

Weakest link or strongest node? Prospects for inland port development in transnational European corridors

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Abstract

In a context of increasing global freight transportation and transnational corridor development, inland ports are becoming more important in enhancing hinterland accessibility of deep-sea ports. At the same time, however, when considering the ‘weakest link’ principle, the increasing reliance on inland hubs can also pose a threat to efficient transnational corridor development, especially in relation to adjacent urban regions. Port literature pays limited but growing attention to the conflicting port and urban functions in inland ports. The aim of this paper is therefore to reflect on the findings of a cross-national comparison of governance strategies for inland port development in four different countries along the CEF Rhine-Alpine Corridor (Rotterdam-Genoa). Our findings reflect the difficult position of inland ports within a densely populated corridor. On the one hand, sufficient capacity is needed to prevent the occurrence of bottlenecks, which could threaten flows on other parts of the corridor. On the other hand, increasing port capacity should be aligned with policy measures on the level of the urban region, to avoid the overlapping of port and urban functions, which could lead to conflicts with respect to land-use, economic development and quality of life. This poses challenges in terms of port governance. We observe that cases in which the port and urban administrations open up the policy process to other private stakeholders and the public, common governance strategies for inland port development are more likely to occur.

Key-words

Inland ports, transnational corridor development, port-city challenges, inland port governance

Introduction

Over the last decade, global freight transportation has expanded considerably, largely resulting from globalisation processes and increasing economies of scale. These growing global volumes are putting pressure on the design and operation of the European transport network. For instance, the emergence of Asian and Latin-American markets on a global level

(e.g. Monios & Wang, 2013; Ng *et al.*, 2013; Wilmsmeier *et al.*, 2014) impacts the spatial allocation of freight movements on the European regional level as a result from differing criteria from companies for port selection, routing, etc. (Notteboom & Rodrigue, 2005). These changing freight volumes have a direct impact on the capacity and accessibility of the nodes, links and supply chains in the European transport network.

In particular, inland ports are becoming more important in enhancing and securing hinterland accessibility for deep-sea ports. As global freight transportation is increasing, deep-sea ports have to expand themselves (which oftentimes is problematic because of local land-use constraints), have to divert the incoming flows along transnational corridors towards inland hubs, or a combination of both (Rodrigue *et al.*, 2010; Wilmsmeier *et al.*, 2011; Monios & Wilmsmeier, 2012). In the European context of path-dependent development, where vacant space in deep-sea ports is relatively scarce and where in many cases different institutional structures overlap, there is a growing urgency to facilitate for increasing freight flows along transnational corridors towards hinterland destinations (Van den Berg & De Langen, 2011; Van der Lugt *et al.*, 2014). Hence, attention to inland port development is growing.

At the same time, however, inland ports themselves are also facing increasing land-use constraints, complex actor constellations, institutional fragmentation, etc. (e.g. Raimbault *et al.*, 2015; Wilmsmeier & Monios, 2015). Thus, when considering the ‘weakest link’ principle, the increasing reliance on inland hubs can also pose a threat to efficient transnational corridor development, especially when inland hubs are closely related to adjacent urban regions, as is often the case in Europe. Sufficient capacity in inland ports is needed to prevent the occurrence of bottlenecks along transnational corridors, but increasing port capacity should also be aligned with policy measures on the urban region level, to avoid competition of port and urban functions, which could lead to conflicts with respect to land-use, economic development and quality of life (Wiegmans & Louw, 2011; Daamen & Vries, 2013). This poses challenges for the governance of inland ports.

Although inland ports are becoming more acknowledged as a research focus in the academic debate, limited attention is paid to the conflicting port and urban functions in inland ports (Witte *et al.*, 2014). A systematic overview of inland port governance strategies (in particular at the level of the transnational corridor) is lacking. This paper tries to fill this gap by providing a cross-national comparison of governance strategies for inland port development

in four different countries along the CEF Rhine-Alpine Corridor (Rotterdam-Genoa). The aim of this paper is to broaden the understanding regarding the pivotal role of inland ports within the complex and overlapping hinterlands of deep-sea ports by exploring the extent to which governance strategies regarding the integration of port and urban functions in inland hubs are present and/or differ between countries along a transnational corridor.

