe service, making HAROPA the first port of call for importation, further traffic increase is expected. Today, on the Seine Axis, the waterway plays a marginal role in freight transport, as do the rail services. The dominance of road in freight transport is such that the waterways and the railways can only play a marginal role in Île-de-France. The growing strength of the multimodal terminal in Le Havre in 2017, with 145,000 TEU handled, is a support for the development of new rail and river services.

Of course, the mutations of the shipping industry also concerns technical aspects, like continuously growing container ships forcing ports to keep modifying their handling tools and processing capabilities. In the light of the increasing massification of containerized freight loads, and while the ultimate goal remains atomization (individual containers delivered to freight owners) (Rodrigue, 2017), the inclusion of ports in the transport system also depends on their integration in the multimodal land transport system.

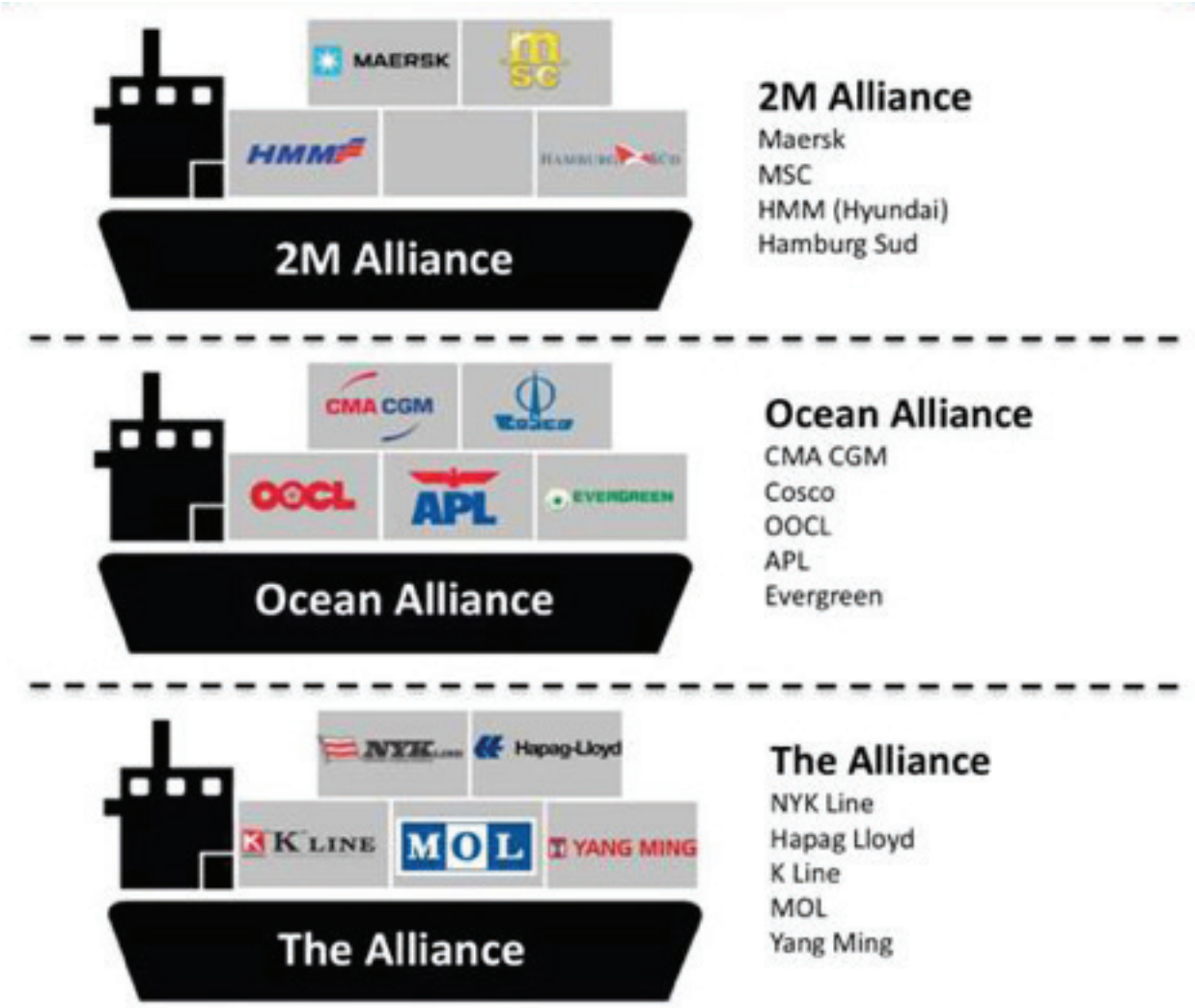

Figure 5.
New shipping alliances (Source: www.shipit.com).

