International Transport Forum

Inland Waterways, Transport Corridors and Urban Waterfronts

Discussion Paper

169 Roundtable

Antoine Beyer
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The International Transport Forum

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Global trends in river transport

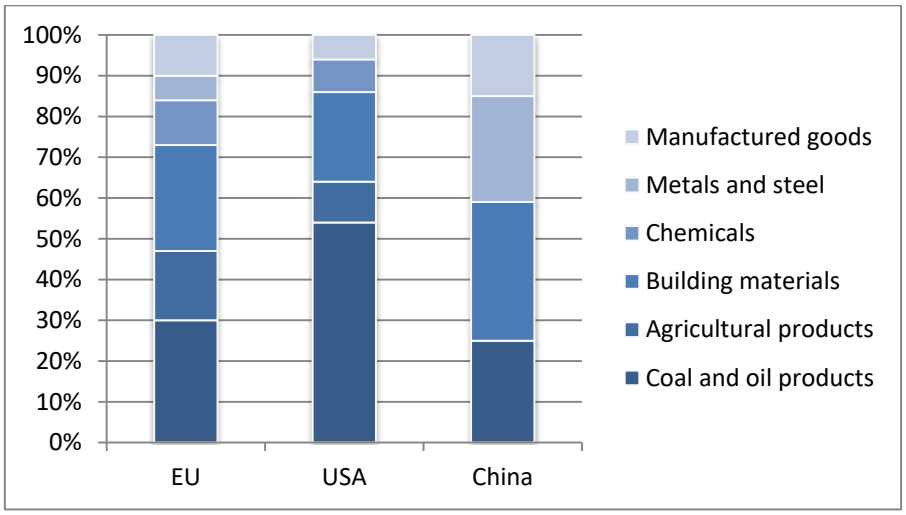
There are around 623 000 kilometres of navigable waterways in the world. Most of these navigable waterways form part of river systems, so networks of rivers and river basins that are interconnected. China is the country with the largest navigable waterway network, representing 18% of the total global length of navigable waterways. Other countries with large navigable waterways include Russia (16%), Brazil (8%) and the USA (7%). Navigable waterways in Europe represent 8% of the global length (Konings, 2016). Only part of these navigable waterways is used for freight transport: around 24 000 km in China, 16 000 km in the USA and 3 500 km in Europe. The main river transport networks are those of the Yangtze, the Rhine-Danube and the Mississippi.

By far the largest commercial use of river transport takes place in China. Approximately 4.9 billion tonnes of cargo was transported in 2013 via inland waterways in China, compared to 0.6 billion in the United States and 0.5 billion in European Union. Whereas volumes declined in the US and only very gradually grew in Europe, China's river transport volumes more than quadrupled since 2000. In terms of tonne-kilometres, river transport volumes in China in 2013 were ten times as high as in 1990 (Konings, 2016). Inland water transport now represents around 8% of the total cargo transport volumes within China and the US (in terms of tonne-kilometres), and 6% in the EU.

Important cargoes transported via river include coal, oil, building materials and agricultural products. Energy products make up more than half of the river transport cargo in the US, whereas metal and steel products are much more important in China (Figure 1). In both China and the EU container barge services exist, that link seaports with hinterlands. In the US, the hinterland connections of main container ports are assured by rail services, whereas its main river system has a North-South orientation that is not connected to the main East-West containerised flows. The cargo flows along the Mississippi are mostly from bulk commodities: chemical and oil products coming from the Mexican Gulf industry upstream and grains from the Midwest downstream. The South American river transport system resembles the American pattern.

River transport is dependent on significant infrastructure investment. Making a river navigable, digging a canal or building a set of locks has huge financial implications. Without maintenance these infrastructures gradually lose their value. Without dredging, the barges have to carry a lighter load. Because of their gradual character, infrastructure managers are often tempted to postpone maintenance or modernisation, at the risk of underutilisation of the waterway. Inland waterways are usually financed by a mix of tax money and user fees, highly different according to the local circumstances. In some cases river traffic is free of charge, e.g. the Rhine since an international agreement in 1868. In the Netherlands and Flanders, the fees are so low that they can practically be considered as a free passage. User fees have been linked to tonnage, tonne-kilometres, value of the goods and the fuel price. Downstream parts of rivers usually have higher transport capacity but lower maintenance costs, whereas upstream parts have lower use but higher costs. The management of the infrastructure is mainly entrusted to national or public administration in charge of the network homogeneity and often disconnected from port governance, which generates co-ordination issues.

