

Arnaud SERRY*

CONTAINERISATION IN THE BALTIC SEA REGION: DEVELOPMENT, CHARACTERISTICS AND CONTEMPORARY ORGANISATION

Abstract. The main focus of the paper is on the container system development in the Baltic Sea Region studying cotemporary changes and organisation, as well as explaining the main driving forces of this situation.

The Baltic Sea is a transport corridor between Eastern and Western Europe. Over the last decade maritime transport in the Baltic Sea area has changed significantly. The disintegration of the Soviet Union forced Russia to start developing its own Baltic ports and terminals and to find new routes to export its oil and gas. The Baltic ports have welcomed a remarkable growth, especially in oil transportation and containerised flows.

The geographical configuration of the region naturally places it away from major global shipping lines. This situation is accentuated by the organisation of maritime regular lines, centred in Northern European ports. For this reason, the regional container network is mainly made up of feeder services.

Key words: the Baltic Sea, containerisation, ports, maritime transport.

1. INTRODUCTION

Ocean shipping is the most important mode of transport in international trade (around 90 per cent of the total). Since its introduction in the shipping industry in the 1960s, containerisation has supported the expansion of the world economy. The development of liner (containerised) shipping in the last 30 years has exceeded the growth of world trade volumes (Ducruet and Notteboom, 2012). Two factors largely explain the success of containerisation: the productivity gains in cargo handling in ports and a more gradual process which involves the refinement of the container networks of the major shipping lines (Frémont, 2007). As container ship-

* Arnaud SERRY, Université Le Havre Normandie, UMR 6266 IDEES CNRS, France; e-mail: serryarnaud@gmail.com

ping is characterised by a constant search for economies of scale (Merk, 2018), the introduction of mega containerships on the main international sea routes between major seaports has made it necessary to distribute containers on short-sea routes. Therefore, regional feeder services collect and deliver containers in a specific region with small and medium-sized container ships and feed mega containerships so as to avoid their calling at too many ports (Polat, Günther and Kulak, 2014).

In a new political and competitive environment, the Baltic Sea Region (BSR) is today completing its full European integration. After innumerable and consequent political and economic changes, this space has recovered its vocation of interface (Escach and Serry, 2015). In the region, transport and logistics sectors are omnipresent economic challenges. The ports of the Baltic Sea Region handled in 2016 around 8.4% of the world total. Even if, as elsewhere in the European Union (EU), road transport is very widespread, it is followed by short sea shipping (SSS) distance. In the BSR, SSS can be split into two segments. On the one hand, Roro transport is one of the specificities of the Baltic area. On the other, feeder containerised services have quickly developed. Feeder services connect transshipment hubs to smaller ports and vice versa. These services can be arranged on a direct hub port to feeder port or can follow a line bundling set-up with several feeder ports of call per vessel rotation. They tend to use regular containerships, but of smaller sizes (often aptly called feeder ships) (Rodrigue, 2017).

Thus Baltic ports as nodes of a regional maritime network are integrated into a larger system. Indeed, the port development and the evolution of maritime traffic are symptomatic of economic and territorial mutations.

Although the maritime traffic in the area is relatively diversified, the paper will focus on containerised flows. It aims to provide an analysis and an empirical study of the container network in the region. This study is based on a literature review and mainly on the analysis of a database developed by the author. This database contains structured, comparable data (port facilities, traffic statistics, etc.) from 1989 onwards for approximately 115 Baltic ports. It also includes all regular lines in 2013 and 2015, and such details as frequencies, capacities, and operators obtained using AIS data, as well as some from a database on ships.

The paper proceeds as follows. Section 1 covers general characteristics of maritime transportation in the BSR. Section 2 focuses on the feeder market, while the section 3 analyses the regional port system.

2. GENERAL CHARACTERISTICS OF THE BALTIC REGULAR LINE TRAFFIC

The Baltic Sea is very transport-intense. Maritime traffic is relatively diffused throughout the whole of the Baltic Sea, despite a distinction of maritime and port activities within the Baltic Sea, mostly between southern and northern shores. Baltic Sea traffic growth is particularly significant in the field of containerisation (Serry and Transnav, 2017).

2.1. From shared growth to more competition?

Since the mid-1990s flows in the ports of the Baltic Sea have been grown quite constantly which (inevitably) demanded a necessary modernisation of harbour facilities and their extensions. That dynamism has been, with a few exceptions (Ventspils), closely shared by the whole BSR (Fig. 1). Thus the maritime traffic almost doubled between 1997 and 2017, from 420 million tons (Mt) to nearly 800 Mt while during the same period, the growth of world maritime traffic increased by nearly 65%.

This development can be attributed to three factors:

- Global economic growth has led to an increase in the volume of goods carried by sea;
- The deep geopolitical changes in the region have (re)opened the eastern shore to the market economy;
- The vital needs of port capacity for Russia to export raw materials and import manufactured products.

Indeed after the collapse of the USSR the main Baltic ports were outside the Russian Federation (Pavuk, 2017). The BSR has an interesting geographical position within the Eurasian transport system, connecting Russia with the European markets (Kabashkin, 2012).



Fig. 1. Evolution and traffic in 2017 of the top 20 Baltic Sea ports

Source: own work based on European Sea Ports Organisation, Eurostat, Port Authorities.

Container volumes around the world have witnessed a tremendous growth in the last 50 years, with an accelerated growth since the mid-1990s (Notteboom and Rodrigue, 2008). That rise of containerisation was the result of the interplay of macroeconomic, microeconomic and policy-oriented factors (Notteboom, 2004).