The paper is structured as follows. In the next section, a literature review on inland port development in relation to European corridor development is presented. This results in parameters to explore the governance strategies of inland ports along the Rhine-Alpine Corridor. Case study areas along this transnational corridor are introduced to zoom in on the most important spatial and institutional aspects of inland port development strategies. In the final section, the prospects for inland ports are discussed in the light of recent European policies on transnational corridor development.

Theorising on inland port development

In recent years, academic literature on inland port development has been expanding. Some authors argue that inland port development can be viewed as the logical next step in the evolution of port systems (Monios & Wilmsmeier, 2012), for instance because of their active role in shaping supply chains by means of inland terminals (Notteboom & Rodrigue, 2009) or because of the strategic positioning of inland ports in hinterlands and corridors (Wilmsmeier *et al.*, 2011). However, the exact scope and nature of the inland ports concept remains vague (Rodrigue *et al.*, 2010). Also, the gap between the growing attention to port geography (Ng *et al.*, 2014) and the – up to now – limited attention to the spatial, economic and institutional dimensions of inland ports is surprising (Van den Heuvel *et al.*, 2013; Witte *et al.*, 2014; Raimbault *et al.*, 2015). This section therefore starts off to elaborate on some definitional issues regarding the inland port concept. Next, the positioning of inland ports in the context of transnational corridor development is highlighted. Finally, the spatial and institutional structure of inland ports is explored.

Defining inland ports

Although the literature on inland ports is growing, the reflections on the role, conceptualisations and strategies of inland ports remain limited. Still, Rodrigue *et al.* (2010) and Monios & Wang (2013) provide some useful guidelines to define the scope and nature of

the inland port concept. In particular, Rodrigue *et al.* (2010) indicate that there should be a link with the handling of containers, a link with a deep-sea port by means of a corridor and some critical mass to achieve economies of scale. They also define three geographical levels: inland terminal, inland port and hinterland. But, the terminal is often in the inland port and the terminal is also often equalled with the inland port level itself. Thus, there is a high degree of variation, which is stressed out by both Rodrigue *et al.* (2010) and Monios & Wang (2013). Both papers indicate different levels of inland port geographies (ranging from the company-level to the interregional relations between inland ports and deep-sea ports), different actors (i.e. public vs. private ownership), different institutions (e.g. governance structures, regulations, etc.) and different functions (both internal and external to the inland port). It is important to notice that the wide range of the definition of inland ports might also complicate the capacity to efficiently govern inland ports.

Another issue complicating the understanding of the inland port concept is the difference between the definition prevalent in the US-based literature regarding inland ports and the European perspective on inland ports. In the American context (e.g. Leitner & Harrison, 2001; Walter & Poist, 2004; Rahimi *et al.*, 2008), inland ports usually refer to large-scale land-bound freight sites with the availability of a rail terminal. These sites often have their own governance structure, regulatory settings, etc. This implies that an intermodal connection to inland waterways is not a necessity in the US-based definition of inland ports. The European equivalent of the US-based understanding of inland ports is generally labelled as freight village, dry port, or the like (e.g. Bontekoning *et al.*, 2007; Roso *et al.*, 2009; Tsamboulas & Kapros, 2003). In contrast, the European understanding of inland ports especially incorporates the necessity of inland waterway accessibility to label inland locations as inland ports. This paper thus is interested in European inland (waterway) ports.

Inland ports in transnational corridors

The starting point to explain the current state of port system evolution is the ‘port regionalisation’-phase as a follow-up on the stages of setting, expansion and specialisation of deep-sea ports in the Bird model (Notteboom & Rodrigue, 2005). Typical of port regionalisation is the reorientation of freight distribution from the deep-sea ports to favourable locations in the hinterlands. For inland ports, this implies that they might function as satellite terminals to relieve the congested deep-sea port areas. When these inland ports are located within a transnational corridor, they might also benefit from a corridor’s cluster

advantage for bundling cargo volumes. Moreover, Wilmsmeier *et al.* (2011) have suggested that as hinterlands of different deep-sea port areas are to an increasing extent overlapping, inland ports can have an important role as active nodes in shaping the transportation chain within largely static corridors. Governance has an important role to play here, for although regionalisation is to a large extent dependent upon the preferences of individual shippers and logistics companies, (inland) port authorities can still play an active role in trying to shape or guide the regionalisation process (Notteboom & Rodrigue, 2005).