Figure 1. Main commodities transported via rivers



Note: The shares refer to tonne-kilometres. Data from 2013 for EU and USA; data from 2006 for China.

Source: Based on Konings (2016).

Financing inland waterway infrastructure often goes hand in hand with a specific vision of the main river transport axes. This was the case of the 2008 reform in Germany that prioritised part of the river transport network, in particular those parts connected to seaports. This new paradigm reflected the end of territorial equity, the concentration of financial resources on some key axes and the partial withdrawal of public authority in the management of river services. Financial support can also extend to support for the river barge sector. E.g. the Netherlands offers favourable fiscal treatment (loan deduction from income tax), state guarantees for acquisition of barges, modest professional fees and special public schools for the children of barge operators.

Within the European Union, inland water transport is directly promoted and largely financed by European institutions that are eager to develop a sustainable mode of transport. Co-operation between member states is institutionalised via two international river commissions, the Central Commission for Navigation on the Rhine (CCNR) and the Danube Commission. Inland waterway transport infrastructure investments in the EU's Member States are predominantly supported by the cohesion instruments European Regional Development Fund (ERDF) and Cohesion Fund as well as by financial means provided for the development of the Trans-European Transport Network (TEN-T). The Marco Polo II programme was created in support of modal shift actions from road to rail, short sea and inland waterway transport. There also is a dedicated programme for inland water transport: the Navigation and Inland Waterway Action and Development Plan in Europe (NAIADES). In addition, national governments in various countries (Netherlands, Belgium, France and Germany) have attempted to developed river transport as a viable hinterland transport mode connected to their main ports.

The US system relies on strongly integrated river transport management administered by the federal US Army Corps of Engineers. The federal government covered full costs until mid-1970 when user pay was introduced. Since the Water Resources Development Act of 1986, expenditures for construction and major rehabilitation projects on inland waterways have been cost-shared on a 50/50 basis between the federal government and commercial users through the Inland Waterways Trust Fund (IWTF), with some exceptions. The more expensive construction or maintenance costs (defined as lager than USD 8 million) are fully covered by the federal government and the Corps also fully funds the costs of studies. A major

challenge is the state of the infrastructure for river transport. The river transport system relies on 192 locks along the Mississippi. Despite an expected lifetime of fifty years, some locks are still in operation after seventy or eighty years of service. Unplanned delays due to mechanical breakdowns have been an issue for more than a decade, which affects the reliability of river transport. Climate change has also a direct impact on navigability by lowering the water level, e.g. during draughts in 2012, or making the meteorological prediction less reliable. Objectives of US policy include the alleviation of transport congestion by increasing use of river transport.

In China, persistent co-ordination challenges exist between organisations at the local, regional and national levels with regards to river transport. The Bureau of Water Transport of the Ministry of Transport has overall responsibility for policy and administration for planning realisation of channels of national importance. The provincial governments are in charge of the secondary network which constitutes the most extended part of the total network. The provincial authorities are required to submit annual reports to the MOT. The two major regions for river transport, the Yangtze and Pearl Rivers, are supervised by dedicated River Administrations which report to the Ministry of Transport. Another key-player is the Ministry of Water Resources that has the final say over projects. Investment in inland waterway transport represents 6% of Chinese transport infrastructure investment (ADB, 2016). Strategic objective in Chinese policies is to expand river transport by substantially upgrading the waterway system by 2020, in particular by making more rivers accessible for vessels of over 1 000 tonnes. Early framework designs have been floated for an integrated river information system.

Integration in transport corridors

Inland water transport is increasingly integrated in transport networks and logistics chains. This is particularly the case for manufactured and containerised goods, and to some extent bulk cargo. The digitalisation of information from transport flows leads to a transformation where flows and data are inextricably combined. This development reflects the strong downward trend in the supply chain towards greater integration and demand-led management. Sharing information and building common platforms is therefore a key factor to the success of both the sharing of information in the standardised data exchange as it exists, for example, in the Cargo Community System or in strategic co-operation of institutional actors.