The amount of containers shipped in the Baltic Sea is determined by the proximity of consumer markets, Russia being the key destination point. Only a handful of ports handle large quantities of containers. The largest regional container port, Saint-Petersburg, stands only 15th in Europe. In 2017, the number of containers handled among Baltic Sea ports amounted to 9.5 million TEUs. The composition of the 20 largest container ports remained stable: St. Petersburg is clearly the undisputable leader in this segment, while Gdansk recorded considerable and continued growth in container traffic (Serry, 2017).

Furthermore, the number of ships in the Baltic Sea has increased. It is also the case of the ships' sizes, even if the shallow depth of the Kiel canal and the Denmark Straits limit vessels to 15 metre draught. The example of the containership size in the Lithuanian port of Klaipeda clearly shows that evolution (Fig. 2.) Using Automatic Identification System (AIS) data, the average sizes of containerships in the port during the last decade were calculated, as well as the size of the biggest ship. Even if Klaipeda is not the largest container port in the region, ship size is steadily growing as throughout the BSR.

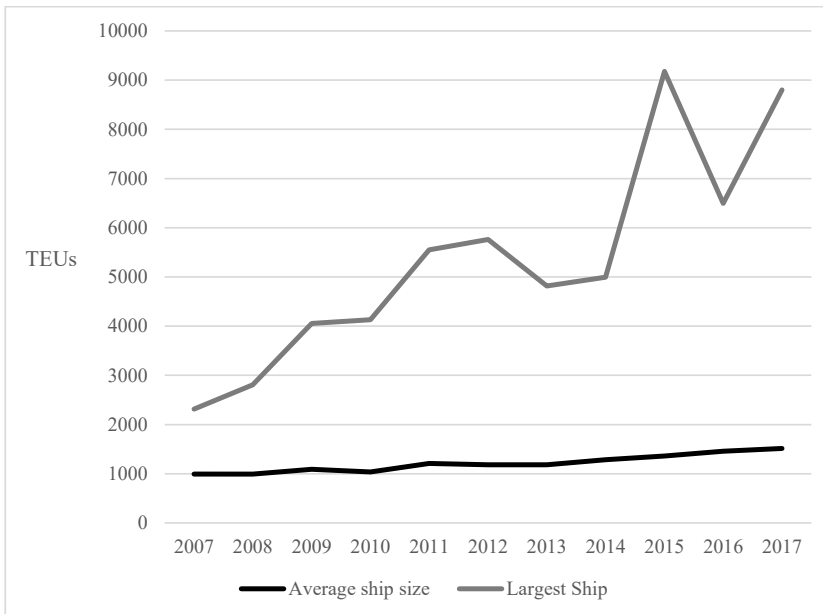


Fig. 2. Containership size in Klaipeda from 2007 to 2017

Source: IHS Maritime, 2018.

2.2. Concentrated containerisation

The Baltic Sea Region has a regular rise in containerised transport. Today, containers are handled in more than 60 ports across the region (Wolff, Herz and Flamig, 2011). But in the BSR, cargo requirements remain modest even though the eastern shore is making significant progress. This partly explains the difficulty in build sizable ports in the region. Thus, in 2017, the container traffic of Gothenburg reached 644,000 TEUs, Hamina-Kotka 690,000 TEUs, and St. Petersburg 1,920,000 TEUs, with a decline due to the crisis in Russia (Fig. 3). Container flows in the Baltic Sea were growing roughly in line with the worldwide market from 2010 until 2014 but suffered a severe downturn in 2015. This decline was mainly connected to the Russian economic situation and was evident in both containerised tonnes and in the volume of TEUs transported by sea. In addition, there was a substantial imbalance in containerised cargo flows: empty containers accounted for approximately 25% of the traffic (Ojala, 2016). In reality, developments throughout ports in recent years have come mainly from changes in dry and liquid bulk. Containerised cargo has not been of major importance for any ports, as on the eastern coast of the Baltic Sea major container volumes are handled through the largest container ports of St. Petersburg and Gdansk (Bolevics, 2017).

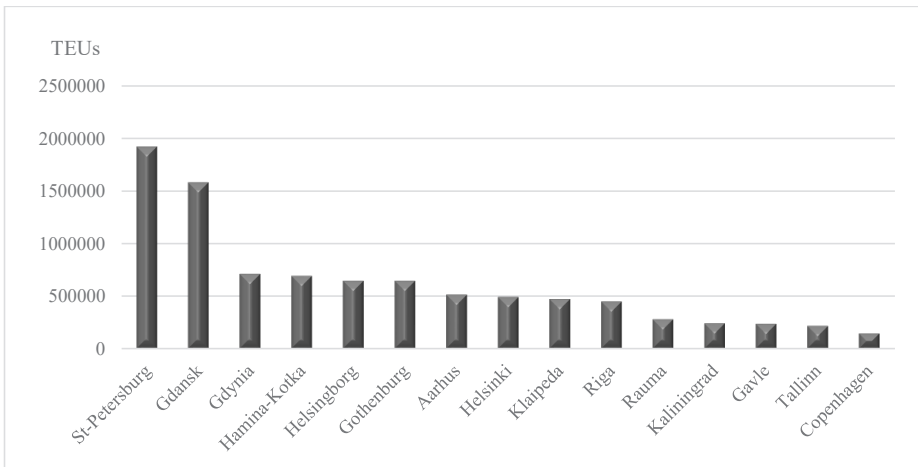


Fig. 3. Traffic in the main container ports in 2017 (TEUs)

Source: ESPO, Port Authorities, 2018.