In recent years, the attitude regarding the positioning of inland ports in the hinterland of deep-sea ports is shifting from a dependent role of inland ports relative to their maritime counterparts (the satellite terminal perspective, e.g. Rodrigue *et al.*, 2010) towards a more independent positioning of inland ports, where development is driven from the inland port itself (the Inside-Out perspective, e.g. Wilmsmeier *et al.*, 2011). This offers development potential. Rodrigue *et al.* (2010) indicate that different actors, such as port authorities, rail operators and logistics service providers have seized the opportunity to capture revenue and generate employment, leading possibly to an oversupply of inland ports in the European transport network, in particular in the Rhine delta. Wilmsmeier *et al.* (2011) call for more strategic planning regarding the allocation of inland ports in Europe. In this respect, Monios & Wilmsmeier (2012) also draw attention to the spatio-temporal development directions of inland ports in the hinterland and that the drivers of development (i.e. the actors) are up to now insufficiently understood. This calls for a more integrated approach regarding inland port development, which also is sensitive to the spatial and institutional structure of inland ports within transnational corridors.

Spatial and institutional structure of inland ports

A relatively new and under-researched part of the evolution of port systems is the spatial and institutional structure of inland ports (Ng *et al.*, 2014). Traditional port authorities to an increasing extent deploy hinterland strategies because of the importance of inland terminals for the competitive position of deep-sea ports (Van den Berg & De Langen, 2011; Van der Lugt *et al.*, 2014). Yet, at the same time these port authorities often find themselves unable to exert great influence in the hinterland too far beyond their own perimeters (Monios & Wilmsmeier, 2012; 2013; Raimbault *et al.*, 2015). In other words, inland ports are strong and powerful actors in the hinterland and port authorities are ‘just’ one of the other players in the field; they encounter institutional barriers in influencing the directional development of

inland ports, even in the Outside-In perspective. Also, deep-sea container terminal operators (such as Hutchison Whampoa through the ECT in Rotterdam) tend to increase their influence in the hinterland via inland terminals. Thus, there is a multitude of actors and institutions involved in port development. Ng *et al.* (2013) for instance also point at the impacts of institutions both in strengthening and in negatively affecting the position of dry ports in Latin-America. According to Monios & Wilmsmeier (2012), the relation between institutional issues and spatial development is not well understood in the context of inland ports. This paper can be seen as a first attempt to do so.

In the context of deep-sea ports, in contrast, spatial and institutional characteristics are much better understood (Ng *et al.*, 2014). Wiegmans and Louw (2011) refer to the emergence of port-city challenges, resulting from the expansion of deep-sea ports to accommodate increasing cargo volumes. At the same time, cities are expanding in former port areas by means of, for instance, residential waterfront development. As a result, port and urban functions tend to overlap, leading to intertwining spatial, environmental and port systems in the same area. Hence, port-city challenges emerge. Daamen and Vries (2013) further develop the idea of port development versus waterfront development. They focus their attention especially on the institutions and governance processes behind spatial projects in port cities. Witte *et al.* (2014) have tried to translate the concept of port-city challenges to the context of inland ports and have zoomed in on multi-level governance strategies of municipalities hosting an inland port. They found that imbalances between positive and negative externalities often occur in the context of inland ports, and that multi-level governance strategies are not easily formulated and implemented.