Dedicated barge services to deep sea terminals can help to resolve terminal congestion. Organising loading and unloading a scheduled 100- to 200-TEU barge is more efficient than dealing daily with hundreds of trucks, which may be delayed by traffic jams. The barge terminal may be in the vicinity of the port or further upstream. The crucial point here is not the geographical distance to be covered, but the transport time suitable for a regular barge rotation. This forms the basis of the “transferium” applied by the ports of Rotterdam and Antwerp. Container transferia are consolidation points for barges that facilitate regular transfer from and to the deep sea terminals. These transferia may also offer more services by offering value-added activities that complete the transfer function, such as empty depots, distribution centres and customs. Possible results include reduced dwell times and higher supply chain reliability.

Box 1. Container Transferium Rotterdam-Oost (Alblasserdam)

The Container Transferium Rotterdam-Oost, operated by the private actor BCTN, began its activity in 2015. It has been established along the congested A 15 motorway on the edge of the Rotterdam ring-road, 30 km away from the New Maasvlakte 2 that opened in the same year. The infrastructure itself has been financed by public bodies, the Minister for Environment and Infrastructure and the Province of South Holland. The objectives announced the suppression of 500 000 truck trips to the sea terminals. Due to the use of the transferium, companies are able to save significant amounts of time and mileage, and trucks can be used for more rides. The solution is also profitable for the seaport terminals, where operators have to cope with increasingly larger vessels. The argument of the BTCN is that by making use of the inland barge shuttle to Alblasserdam they can better absorb peaks and gain their modal split targets. Another advantage is that the seaport terminals know in advance the second modality. This helps the deep-sea terminals with their planning and increases efficiency. The service operator BTC secures a daily inland waterway shuttle from the transferium to the main container terminals on the Maasvlakte (PMT, ECT, RWG and Euromax). The containers delivered in Rotterdam-Oost are unloaded the next day and vice versa. The terminal is provided with up-to-date environmentally designed material, such as electric cranes, cleaner fuels and cold ironing for the barges.

The integration of river transport with the larger supply chain is also highlighted in the concept of synchro-modality. This concept emerged in the Dutch logistics sector discourse in 2010 and has since been widely diffused (TNO, 2010; Van der Burg, 2012). Synchro-modality is presented as a new stage in the development of transport supply, going beyond inter-modality, which presupposes a predetermined combination of two successive means of transport, and beyond co-modality which leaves the choice of the most appropriate means of transport up to the organiser. The idea of synchro-modality is that transport managers can opt for one transport mode or another, depending on the circumstances and the level of saturation of a transport vector.

The synchro-modal development is enhanced when the river ports are equipped as tri-modal places (connecting by water, road and rail) and when terminal operators or the port authority can offer integrated services. This is the case for German port authorities who are generally in charge of combined rail/road transport sites and often have their own railway subsidiaries. The targeted fluidity in the modal choice presupposes a permanent smoothing between parallel offers and requires performing interoperability. This service requires a reorganisation of the network architecture and the intensification of the instantaneous exchange of data.

Cargo community systems provide ways in which information flows of maritime logistics chains could be integrated with those of river ports. The International Port Community System Association (IPCSA) defines CCS as a neutral and open electronic platform for the intelligent and secure exchange of information between public and private actors in order to move the competitive position of port communities. It automates logistical processes through a one-stop procedure for transferring the data between several types of players: private carriers (shipping companies, agents, freight forwarders, freight forwarders, terminals, depots), private importers and exporters from the hinterland, pre- and post-transport by road, rail and inland waterways, port authorities, customs administration and other public bodies. In addition to port and customs formalities, the information exchanged makes it possible to optimise the management of traffic throughout the route and more particularly for access to the terminals, which are very sensitive to uncertainties and allows for predictions of traffic. Finally,

traceability is a key element of safety devices, which have continued to be strengthened. Cargo community systems could be considered an extension of port community systems and allow for integration of river ports. For example, the CCS of the port of Marseille extends to the ports along the Rhone River.

Box 2. Container Transferium Antwerp-Oost (Beverdonk)

The Antwerp-East platform plays the same role as its Dutch counterpart in easing traffic to deep-sea terminals by taking the pressure off the roads and the barge service is managed by the same group BTC. The location choice is guided by the motorway junction E313 et E34, alongside the Canal Albert (Anvers-Liège), 30 km from the deep-sea terminals. The platform facility is managed by Beverdonk Container Transferium NV whose capital is shared between DP World (80%) and the Port Authority (20%). A 25-year concession agreement has been signed with the Flemish region through its Agency for Waterway Management in charge of the Canal Albert, as the landlord.