The BSR dominates the Russian containerised traffic and accounts for nearly 70% of the total (Lorentzon, 2014). Currently, the Russian market of container traffic includes more than 11 operators and over 40% of Russian containers belong

to operators with container terminals in the ports of St. Petersburg and the Leningrad Region (Yudnikova and Aleksandrova, 2016). The port of Saint-Petersburg remains the most important even if its traffic declined in 2015 (27.8% less than in 2014). The Russian containerised port system in the Gulf of Finland is complemented with the *Ust-Luga Container Terminal* with a capacity of 400,000 TEUs. Ust-Luga is a solution to face the constraints imposed on maritime traffic in St. Petersburg, including the lack of space and the competition of metropolitan flows. The ambitions for Ust-Luga are considerable. Ubiquitous investment already placed the port as the regional leader in terms of total volume with 103.43 Mt in 2017. These two ports provide 70% of container traffic originating from or destined to Russia in the BSR. The rest of Russian traffic provides transit traffic mainly to Hamina-Kotka (Finland), Riga (Latvia), and Klaipeda (Lithuania).

The Polish ports, Gdansk and Gdynia, were originally mainly connected to the Polish hinterland and Central European market. They are now becoming new transshipment ports for the regional traffic. It is especially the case for Gdansk which benefits from the choices and investments of *Maersk shipping lines* and from its alliance with *Mediterranean Shipping Company* (MSC). In 2017, nearly 2.3 million TEUs were handled in the two Polish ports. Gdynia's container terminals are currently on its way to achieve a good position among secondary ports in the BSR and the *Deepwater Container Terminal* in Gdansk is slowly aspiring to the role of one of the biggest handling bases in the Baltic Sea (Romanow, Frasz and Kolinski, 2015).

Nodality (the degree to which a place is a point of convergence for different routes) is the main strength of the place of Gothenburg, and also Helsingborg. These ports take advantage of their locations near the Danish straits. They are the main gateways for the Swedish market, but also offer some relevant solutions for regional regular lines or even at a global scope (Guillaume, 2012). However, the competition of the Polish ports is omnipresent and today Gothenburg sees its container traffic decreasing.

Container flows in other Baltic ports are still modest and often have a minor share in the structure of the traffic. Some ports like Kaliningrad, largely dependent on maritime coverage for its supplies, or Rauma reach significant traffic. In any case these trades are usually provided by small and medium size vessels connecting the Baltic ports to largest European ports.

2.3. A foreland concentrated on northern Europe

Geographically, maritime traffic has evolved considerably over the last few decades. The largest ships operate on multi-port itineraries calling at a limited number of ports (Ducruet and Notteboom, 2012). The main transoceanic connectors link a series of key ports in Europe. These ports connect regional port systems, including the Baltic one, to transoceanic and circum equatorial routes, mainly through hub-and-spoke services (Rodrigue, 2017). Extensive hub-feeder container sys-

tems and short-sea shipping networks developed to cope with increasing volumes and to connect to other port ranges (Rodrigue and Notteboom, 2010).

The Baltic Sea as a basin for ocean-going container ships is restricted by physical prerequisites. Small markets and limited hinterlands may also reduce the competitiveness of ports (Lorentzon, 2014). Baltic ports are therefore essentially served by a feeder network. The BSR was mainly connected to Europe with less than 10 regular container lines to the rest of the world in 2015. Starting from Northern Range ports, the rotations of the feeder ships are either circular, serving a few ports, either direct to one or two ports. So Baltic ports are not relays of large European and global flows but rather secondary nodes in the maritime network, even the most developed of them are connected through feeder services to some other ports' range. Thus, in mid-2015, the first connected port was St. Petersburg with 48 direct lines, including five destinations outside Europe. It had twice as many lines as the other container ports: Helsinki (21 lines), Klaipeda and Gothenburg (20 lines) or even Gdansk (11 lines). The case of Gdansk is interesting as in spite of the low number of lines its traffic was relatively high since of its new role as a regional transshipment hub. Non-European connections are very poor: out of 126 regular containerised lines listed in mid-2015, only 10 went beyond the European horizon.

If regular lines are dominated by relations with the north-western Europe, intra-Baltic lines (mainly roll-on roll-off and ferries) are also well developed. This clearly marks the Baltic paradox: while the Baltic economy goes global, its transport system is regionalising (Escach and Serry, 2015). This phenomenon is reinforced by the strategies of shipping companies: Western operators are investing in the eastern shore, as *HHLA* (a Hamburg-based stevedoring group) that participated in the expansion of container terminals in the port of St. Petersburg. These examples show how both the geopolitical strategies of states along with the behaviour of private actors seeking to diversify maritime routes and conquer position beyond Russian borders may differ/may be different / are different (Thorez, 2011). It explains the temptation to orbit marine services related to extra-European services by a network of feeder lines starting in German or even Benelux ports. We are here in the heart of a peripheral location, which cannot hope to attract direct overseas services (Guillaume, 2012).

3. SPECIFICATION OF THE FEEDER MARKET

In Europe, cabotage restrictions were lifted by the end of the 1990s, and the liberalisation has become almost complete. Furthermore, the European Commission is working to develop cabotage, including through the creation of the Motorways of the Sea (MoS) (Rodrigue, 2013). Scandinavia and the Baltic area represent in volume the leading European feeder market with strong growth (+ 10% during the last 10 years, 20 million TEU expected in 2020).

3.1. German ports, main hubs for the Baltic Sea

In the Baltic Sea, feeder lines are concentrated in some ports, mainly near the Danish straits and on the south-eastern shore of the Baltic, as well as in the Gulf of Finland (Fig. 4).