Recently, Raimbault *et al.* (2015) have added to the inland ports debate a nuance regarding the Inside-Out, Outside-In conceptualisation of Wilmsmeier *et al.* (2011) and Monios & Wilmsmeier (2012). They project the Inside-Out, Outside-In approach as a dichotomy of development trajectories, because they argue that Inside-Out and Outside-In can be at play simultaneously. Instead, they suggest applying a relational perspective towards inland port development. This allows analysing not only the differing institutional contexts of inland port development, but also the actor-specific practices and processes across territorial scales (Raimbault *et al.*, 2015). The increasing focus on actor practices in port development was already visible in the context of deep-sea ports (e.g. Dooms *et al.*, 2013; Wilmsmeier & Monios, 2015). This shift in focus also implies a broader understanding of governance; not

only referring to coordination problems within the logistics chain, but also sensitive towards the governance capacity in terms of regional-economic development and spatial planning. In this paper, we use this broader understanding of governing inland ports and also highlight the spatial and economic dimensions of inland ports at the transnational level.

Understanding inland ports: towards parameters

This paper aims to explore the extent to which governance strategies regarding the integration of port and urban functions in inland hubs are present and/or differ between countries along a transnational corridor. Therefore, we make use of the inland ports definition of Rodrigue *et al.* (2010), where an inland port can be viewed as an inland location in the hinterland with a connection to a deep-sea port by means of a corridor and with sufficient critical mass to achieve economies of scale (preferably hosting an inland terminal). We specify this definition by highlighting the necessity of waterway access. Within the hinterland, inland ports can have Inside-Out and/or Outside-In driven development, which is dependent upon the specific actor constellations within an inland port. Next to the logistics functions of an inland port (e.g. satellite terminal, load centre, etc.), we are particularly interested in the spatial and institutional dimensions of inland ports.

Recent literature on port development is to an increasing extent focussing on institutional theories (e.g. Daamen & Vries, 2013; Monios & Wang, 2013; Ng *et al.*, 2014; Witte *et al.*, 2014; Raimbault *et al.*, 2015; Wilmsmeier & Monios, 2015). In line with this trend, this paper takes an institutional approach in making a cross-national comparison of inland port development. We understand institutions – the structures and mechanisms of cooperation between individuals or groups – as the total sum of governance structures, laws and regulations in the formal domain, and informal institutional structures such as policy documents and development strategies in the informal domain. This is in line with Scott's (2001) understanding of the regulative pillar of institutions. Following theories of institutionalism, this implies that these formal and informal institutions shape the actions of actors within a particular context. By doing so, for instance, governance processes may be affected by the interplay between actors and institutions. Thus, in this case, we aim to analyse the institutional structures which are possibly shaping port-city challenges in the context of inland port development.

Table 1: Institutional aspects of inland port development

Domain	Type	Parameters
Formal	Governance structure	Control of the port authority
		Level of governmental support
	Laws and regulations	Ownership of port-related real estate
		Environmental- and safety regulations
Informal	Development orientations	Market conditions
		Spatial conditions
		Financial conditions

Source: adapted from Daamen & Vries (2013)

Furthermore, Daamen & Vries (2013) are interested in the institutional and spatial aspects of port-city challenges in the context of deep-sea ports. In their paper, they draw attention to three types of institutions which are likely to shape governance processes in the European port-city interface (Table 1). First, they highlight the importance of *governance structures* in port areas in trying to find a balance between diverging economic, transport, spatial and environmental interests. The governance structures include among others the control of the port authority and the level of government support. Second, they stress the importance of *laws and regulations* in dominating the spatial outcomes of conflicts between ports and cities, which prevent further integration of port and urban functions. Of interest are property rights (i.e. ownership of port-related real estate) and environmental- and safety regulations. These first two types of institutions are part of the formal domain. Third and part of the informal domain of institutions are the *development orientations* of ports. These include considerations with respect to the market-, spatial- and financial orientations towards port development.

This paper makes use of data collected in the context of the transnational European NWE INTERREG-IVB programme CODE24, Corridor Development Rotterdam-Genoa (CODE24, 2015). Within this programme, a specific project was dedicated to inland port development. The goal of this project was to have a more detailed insight into the potentials for future development of the nodes and networks between maritime and inland port systems along the corridor. The project tried to get a grip on the ecological, economic and social demands of the stakeholders involved in inland port development. The operational research question of the project was: “*How to promote logistics needs of companies and exploit the economic potential of the corridor without limiting the comforts of urban life in the urban regions along the corridor?*” Of particular interest was the relation between port and urban functions

and the future role of ports and terminals along the corridor, with a specific focus on the embeddedness of these facilities in their regional spatial and environmental contexts. A pilot project with several case-study areas has been implemented dealing with the challenges inland ports are facing in their future development.