The goods and containers delivered in Beverdonk have the same custom facilities as the port terminals and can reach their destination without any specific documents. Five years after its creation in 2011, the accumulated traffic reached 30 000 TEU and presented as an operational and commercial success. The installation has been set for a maximum capacity from 50 000 TEU a year (with a possibility of 300 000 from further investment). It is also difficult convincing carriers and transport firms to switch to a last-mile barging solution.

The platform participated in the rapid logistic expansion along the Canal Albert, where the Meerhout terminal (Europort Group part of Hutchinson Holding) is a serious challenger or the ECT terminal Willebroek that linked with Rotterdam with similar ambitions. It is not quite clear in which way these Flemish terminals play a role as an alternative access to the road or whether they develop their own traffic linked with the nearby warehouses, that have considerably expanded along the canals and rivers in the Delta region during the last decade as European distribution centre for major economic players (Nike, Energizer, Wilkinson, Lexmark, Casa, Estee Lauder…).

The attractiveness of the Canal Albert area should also be increased by the land availability in the port area, which is becoming scarce and by the fact that all the bridges which cross this canal will be rebuilt to allow for four-layered convoys by 2020. In that sense, real transferia are far away from inland ports, although a theoretical approach devoted to a (de)consolidation function related with warehousing, as the transferium is focused only on container handling.

More co-operation between ports is starting to emerge. Links between river ports are numerous and very varied in scope and intensity. The trend is gaining momentum as an expression of the need for upscaling port governance. This development appears as an obvious answer to increasing volumes of transport. It pushes private actors and public authorities into structuring their policies with regard to the relaying role played by inland ports in the process. This networking can be initiated by different actors, including by maritime ports that seek to consolidate inland support by establishing privileged partnerships with public authorities at various geographical levels. These partnerships are intended to rationalise the investments necessary for the modal shift. When river ports work together, their co-operation enables them to better meet the expectations of the users and have more influence in their relations with their maritime interlocutors. This co-operation can take various forms, including mergers between river ports, co-operation with a clear hierarchy and collaborations on more equal footing (Figure 2).

Figure 2. Types of emerging port coalitions

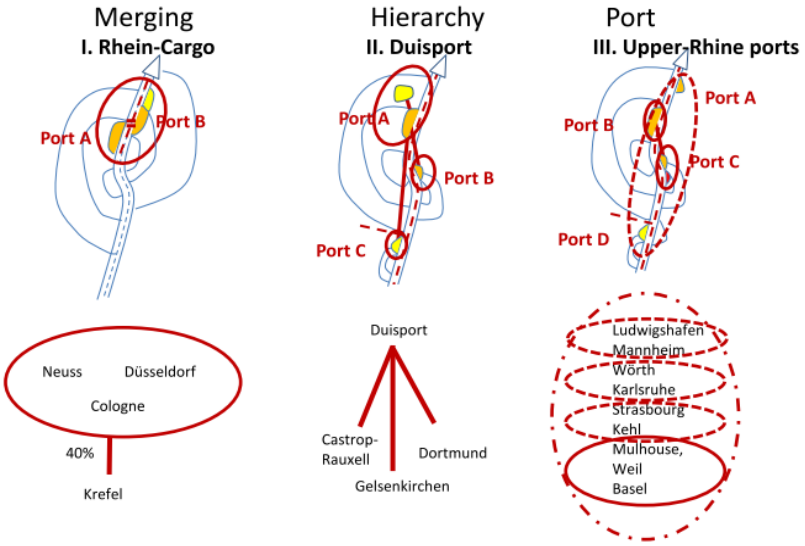
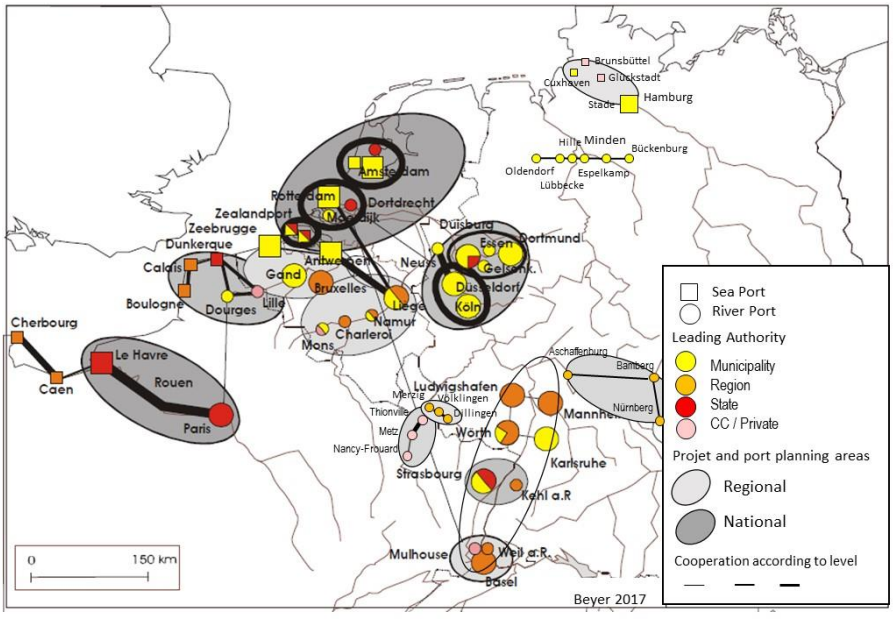