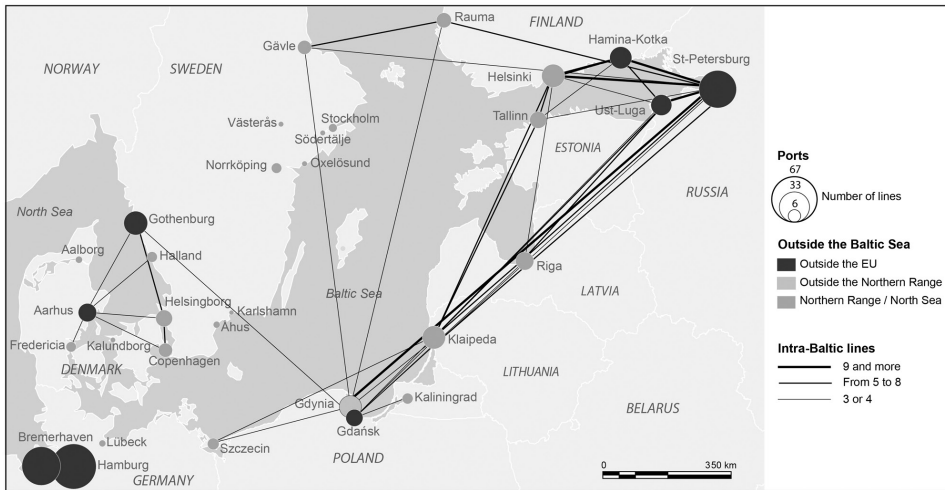


Fig. 4. Container lines in the Baltic Sea in mid-2015

Source: own work based on Baltic Transport Map, Autorites portuaires, Compagnies maritimes.

Feeder lines overwhelmingly start in north European ports. In 2011, around 50 ports have been identified as maintaining container flows with the Port of Hamburg (Wolff, Herz and Flamig, 2011). In 2015, 88% of Baltic container ports maintained at least a link with Hamburg. 34 ports were served by regular lines departing from Hamburg (12 in Sweden, 9 in Finland, 4 in Denmark, 3 in Russia and Poland, 1 in Estonia, Latvia or Lithuania), 33 from Bremerhaven but only 17 from Rotterdam or 15 from Antwerp.

The situation is still sharper if we consider the theoretical capacity offered by Hamburg. This capacity is calculated using the number of regular lines identified in July 2015. For each line the frequency as well as the capacity offered by ships used on these rotations is determined. In Hamburg, this capacity was around 5.1 million TEUs per year while that proposed in Bremerhaven is 4.3 million or 4.4 for Rotterdam and only 1.8 in Antwerp. This result plainly identifies the role of the port of Hamburg as the hub of the Baltic Sea. Its location enables efficient loading and unloading of goods from global to local destinations. By the way the relatively large capacity offered by Rotterdam is explained thanks to the types of services offered: Hamburg and Bremerhaven especially welcome feeder lines whereas Rotterdam is involved in lines with larger-sized vessels like the *Maersk AE1* service.

Transshipment is vital for the port of Hamburg: according to the Hamburg port authority 30% of containers are transhipped. Undoubtedly Baltic trade (1.77 Million TEU'S in 2017) is one of the main pillars of the Port of Hamburg's container handling. In 2017, the BSR was the second market of the port behind North East Asia. This situation is not new (Vigarie, 1979) as indeed Hamburg is known for having a *wet transit* tapped into the Baltic and Scandinavian world (Weigend, 1956). In fact, the rapid growth of container traffic in the port of Hamburg, in the last twenty years (less than 2 million TEUS in 1990, 8.8 million TEUS in 2017) is mainly due to this rediscovery of the traditional hinterlands of the port, following German reunification and collapse of the Soviet Union.

During a round trip, the time of which ranges usually from 1 to 2 weeks, ships can call at up to 7–8 ports. The main function, i.e. the forwarding of containers from/to the hub port, makes a ship's transport capacity during a round trip limited to a double load capacity (Kotowska, 2014). Consequently, freight rates are independent of the distance between the hub and the feeder port: this is the case in the ports of Denmark (Copenhagen, Fredericia...), East Germany (Lübeck and Rostock), and Poland (Szczecin). Transportation cost is certainly one of the major factors to explain the situation. Using the method developed by Sevin (Sevin, 2011), we can compare transport costs between Rotterdam or Hamburg and Baltic ports (see Table 1).

On the basis of a ship of 1,085 TEU (average capacity of ships in 2015) we obtained the following results: for shipping companies, it costs about €44.9 less per TEU using the port of Hamburg than using the port of Rotterdam (Table 1) (Serry, 2016). For Baltic feeder market served via existing hubs, feederships incur additional costs as a result of transit via the Kiel Canal. These additional costs relate to both the operating cost of the ship, based on the time taken for the canal transit, plus canal fees and expenses (Baird, 2006).

Table 1. Comparison of maritime transport costs in 2015 (€)

Costs	Copenhagen	Helsinki	Saint Petersburg
Cost per TEU from Rotterdam	109.5	208.1	233.3
Kiel canal fees	35.9	35.9	35.9
Total cost per TEU from Rotterdam	145.4	244	269.2
Cost per TEU from Hamburg	69.9	161.5	186.6
Kiel canal fees	35.9	35.9	35.9
Total cost per TEU from Hamburg	105.9	197.4	222.5

Source: own work based on Sevin 2011 and <http://www.kiel-canal.de>.