The data of this pilot project consist of desk research, analyses of port-related policy documentation, municipal- and inland port statistics from public statistical agencies and presentations and discussion results of the CODE24 round table workshop. This enables to conclude for development strategies respecting general and common constraints of European inland ports. In particular, the round table workshop which was organised in Mannheim (Germany) on June 3, 2014 has shaped the results of this paper. The main aim of this workshop was to exchange experiences between inland ports along the Rhine-Alpine Corridor. The participants included representatives from the City of Mannheim, Port of Mannheim, City of Neuss, Port of Düsseldorf-Neuss, Region of Basel, Port of Basel and Port of Strasbourg. The participants presented and discussed the current state of affairs in their respective port development strategies. A full report of the pilot project can be accessed through the CODE24 online platform (CODE24, 2015).

Inland port development along the Rhine-Alpine Corridor

The case-study areas (Figure 1) include Moerdijk (Netherlands), Düsseldorf/Neuss and Mannheim (Germany), Strasbourg (France) and Basel (Switzerland). The key data of the case-study areas are outlined in Table 2. The case-study areas are selected keeping in mind the definition and criteria for inland ports by Rodrigue *et al.* (2010). All case-study areas are located within the densely populated Rhine-Alpine Corridor ranging from Rotterdam (Netherlands) to Genoa (Italy). With this distribution of case-study areas, most countries which are part of the Rhine-Alpine Corridor are represented. The case-study areas are part of the hinterland network of the Port of Rotterdam. The main inland waterway connection in this corridor is the river Rhine. All case-study areas have significant volumes of cargo and container throughput and have considerable numbers of direct, port-related employment. With the exception of Moerdijk¹, the case-study areas are closely related to adjacent major urban regions.

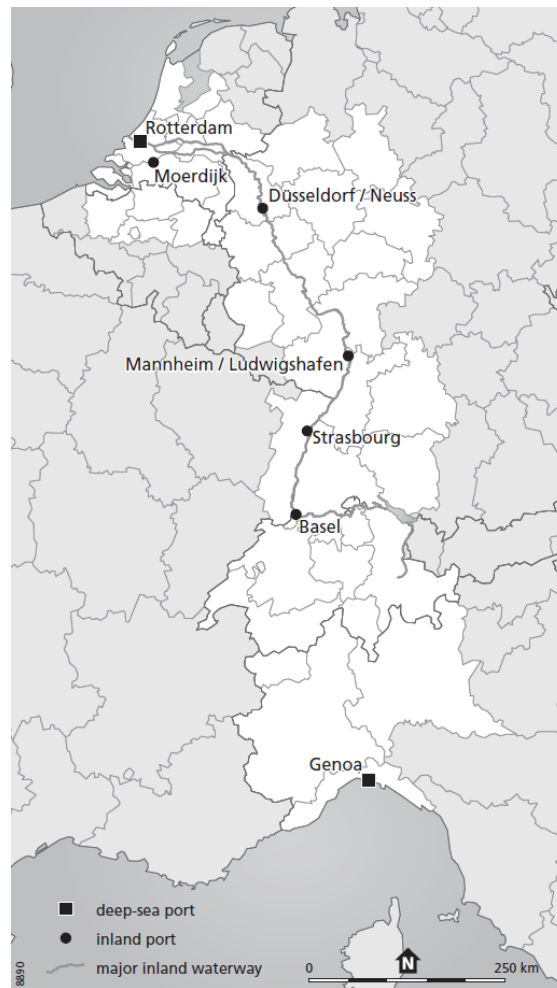
¹ Although Moerdijk has no large-scale urban region in close proximity, it nevertheless represents an interesting case-study area, for the port authority has recently developed a new port vision which is facing heavy local resistance. Also, the strategic location relative to the Port of Rotterdam and the metropolitan region of