Figure 3. The emergence of new institutional co-operation among sea and river ports



Over the past decade, numerous studies have highlighted the increasing interdependence between ports through flows and services provided by private transport companies. These are interpreted as an optimisation of value chains (Robinson, 2006). The most powerful economic players develop active strategies to penetrate and control the hinterland, by alternately using complementarity or competition between ports. Increasingly, however, the port authorities are intervening as a driving force behind corporate actors. The success of the notion of Extended Gateway is thanks to the Flemish Institute for Logistics in 2003 (Charlier, 2009). Considering this phenomenon in its spatial component, Notteboom and Rodrigue (2005) have put forward the notion of "port regionalisation". The river corridors, commonly serve as “conductive threads” for the political and functional coalition of ports (Figure 3).

River ports and cities

The trend towards urban redevelopment in port areas is known as waterfront regeneration. Experiences from North America spread over to Europe and were used as model for the transformation of river ports (Höllander et al., 2011). The phenomenon has raised a great deal of interest, not only because the port regeneration projects have been an overwhelming commercial success, but also because they have served as a catalyst for creating new identities for cities. Port regeneration was also seen as a visible sign of a shift from a production to a services economy.

Little attention has been paid to the restructuring of river ports, which are considered to be late-comers to the restructuring process. Urban governments in river ports have been directly influenced by what has happened in sea ports. In most cases, a river port is closer to a city, both in a geographical and political sense, as port management generally remains in the hands of the municipalities. Unlike sea ports, which simply withdrew from obsolete installations and built new terminals further away on unused land partly reclaimed from the sea, river ports do not have the same opportunities for expansion and have much more of a struggle to avoid losing land. Along the Rhine River, the trend towards port regeneration is characterised by its rapidity and scale. Almost every large and medium-sized city has a regeneration programme that is accelerating a continuous functional disconnection between the city and its port activities.

Waterfront regeneration in river port-cities generally strengthens urban functions. According to (Stöckner, 2005) 60% of port revitalisation on the banks of the Rhine is planned to reinforce the city's status as a centre, 30% to rehabilitate the public space on the river banks and only 14% to strengthen port activity by consolidating traffic. Port restructuring can be seen as a way of reconnecting the city to the river space, where access to water is considered to be a central part of the urbanisation process, intimately linked with positive values such as leisure and proximity to nature.

The waterscape appears to be extremely valuable, as it offers the last open view in a dense urban environment. The port area also has a unique atmosphere, which is central to its distinctive nature and contributes directly to the quality of the location. New buildings, designed by famous architects to add to their fame, are built as landmarks. Port renewal, especially along the Rhine, has called on *starchitects* to generate emblematic buildings, such as those by Franck Gehry in the *Medienhafen* in Düsseldorf, the Hitachi Power office by Sir Nicholas Grimshaw, the Museum of Fine Art by Herzog, de Meuron and Norman Foster in the *Innenhafen* in Duisburg, the 2009 MIPIM award-winning Kranhäuser by Alfons Linster, and Teherani in Cologne. These ambitious projects set out to attract corporate head offices and research centres via clustering. These clusters include media in Düsseldorf and Cologne, finance in Frankfurt and biotechnologies in Basel.