This cost advantage partly explains why the role of Hamburg as the transshipment hub for the BSR has intensified over the years. Another conclusion is the following

one: when it is possible, using the Kiel canal is economically the most interesting solution: at least 7 € by TEU shipper. Our analysis also enlightens the new role of the port of Gdansk which offers economic advantages even if a port like Gothenburg offers lowest cost for its direct connections (24.8 \$ per TEU from Hamburg). But its location (outside the Danish straits), quite far from the other main container ports of the region, is a handicap. For instance, to reach Helsinki from Hamburg, it cost 6.2 € more per TEU via Gothenburg than via Gdansk.

3.2. Main actors of the feeder market

According to our data, 28 companies were present on the Baltic container market in 2015. Among them renown feeder companies (*Unifeeder*, *Team Lines*) and global carriers such as *MSC* were very well established. Several regional companies completed the offer, e.g. *Seagoline*, *Containerships* (Finland), *Mannlines* (Germany) or *Tschudi Line* (Norway). The largest fleet of feeder ships was controlled by *Unifeeder* with 30 ships (annual theoretical capacity of 1.53 million TEUs) ahead of *MSC* (1.4 million TEUs). The dynamics of the market regularly attracts new players and this despite the crisis in Russia. For example, *China Shipping Container Lines* (CSCL) developed its feeder *Golden Sea Shipping* company which offers a weekly rotation between St. Petersburg, Hamina-Kotka and Hamburg.

To refine the analysis, thanks to AIS data, we determined all container ships that called at a BSR port between 1 November 2015 and 1 November 2016 (Fig. 5).

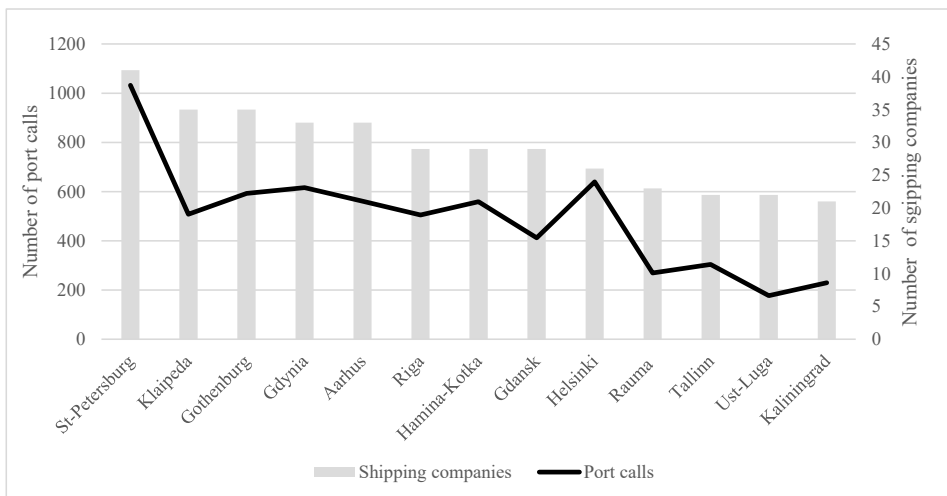


Fig. 5. Container ships' port calls and operators from January 1st to November 1st 2016

Source: IHS Maritime, 2018.

We can establish that in the studied period, 60 different operators provided containerised services to ports. Some companies such as *Containerships* have quite local strategies with ships calling only at 3 ports (Helsinki, St. Petersburg and Riga) when other, for instance *MSC*, propose services to almost the entire BSR. In addition, it is also possible to determine the capacity offered by each company in each port. For instance, *Maersk Line* offered a capacity of 966,336 TEUs in the port of Gdansk but only 40,233 TEUs in Kaliningrad. It is an interesting way to focus on the three different types of actors present in the region. It clearly appears that companies have different strategies: global carriers concentrate their flows on some ports as the Gdansk hub while companies specialised in feeder services have a more decentralised network.

To understand how the containerised market works in the BSR we also need to focus on port activities and more particularly stevedoring companies. The arrival of foreign investors in container terminals is a new reality in the BSR: Hutchinson (Hong Kong) at Gdynia (GCT) and Stockholm/Nynäshamn (CTN), Macquarie (Australia) at Gdansk (DCT) (Charlier, 2014). The German group *Eurogate* operates the container terminal in Ust-Luga whose planned capacity is 3.5 million TEUs. St. Petersburg also attracts some major international investors. For instance, *HHLA* has invested in one of the terminals in the Russian port. However, St. Petersburg may not attract a hub for regional containerised traffic because of its location at the easternmost point of the Gulf of Finland and its constraints. In fact, investments are increasing in the ports of the Eastern shore and they now include the logistical dimension. For example, the Finnish company *SRV* launched an A class logistics centre (120,000 sq. m) in St. Petersburg (Grzybowski, 2013). This type of logistical development spreads to almost all container ports in the region placing them as major nodes in distribution networks.

Finally, the BSR bears the marks of being an integrated periphery, with relatively low needs. Containerised transport actors have, therefore, adopted efficiency strategies that are not without impact on the organisation and evolution of territories. Especially as they must be careful of road transport competition and its possible complementarity with ro-ro (*DFDS*, *Tor Line*) and ferry lines promoted by powerful regional companies (*Color Line*, *Stena Line*, *Finnlines*, or *Tallink-Silja Line*...). Moreover, these ro-ro services utilise the success of door-to-door delivery (Guillaume, 2012) and the network of ferry connections includes 60 services with 116 ferries operated (Urbanyi-Popiołek, 2018).