Table 2: Key characteristics of the case-study areas

Port city	Population	Port area (ha)	Throughput in tonnes (2013)	Throughput in TEU (2013)	Direct employment
Moerdijk	1.200	2.345	18.400.000	150.000	10.000
Düsseldorf/Neuss	D: 594.000	500	19.100.000	250.000	23.000
	N: 156.000				
Mannheim	300.000	1.131	8.800.000	136.621	13.000
Strasbourg	272.000	1.057	11.000.000	406.399	10.000
Basel	173.000	159	6.800.000	105.000	10.000

Source: authors' own adaptation on basis of municipal- and inland port statistics from public statistical agencies, presentations and discussion results of the CODE24 round table workshop, information from port authorities' websites and information from port-related policy documentation

Figure 1: Case-study areas inland port development along the Rhine-Alpine Corridor



Source: authors' own adaptation

Rotterdam-The Hague, and the involvement of the Port of Rotterdam in the future development of Moerdijk make further investigation of this case-study area worthwhile.

Moerdijk (Netherlands): Havenstrategie Moerdijk 2030

The port of Moerdijk is currently the largest inland port in the Netherlands in terms of cargo throughput. Some argue if Moerdijk should not rather be labelled as deep sea-port because of the close proximity of the North Sea. However, it bears all the characteristics of a 'regular' inland port (cf. Rodrigue *et al.*, 2010) and it cannot be reached from sea without making use of the inland navigation network. Originally, Moerdijk was developed in the 1960s to host the petrochemical industries of the Port of Rotterdam. The location decision for Moerdijk was influenced by the stakes that the chemical branch of Shell had in the project. For the spatial development of the industrial area of Moerdijk forty farms have been expropriated. As a compensation, a recreational area of 258 ha was developed. In 2011, a chemical accident in the industrial area fuelled the social unrest of the citizens of Moerdijk for the future development of the port area. In 2012, the port authority of Moerdijk and the port authority of Rotterdam formally signed a joint development contract for future cooperation in terms of commercial activities and port operations, for instance with regard to knowledge sharing, sustainability aspects and safety measures. In 2014, a port development strategy (*Havenstrategie Moerdijk 2030*) was published.

Düsseldorf/Neuss (Germany): Neuss rückt näher ans Wasser

The port of Düsseldorf/Neuss is a fusion port south of the Ruhr area in Germany. The first discussions to jointly develop the inland ports of Düsseldorf and Neuss date back to 1929, when integration of the ports was part of a municipal restructuring process. However, at the time the municipality of Neuss was not interested to participate. In the 1940s, similar plans were discussed, but were blocked by the Ministry of Domestic Affairs. In 1994, the fusion of the ports was discussed again because of the pressure of freight transport on the local transport network and the joint interests in developing four intermodal terminals within a context of scarcity of space for expansion. With a common development vision, the ports could jointly compete with other ports in the European transport network. This form of cooperation was finally formalised in 2003. In 2012, a next step in the development of the port of Düsseldorf/ Neuss was the collaboration with the Port of Cologne (*Köln-Deutz*). The outsourcing of a share of the freight transport from Neuss to Cologne enabled the redevelopment of some vacant space in the port area of Neuss. At the moment, Neuss is working on residential development near the waterfront in this area (*'Neuss rückt näher ans Wasser'*). The aim of this effort is to better connect the city to the river Rhine.

Mannheim (Germany): *Hafen.Stadt.Mannheim 2035+*

The port of Mannheim currently is one of the largest inland ports in the European inland navigation network. Also, Mannheim is important in providing a historical explanation for the development of the European transport network, for in 1868 the '*Mannheimer Akte*', a treaty which ensured free exchange of goods on the river Rhine, was signed here. The first container terminal of Germany was opened in 1968 in the port of Mannheim. In 1983, a roll-on, roll-off facility was established, followed by the introduction of the intermodal terminal in 1991. Since 2001, the port of Mannheim cooperates with the port of Ludwigshafen, which is on the opposite side of the river bank. At the moment, the expected growth in container throughput is leading to concerns on part of the port authority with regard to land deficits, employment growth and value-added activities around the port. Therefore, the port authority and the city of Mannheim together launched the master plan study '*Hafen.Stadt.Mannheim 2035+*' for the integrated development of both port and city. The study – which is at the moment on-going – consists of the identification and evaluation of different scenarios for the future development of both port businesses and urban activities.