In 2016, French ports were given special attention by the French government and parliament. Several proposals resulting from parliamentary reports should make French ports more competitive.

4.2. AIS Data to Understand

Being integrated into regular lines of different companies is very important for the ports, although it does not guarantee the capture of the flow of goods (Figure 6). On the basis of AIS data, we have, by simple calculations, determined the average share of containers handled by ships. Although this method needs further development, it can give, e.g. an interesting overview of the importance of a port's hinterland. The CIRMAR platform, used to explode and analyze large databases – the so called big data – yields unavoidable and tremendous results (Kerbiriou et al., 2017).

Therefore, AIS data were used to obtain some interesting results about port calls in the North Range in 2016. Rotterdam is the port with the highest number of calls, with 14,483 container ship stops in 2016, far ahead of Antwerp (4,470) and Le Havre (2,274).

Figure 6.
Ports calls and handled containers in the Northern Range in 2016.

The importance of transhipment in a port has a strong impact on the number of stopovers. This is highlighted when the average size of container ships is analyzed. Port of Rotterdam, which carries large transhipment traffic to the United Kingdom and by river barges, receives units with an average size of 2,446 TEU, while Le Havre accommodates units over 6,000 TEU. Large ships on intercontinental shipping lines call at Le Havre but feedering services seem to be very rare in the Seine Axis ports. Their weaknesses are underdeveloped transshipment traffic and relative maladjustment to shipping companies' strategies.

In addition, when average loading and unloading rates of container ships per port are compared, only 18 % of containers are loaded / unloaded in Le Havre, compared to 65 % of the total quantity of TEU in Hamburg or 46 % in Antwerp.

Data analysis gives us an overview of the operational and strategic reality orchestrated by the major global shipping lines. In the context of transshipment, calls of giant containerships to the port of Le Havre are two to three times less important in terms of volume than in Rotterdam. On the one hand, Le Havre always takes advantage of its unique geographical position of the first port of call and the last output port of the North-European economic area. On the other hand, Le Havre suffers from the short sea shipping network. Short distance shuttle feeders do not cover all the coastal areas from the Portuguese Algarve to the Northern British markets. Furthermore, and without detailed analysis, it is worth recalling the reality of the hinterland and multimodal drainage capabilities that complement giant container ship stopover volumes. The Seine Axis system seeks to densify its volumetric imports and exports data via land-based multimodal strategies to counter the "logistical diversions" traffic orchestrated by the Antwerp and Rotterdam port communities.

5. CONCLUSION

The performance of the Seine Axis ports is riddled with paradoxes. It has been lagging, but the ports 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 some obstacles and brought port governance in line with European practice. But the Seine Axis ports are operating in a very competitive environment, contending with ports such as Antwerp and Rotterdam that have managed to capture parts of the French hinterland.

Challenges are still numerous for the ports of the Seine Axis. The quality of infrastructure, the willingness to massify flows and logistics development are at the heart of the strategy of port

development in the North of Europe. French ports must get closer to these models so that all the actors of these maritime and shipping sectors can fully play their role in developing wealth and employment.

Economic actors have a role to play if the Seine Axis ports' system is to modernize and become more competitive, but they can't do anything without the support of real political will. There is room for innovation both at the infrastructural level, and at the level of regulations which still create artificial barriers likely to impede development. The full potential of the French transport network must be exploited to develop these ports at such a privileged geographical location.

After an exceptional year of 2017 and six years since its establishment, the HAROPA has become the leading French port system. If strong integration trends expressed by the French Prime Minister are realized, some change is anticipated in 2018. Figures and ambition prove that HAROPA meets all the conditions to keep growing, at the service of its customers in 2018.

6. ACKNOWLEDGMENTS

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