4. CONTAINERISATION AND REGIONALISATION OF THE PORT SYSTEM

Baltic regionalisation is evident because of the concentration of sea connections on a low number of north European ports. However, the Baltic Sea remains a heterogeneous space.

Providing services to many areas, feeder ships are the latest tools in the process of trade globalisation. This activity displays the international port hierarchy (Tourret, 2008). Global and regional contemporary upheavals redraw and complicate the map of this interface: new emerging nodes tend to centralise sub-regional dynamics (Marei and Ducruet, 2014).

4.1. Towards a port sub-regionalisation?

Container traffic displays a weak integration at the Baltic level because of the concentration of flows in the *Northern Range* according to the *hub-and-spoke* model. It thus introduces a clear differentiation of maritime and port activities in the BSR (Fig. 2). The ports of the eastern Baltic as Saint Petersburg, Ust-Luga, Klaipeda, Helsinki and, Gdansk, but also Gothenburg, appear as the major nodes. By modernising, they manage to attract international forwarders, new industry, and economic actors as *DP World* or *GEFCO*.

In addition, the increasing connectivity of the network shows the restructuring of regional logics. On the eastern shore as in the Danish straits, the reinforcement of an intra-Baltic network of ports is obvious (Fig. 4). The Gulf of Finland and more widely the south-eastern Baltic are thereby two particularly active and attractive areas within the Baltic networks: the centre of gravity of the Baltic transport space is shifting eastwards.

The analysis of the containerised traffic in the Baltic ports distinguishes four types of ports in the region:

- Traditional regional ports, as Gothenburg whose location and the early integration in containerised networks explain its contemporary importance. Gothenburg has early historically benefitted from its location: in front of the Danish straits, without draught constraints, and a location near the *Norden* (Denmark, Finland, Island, Norway, and Sweden) with 50% of the industries located less than 300 km away, and 70% within 500 km;

- Regional or national ports, mainly located on the western shore of the Baltic Sea. The often modest traffic of these ports must not minimise their role in the regional economies, for instance, in the Gulf of Bothnia, transport system which includes numerous seaports in Sweden and Finland (Wiśniewski, 2015);

- Ports of “Russia” are made up of Russian, Baltic and Finnish ports. (From Hamina-Kotka to Kaliningrad) Those ports are also the most dynamic ones in the BSR. They have similar combinations, exploiting at least partially the same hinterland. That allows one to speak of an eastern Baltic port range (coastal system of interdependent ports) (Vigarié, 1979);

- Emerging regional hubs such as the port of Gdansk (Fig. 4). In recent years the cargo turnover of Gdansk has increased significantly. It rose almost 16 times in 2005–2015. Gdansk has technical features which make it possible to accommodate Triple-E container carriers with a depth to the point of 16.5 m. This fact became one

of the most fundamental in the decision on the inclusion of *Maersk Line* in Gdansk linear ocean route AE10 from Southeast Asia to Europe (as the final ship entry port). That fact allowed the Gdansk port to start specialisation in transshipment operations and transit in Russia, Sweden, Finland and the Baltic countries. With the introduction of the *Maersk Line* direct vessel calls, the transshipment level has risen in the Gdansk port. The percentage of the cargo transshipment in the total cargo turnover increased from 5% in 2004 to 60.3% in 2013 (Gulyaev, 2018).

Therefore, on a global scale, the reorganisation of traffic has generated standardisation on all shores of the Baltic Sea, responding to the hub and spoke mode (Serry, 2017).

4.2. Some factors of explanation and driving forces

In such a scheme, the question of port competitiveness is central for port authorities and operators. It especially includes port operation efficiency levels, handling charges, reliability, and landside accessibility. Regarding the Baltic ports, we can analyse port efficiency using the duration of port calls offered by AIS data. Baltic container ports appear very different (Fig. 6): two ports in particular, namely Gothenburg and Gdansk, are served by ships offering a larger capacity than in the other ports.

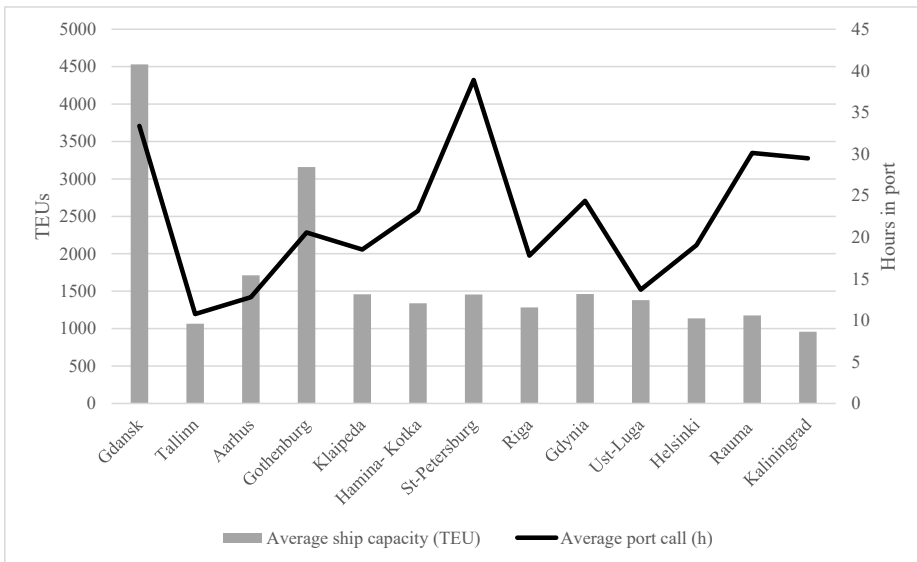


Fig. 6. Containerships’ capacity and duration of port call from January 1st to November 1st 2016
 Source: IHS Maritime, 2018.