A consequence of the waterfront development in river port-cities could be the reduction of land available for port functions. The topic is not a recent one, and several reports, position papers and public meetings have raised this point, presenting the loss of land as an irreversible process that cannot easily be compensated for by new installations.[1] The opportunities for expansion onto the water are very limited and subject to strict environmental controls, requiring long and expensive procedures that generally raise fierce opposition within neighbouring communities.

Table 1. The public ports in the Rhine area and their urban projects

	Conventional traffic (in 1 000 t) 2010 (2025 est.)	Container traffic (in 1 000 t) 2010 (2025 est.)	Land area (ha)	Urban project	Year	Size (ha)	Land availability (2012) ha
Andernach	2 499 (3 312)	83 (184)	54	No	-	-	90
Bâle	n.a.	n.a.	125	New Basel	2005	18.7	0
Bendorf	Ports	n.a.	37.5	No	-	-	-
Bonn	n.a.	n.a.	63	no	-	-	12
Colmar Neuf Brisach	n.a.	n.a.	550	no	-	-	-
Dortmund (canal)	1 713 (1 601)	127 (269)	135	Speicherstraße	2005	12.5	15
Duisburg	18 318 (20 750)	1 181 (3 227)	933	Innenhafen	1995	50	15
Düsseldorf	n.a.	n.a.	150	Medienhafen	1989	26	50
Emmerich	410 (465)	78 (130)	56	no	-	-	8
Emmelsum-Voerde	n.a.	n.a.	58	no	-	-	12
Frankfurt (Main)	4 011 (4 820)	62 (72)	162	Hafen 2000 +	2003	12	0
Germersheim	Nc	170 (557)	59	no	-	-	0
Gernsheim	n.a.	n.a.	15.3	no	-	-	-
Karlsruhe	5 791 (7 312)	23 (68)	229	no	-	-	185
Kehl	5 517 (6 651)	32 (100)	264	no	-	-	6
Koblenz	722 (777)	71 (135)	30	no	-	-	1
Köln	22 413 (24 497)	200 (439)	218.5	Rheinauhafen	1998	15.5	15
Krefeld	3 891 (4 962)	57 (537)	500	no	-	-	29.5
Lahnstein	n.a.	n.a.	12.8	no	-	-	-
Strasbourg-Lauterbourg	n.a.	n.a.	86	no	-	-	100
Ludwigshafen	8 327 (9 054)	83* (260)	127	Rheinufer Süd	1996	30 (15)	5
Mainz	972 (911)	128 (400)	30	Alter Zollhafen	2011	30 (22)	7.5
Mannheim	7 644* (9 463)*	311 (844)	863	Mannheim Blau	-	40	6.5
Mulhouse-Ottmarsheim	n.a.	n.a.	84	no	-	-	-
Münster (canal)	n.a.	n.a.	75	Kreativkai	1996	75	33.26
Neuss	n.a.	n.a.	350	Stadthafen	2007	17	50

	Conventional traffic (in 1 000 t) 2010 (2025 est.)	Container traffic (in 1 000 t) 2010 (2025 est.)	Land area (ha)	Urban project	Year	Size (ha)	Land availability (2012) ha
Offenbach (Main)	n.a.	n.a.	30	Hafeninsel	2014	30	0
Orsoy (Rheinberg)	n.a.	n.a.	8	no	-	-	-
Speyer	n.a.	n.a.	15	Alter Hafen	1999	6.4	-
Strasbourg	n.a.	n.a.	580	2 rives	-	30	-
Weil	n.a.	n.a.	11.5	no	-	-	-
Wesel	n.a.	n.a.	13.8	stopped	-	-	-
Wiesbaden	n.a.	n.a.	0	Osthafen	-	6.3	0
Worms	n.a.	n.a.	26.5	no	-	-	-
Wörth	459 (488)	129 (359)	126	no	-	-	8

Note: *without rail / na: not available.