Strasbourg (France): *Contrat de Développement Ville/Port*

The port of Strasbourg is the second biggest inland port in France after Paris and is also one of the largest inland ports along the river Rhine. The port was initially developed in 1926 and is currently under the formal control of the French transport ministry. The instalment of the port authority of Strasbourg (*Port Autonome de Strasbourg*) is a special case because of the state control. This is because of the importance of Strasbourg in terms of regional-economic growth and intermodal transport. The port hosts two container terminals, of which the first one was established in 1969, but is looking to extend their container facility to the nearby port of Lauterbourg. This is creating space for urban development in the former port area. The port authority has a dual development strategy on container throughput and tourism (river-based passenger transport accounts for nearly 800.000 tourists each year). Due to this, the port authority realised that the port companies worried about the urban developments in the former port area. Therefore, the port of Strasbourg has analysed and communicated current and future needs of the companies located in the port. This provided the input for the current development strategy of the port (*Contrat de Développement Ville/Port*), which outlines the development directions and spatial extensions of both port and city.

Basel (Switzerland): Basel Nord & Hafen St. Johann

The port of Basel is the most important inland port in Switzerland. The port has different locations along the banks of the river Rhine and is located close to the city. The port locations cooperate under the umbrella of ‘*die Schweizerischen Rheinhäfen*’. The oldest parts of the port were established in 1922. Because of path-dependent development resulting from the special location of Basel near three national borders (Switzerland, Germany and France), many port-related businesses have ended up at locations within the urban districts. This implies that Basel needs to redevelop the port area in an integrated way; there is not much vacant land available, but many areas are suitable for urban transformation. One of the current redevelopment projects is the historic port site of *St. Johann*, which is located close to an old residential district. This port area is redeveloped into a knowledge campus close to the waterfront of the river Rhine. Because of this, some port activity is relocated to the port of Kleinhüningen in the south and some port activities at existing sites are intensified. Also, to handle the expected growth in container volumes coming from the Second Maasvlakte in Rotterdam, a new container terminal is established in *Basel Nord*.

Spatial and institutional aspects of inland port development

In this section, the results of the cross-national comparison are presented. For each case-study area, the most important spatial and institutional aspects are mentioned. After the discussion of the case-specific findings, the most important similarities and differences between the cases are highlighted.

Moerdijk: from strategic planning to compensation planning

The port of Moerdijk, together with the municipality and the province of Noord-Brabant have recently designed a port development strategy for 2030. The port of Rotterdam assisted in the creation of this new vision, which can be seen as a form of Outside-In driven development (Wilmsmeier *et al.*, 2011). Despite the involvement of the port of Rotterdam, the port development strategy met heavy local resistance. Participation projects and surveys with residents could not avoid fierce NIMBY situations. An independent committee even argued that the town of Moerdijk should be sacrificed to make space for the future expansion of the port. Previous research already indicated that the future spatial development of the port and town of Moerdijk would not be uncontested (Witte *et al.*, 2014). At the moment, a new spatial planning Act (*Moerdijkregeling*) is in place to assist residents in selling their real

estate to the municipality for a reasonable price when they fail to do so on the regular market. The municipality of Moerdijk is implementing spatial projects such as a community centre for cultural activities as a compensation for the port expansion. This is in line with other forms of compensation planning which have been employed in the case of Moerdijk in the past. Another strategy is the outsourcing of port expansion towards more peripheral locations. For instance, the new logistics park of Moerdijk is planned on a greenfield site near a motorway access point, which is located far from the existing residential area. All in all, a shift from informal (strategic planning; *Havenstrategie*) to more formal types of institutional aspects (compensation planning; *Moerdijkregeling*), can be observed.