Combining this analysis with operator strategies is also interesting. In the case of Gdansk, the situation is clearly the result of the choice of *Maersk Line* to make the Polish port its Baltic hub. During the considered period, AIS data showed that 35% of all port calls were carried out by *Maersk Line* with an average capacity of 4,530 TEUs.

By integrating the port traffic in the research process, it is also possible to estimate the average length of handling of one TEU in each port. In the study, container traffic has been weighted by the estimate share of ro-ro traffic. Such an analysis could be more precise with the number of cranes used in each terminal for instance. Despite these few restrictions, the results are remarkable and give an interesting order of magnitude. Container terminal efficiency is very variable in the BSR (Table 2): in the port of Gdansk, it takes three times less than in Kaliningrad to operate one TEU. The average operational speed is 1.56 min per TEU and only five ports offer a better efficiency. Gdansk is clearly more efficient than other Baltic ports which also explains the quick expansion of its container flows.

Table 2. Determination of average speed per TEU according to AIS data

	Gdansk	Gothen- burg	Klaipeda	Hamina- Kotka	St. Petersburg	Riga	Ust-Luga
Average port call (h)	33.37	20.55	18.5	23.15	38.9	17.77	13.68
Average TEU's per call	2,358	919	708	836	1,378	619	385
Average speed per TEU (minute)	0.85	1.34	1.57	1.66	1.69	1.72	2.13

Source: IHS Maritime, 2018; author's calculations.

The competitiveness of containerised cargo shipping compared to that of the direct road transport depends primarily on the cost and time of the whole land-sea transport chain (Kotowska, 2014). Even if it is difficult to know the reality of the cost and to have a forecast, we can try to make a short analysis using some recent data. According to the Chinese *Kinglee Company Limited* price proposal between China and the BSR for a 40 foot container in July 2018, two interesting results help us to explain traffic organisation:

- the lowest rates are located in the Gulf of Finland with a considerable advantage for Hamina-Kota (1,353 USD) over St. Petersburg (1,530 USD);

– prices in the rest of the BSR are higher than in the Gulf of Finland (1,421 EUR on average). But the rates are quite variable between southern ports, such as Gdansk (1,394 EUR) or Klaipeda (1,397 EUR), and northern ports like Riga or Tallinn (1,446 EUR).

In fact, the rates are the lowest where traffic is higher because of potential market proximity or transshipment possibilities. Freight rates match port traffic or port potential in the regional containerised system.

5. CONCLUSIONS

Economic and political changes have created new conditions for the development of trade and transport in the Baltic Sea Region. The expansion of international trade has led to an increase in the cargo turnover in the Baltic ports, primarily due to the active development of Russian ports as well as new transshipment activities. Consequently, the collapse of the Soviet Union and EU enlargements have favoured the northern ports, especially Hamburg, and forced Russia to recover its lost port capacities.

Today several multi-port ranges can be separated. These are Kattegatt/The Sound, Gdansk Bay, Gulf of Finland / Eastern Baltic, and Bothnian Bay. They are strongly connected to Heligoland Bay (Hamburg, Bremerhaven/Bremen) which is the dominating multi-port gateway. This position is underlined by the leading role of Hamburg as a hub for traffic inside and outside of the Baltic Sea (Lorentzon, 2014).

The competition between ports is evident, as can be seen between Gdansk and Gothenburg or between the ports of the Baltic States and between them and Russian terminals. In that case, calls of large container ships confirm the ability of ports inside the BSR to compete as hubs in international transport networks illustrated by the port of Gdansk. The competition between the ports of the Baltic Sea Region consists of ports which can handle container ships and the distribution of goods to close markets.

Another aspect applies to the regionalisation of the port system which shows that the Baltic Sea is a major example of geographical “in-between” space characterised by interrogations on division and unification, opening and closing, or networks and territories. It is today an entire part of the global maritime network and an open system but its location near major European ports and its situation in a maritime “cul de sac” create a unification through external forces.

By its connections to the global container-shipping network, the Baltic Sea has gained in maritime efficiency what it has lost in direct access to the vast world. New reticular compositions have not caused geographical isolation or economic overloads. On the contrary, they have deepened the relations with the world oceans as regional hubs emergence prove it.