Source: Author's own amalgamation of several sources. Traffic data from Planco (2013).

The reduction in the size of a port area not only limits activities there; more indirect consequences also have to be considered in terms of spatial redistribution. The proximity of port and urban activities and, in some cases, the mixing of functions may lead to more acute cohabitation conflicts. Handling and production in ports usually generate several types of unwelcome impact (noise, odours, gas emissions and road traffic, for example). This requires the creation of buffer zones for lighter economic activities that consume land that cannot be set aside for other transport or industrial purposes. In urban sites, even a slight reduction in land occupancy rates may radically limit the possible use of the port and trigger a gradual process of abandonment.

Port advocates point to the employment that these generate. In Germany, the 109 public river ports are thought to provide 235 000 direct and a further 400 000 indirect jobs.2 Another estimate states that every 1 000 tonnes of freight handled create between 1 and 1.5 jobs and produce EUR 80 000 to EUR 100 000 of added value before tax.3 The firms that operate in ports stress the need for sustainable mass transport such as that provided by waterways. This is, for instance, the case for the municipality of Neuss, which rejected a profitable project based on office buildings to rent the site to a logistics provider.4 In this case, the port as a logistics location is an integral part of the city's urban identity and economic orientation. In contrast, the city of Düsseldorf, which faces Neuss on the opposite bank of the Rhine, continues to gradually replace its traditional port activities with high-level services. The remarkable success of the *Medienhafen* conversion project encourages continuation of the urbanisation process that is under way, with a real and positive spill over effect (Fläming, 2010).

Falling traffic in a technically obsolescent environment leads to a non-conflictual transition. Port traffic in Münster on the Dortmund-Ems canal was falling so much that it made no sense to maintain a port there. The entire area will therefore be gradually converted to urban use. The first stage of redevelopment has already been completed with the "Kreativ Kai" urban project that combines housing and leisure (especially gastronomic) in the former port area. By this time, the nucleus of the Port of Duisburg, the so-called *Innenhafen,* had lost almost all commercial significance. The body of water around which

redevelopment has taken place is a few kilometres away from the Rhine and can only be reached by way of a narrow outdated lock. Its area of 50 hectares represents only a small fraction of the total area of the port (3.5% of the 1 350-hectare port extension). A number of buildings dating from the early 20th century have been recognised as historical monuments and must therefore not undergo any structural change. Faced by a severe loss of population, the core of the industrial Ruhr needed this redevelopment project to restore its urban image and enable it to continue to perform the role of a port management centre, in particular by providing a location for the headquarters of the transport and logistics services firms attracted to other parts of the port by the large amount of available land.

Urbanisation is not the only way to revitalise unused or underused port areas. Other river-connected functions, those more directly linked to the existing infrastructure, may be encouraged, for example tourism terminals, which can take advantage of the proximity of a city centre. In Cologne-Deutz, the alternative proposal to the conventional plan for a marina would be to safeguard the maintenance and repair centre that could also provide an emergency repair service for river cruise boats, as the majority of them call at Cologne. In addition, not all the port areas are suitable for urban development due to a flood risk. Ute Stöckner takes an optimistic standpoint, estimating that 95% of port areas could be declared suitable for building if adequate measures are taken, such as, for example, strengthening dikes, using the ground floor exclusively as garage space or keeping it completely free.5

Another option is to bring together port handling activities at specific sites and modernising a few installations to improve their efficiency. Traffic intensity in relation to quay length varies from one to seven,6 which suggests that major productivity gains are possible in many cases. As a result, higher intensity and more compact organisation could produce quite interesting results locally. This was the solution chosen in Frankfurt am Main, for example, where the West Hafen was completely closed down and local economic actors were willing to be relocated to other port sites (*Ost-Hafen* or the nearer *Gutleuten Hafen*). Meanwhile, the power plant that could not be removed without great economic loss has been integrated within a completely new urban environment. The same process took place in Basel for the historic St Johann port, whose poor rail and road access meant it generated through traffic in residential areas.