REFERENCES

- BAIRD, A. J. (2006), 'Optimising the container transshipment hub location in northern Europe', *Journal of Transport Geography*, 14 (3), pp. 195–214.
- BOLEVICS, V. (2017), 'The impact of governance on the efficiency of the Baltic States' major ports', *Journal of Business Management*, 14, pp. 7–26.
- CHARLIER, J. (2014), Container traffic at Baltic ports, 1992–2012, and the peripheral ports challenge, 2014 IGU Regional Conference, Krakow, 12–18 August 2014.
- DUCRUET, C. and NOTTEBOOM, T. (2012), *The worldwide maritime network of container shipping: Spatial structure and regional dynamics*, Global Networks, Wiley, 12 (3), pp. 395–423.
- ESCACH, N. and SERRY, A. (2015), 'Les méditerranéennes ou l'émergence de régionalisations réticulaires', *Géographie des mers et des océans*, Dunod, pp. 226–270.
- FREMONT, A. (2007), 'Global Maritime Networks. The case of Maersk', *Journal of Transport Geography*, Elsevier, 15 (6), pp. 431–442.
- GRZYBOWSKI, M. (2013), 'Development of Logistics Functions in the Baltic Sea Region Ports', *Marine Navigation and Safety of Sea Transportation*, pp. 243–247.
- GUILLAUME, J. (2012), 'Réorganisation maritimo-portuaire et développement des territoires d'une périphérie intégrée: l'exemple de l'Europe nordique', *Norois*, 223, pp. 105–122.
- GULTYAEV, A., MAKOWSKAYA, J., MIKHNEVICH, A. AND NEMANOVA, N. (2018), 'The seaport of Gdansk as the hub of international trade', *Journal Sepike*, Ed. 20, pp. 115–118.
- KABASHKIN, I. (2012), 'Freight transport logistics in the Baltic Sea Region. Regional aspects', *Transport and Telecommunication*, 13 (1), pp. 33–50.
- KOTOWSKA, I. (2014), 'The Competitiveness of Feeder Shipping Compared to Road Transport', *Journal of Maritime research*, XI (3), pp. 21–26.
- LORENTZON, S. (2014), Containerization of the Baltic Sea – A competitive perspective, Working Paper, School of Business, Economics and Law at University of Gothenburg, p. 48.
- MAREĪ, N. and DUCRUET, C. (2014), 'L'intégration économique de la Méditerranée par les réseaux maritimes et portuaires', *Maghreb-Machrek*, 220, pp. 11–33.
- MERK, O. (2018), Container Ship Size and Port Relocation, *International Transport Forum*, <https://globalmaritimehub.com/wp-content/uploads/2018/10/container-ship-size-and-port-relocation.pdf>.
- NOTTEBOOM, T. (2004), 'Container Shipping And Ports: An Overview', *Review of Network Economics*, 3 (2), pp. 86–106.
- NOTTEBOOM, T. and RODRIGUE, J. P. (2008), 'Containerisation, Box Logistics and Global Supply Chains: The Integration of Ports and Liner Shipping Networks', *Maritime Economics & Logistics*, 10, Palgrave, pp. 152–174.
- OJALA, L. (2017), 'Maritime transport in the Baltic Sea in 2016', *BSR Policy Briefing 1/2016*, pp. 38–50.
- PAVUK, O. (2017), 'Comparison of port activities of the East Coast of the Baltic Sea: 1996–2016', *Technology audit and production reserves*, Vol. 4, 5 (36), pp. 15–19.
- POLAT, O., GÜNTHER, H. O. and KULAK, O. (2014), *Maritime Economics & Logistics*, Vol. 16, pp. 343–369.
- RODRIGUE, J. P. (2017), *The Geography of Transport Systems*, New York: Routledge.
- RODRIGUE, J. P. and NOTTEBOOM, T. (2010), 'Foreland-based regionalization: Integrating intermediate hubs with port hinterlands', *Research in Transportation Economics*, 27 (1), pp. 19–29.
- RODRIGUE, J. P., COMTOIS, C. and SLACK, B. (2013), *The Geography of Transport Systems*, 3rd Edition, Routledge.
- ROMANOW, P., FRAS, J. and KOLINSKI, A. (2015), 'Container transport in Poland in logistic supply chain', *Research in Logistics & Production*, 5 (1), pp. 43–51.

- SERRY, A. (2016), Feederling and maritime regional markets: the case of the Baltic Sea, In Devport International Conference, Le Havre, May 19–20 2016.
- SERRY, A. (2017), Automatic Identification System (AIS) as a Tool to Study Maritime Traffic: the Case of the Baltic Sea, *Marine Navigation*, CrC Press, pp. 139–146.
- SERRY, A. and ESCACH, N. (2015), 'Les villes et ports de la Baltique, des interfaces aux portes de l'Europe', *Revue d'études comparatives Est-Ouest*, 46 (4), pp. 229–263.
- SEVIN, J. C. (2011), La desserte maritime et terrestre de l'Europe en trafics conteneurisés à l'horizon 2030, Thèse en économie des transports, Conservatoire national des arts et métiers.
- THOREZ, P. (2011), 'Les enjeux portuaires de la Russie en mer Baltique', *Territoire en mouvement*, 10, pp. 49–59.
- TOURRET, P. (2008), 'Le feederling marché spécifique de la conteneurisation', *Note de synthèse n°101 de l'ISEMAR*, <http://www.isemar.asso.fr/fr/pdf/note-de-synthese-isemar-101.pdf>
- URBANYI-POPIOLEK, I. (2018), Challenges for Polish ferry market development in Baltic Sea Region, In GLOBMAR Conference, Gdansk, 19–20 April 2018.
- VIGARIÉ, A. (1979), *Ports de commerce et vie littorale*, Paris, Hachette.
- WEIGEND, G. G. (1956), 'The problem of hinterland and foreland as illustrated by the port of Hamburg', *Economic Geography*, 32, pp. 1–15.
- WIŚNIEWSKI, S. (2015), 'Significance of Trans-European Transport Networks for Logistics Centre Localization as Exemplified by the Łódź Region', *European Spatial Research and Policy*, 22 (1), pp. 23–44.
- WOLFF, J., HERZ, N. and FLAMIG, H. (2011), Report on Empty Container Management in the Baltic Sea Region: Experiences and Solutions from a Multi-actor Perspective, Hamburg University of Technology, The Baltic Sea Region Programme 2007–2013.
- YUDNIKOVA, E. and ALEKSANDROVA, S. (2016), 'Evaluation of the resource potential of maritime container terminals of St-Petersburg and Leningrad region', *Russian Journal of Logistics and Transport Management*, 3 (2), pp. 3–11.