Leasing out former port land can also be seen as a financial opportunity for the port administrators to make greater profits by taking shares in a jointly-owned company that is responsible for real estate operations, as was the case in Cologne with the port management firm HGK for the *Rheinauhafen* project. Similarly, in Strasbourg, the port administration (*Port Autonome de Strasbourg*) decided to lease the land to urban promoters to maintain their ownership interest and benefit from regular income generated by future operations. At the same time, as a shareholder or even a land owner, the port can more easily prevent any developments that could interfere with remaining port activities. In this case, too, ownership is used to ensure the desired balance is maintained.

For the Port manager, the question is to what extent is mixed use possible without generating conflict? This requires the creation of transitional spaces and a strict hierarchy of possible activities. Port or local urban activities may dominate, depending on local circumstances. The Tolbiac port project in Paris is an acknowledged reference for the mixed use of quays: during the week, access is reserved for raw building materials; in the evenings and weekends, it provides space along the River Seine for pedestrian use, while special lighting effects at night turn the port installation into a local landmark.

When the potential for expansion is limited, other possibilities should be considered. The first of these is to take over industrial land or re-use brown-field sites. These may be directly accessible from the water, and can be provided with new terminals, as is the case in LogPort 1 & 2 in Duisburg or the Trilogiport in Liège. One of the areas under discussion is the pooling of land management resources and the joint use

of terminals to optimise existing capacities, for example the merger of Neuss and Düsseldorf (a grouping that also controls 45% in the Port of Krefeld), and later with HGK (Cologne).

Conclusion

Even more than in the past, river transport has reinforced its dependence on maritime access. The seaport interfaces with river transport according to the demands and the rhythms of globalised flows. As a direct consequence, river transport actors are increasingly integrated in the contemporary logistics chains due to two major vectors: higher volumes of handled goods and integration of supply chains. These developments push the inland water transport sector to open up and redefine itself in terms of operations and strategic positioning. This involves several challenges:

- Preserving investments for the maintenance and development of infrastructures with a strong emphasis on linkages to maritime connection, the main element in structuring transport corridors, especially since inland waterway transport is notoriously under-funded in relation to its effective environmental and economic contribution; to maintain this position, river transport has to keep up with technical innovation, while road (because of economies of scale) is more proactive.
- The integration of the actors in the logistics chain leads to the increasing insertion of waterways into more complex organisational arrangements where its advantages of cost, capacity and regularity find their place. Here, river transport shows more adaptability than the rail system.
- Improving the operational interface with the other means of transport within the logistic nodes (in terms of equipment as well as in governance). In this context, infrastructure managers play a key role, such as the road connection problem identified in Dutch secondary river ports, or the reassessment of the central place of rail that makes the German ports a possible model for inter-modal models.
- Re-introducing waterways in local or regional comprehensive development projects, particularly on the urban scale. Here, the problem is related to the resolution of land tenure in the redeployment of activities in inner-city spaces. Sharing the use of river banks should be considered, as it has successfully been implemented in central Paris, although it is not always so simply applicable. Waterways also present a logistic resource that is still under-exploited on the metropolitan scale. Dialogue with local authorities is to be initiated on the basis of open strategic negotiations. Here again, river transport should break out of its historical isolation.

Notes

1 Bundesverband Öffentlicher Binnenhäfen, *Wachstumsmotor* (2006); Bundesverband Öffentlicher Binnenhäfen, *Stadtentwicklung* (2007). See the meeting with federal deputies in 2007.

2 Bundesverband Öffentlicher Binnenhäfen, *Stadtentwicklung* (2007), p. 8.

3 Ministerium für Wirtschaft, Energie, Bauen, Wohnen und Verkehr des Landes Nordrhein-Westfalen, *Binnenhäfen* (2010), pp. 19-20.

4 Ministerium für Wirtschaft, Energie, Bauen, Wohnen und Verkehr des Landes Nordrhein-Westfalen, *Binnenhäfen* (2010).

5 Stöckner, *Strategien* (2005), p. 48.

6 Stöckner, *Strategien* (2005), p. 97.

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International Transport Forum

Inland Waterways, Transport Corridors and Urban Waterfronts

This paper analyses the opportunities and challenges of integrating inland waterways into transport corridors. Less than a fifth of the world's 623 000 kilometres of navigable inland waterways is currently used for freight transport. Although river transport has expanded in some countries, it is actually declining in others due to lagging investments or co-ordination. At the same time, urban development is encroaching on inland ports, reducing the space for logistics activities in many river ports, creating challenges for policy makers.

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