Düsseldorf/Neuss: intra- and interregional cooperation between ports

In the case of Düsseldorf/Neuss, there is strategic cooperation between ports both on an intra- and an inter-regional level. For the ports of Düsseldorf and Neuss are fused (intraregional) and the port of Cologne has a strategic (Outside-In) stake in the development of the port of Düsseldorf/Neuss (interregional). In the port of Neuss, a new commercial district is created in between the port area and the mixed-use inner-city area. This commercial area functions as a buffer zone and is designed in such a way that it is possible to view the port area from the inner-city. The redevelopment of this area along the river Rhine has also led to new port activities south of Düsseldorf, where a waste disposal site is planned to be transformed into a new port area (*'Reisholz'*). Important institutional aspects in the realisation of these plans are the incorporation of port businesses in the planning through mediation by institutions such as the Chamber of Commerce or the port authorities. Especially in Neuss, there is a tradition of influential family companies in the development of the port. Such institutions are also important in bridging the gap between the political and commercial spheres.

Mannheim: different scenarios for joint development of port and city

The port and city of Mannheim are currently working on a joint master plan for the future development of the port and city. The port companies are also involved in the development of the master plan. In the development process, a land-use and site potential analysis have been carried out. These analyses revealed that vacant sites with water access are few and are rather unsuitable for port-related use as long as current settlements are not relocated. Therefore, these areas could be used instead for brownfield redevelopment or logistic activities. However, the distance to the container terminals may limit this potential. At the moment, scenarios are defined to identify potential locations for an additional container terminal. To

achieve spill-over and synergies with existing container facilities, the Handelshafen has the largest potential for this. However, in the Handelshafen many urban functions also exist, which may potentially lead to conflicts. The scenarios therefore differ with respect to the extent of integration of urban functions in the port area. Buffer zones are implemented to ensure a minimum distance between conflicting land-uses. In the round table workshop it was discussed that residential development in the port area is one of the goals of the mayor of Mannheim, but that this is likely impossible due to the presence of the international chemical company BASF; formal institutional aspects such as the SEWESO-II guidelines are preventing settlement near the chemical industries. Although many urban districts are already located on the river banks and although in theory commercial use would further enhance the value of the port area, in practice it is not feasible to extend residential areas too far into the port area, for instance because of the detrimental effects of noise nuisance from port activities for the residential environment.

Strasbourg: from informal cooperation to a formal development contract

The port of Strasbourg has a spatial development orientation towards the nearby city of Kehl (Germany). To identify the current and future needs for space, the port companies set up a project to map out the land-use claims and site potential in the port. The most important conclusions of the companies are to increase the public awareness of port development, to enhance the efficiency of the local transport network within the port area and to enlarge the attractiveness of the port area. These conclusions which are derived from a preliminary informal process have been integrated in the formal development contract between the port and the city. This contract is still used as a starting point for discussing future issues between the port and the city. In the round table workshop it was stressed that this form of cooperation, consisting of open dialogue and common goals, has resulted in positive experiences on part of both the port and the city.

Basel: path-dependent development leads to successful integration

The implementation of the port expansion project in Basel Nord is seen as the most important 'engine' for the future development of the port. To connect this area to the existing port and city, the federal government have announced the creation of a motorway tunnel, to avoid too much pressure on the local urban transport network of Basel. Also, the federal government imposed the city of Basel and the port of Basel to formulate an integrated development strategy for the creation of the knowledge campus in the port of St. Johann and the relocation

of existing port facilities to the port of Kleinhüningen. Although these projects have a large impact on the urban environments, the participants in the round table workshop stressed the importance of informal institutional aspects such as mentality in the case of Basel. The residential districts of Kleinhüningen and of Klybeck are surrounded by port activities, but the residents are tolerant towards its emissions. This is because these are historical working-class neighbourhoods which have been part and parcel of the port's development in the past century. Understanding the necessity of port development is part of the identity of these neighbourhoods, which explains the high density and integration of port and urban functions in the case of Basel. Still, since the integration is already high, it is also pointed out by the participants that future expansions of either port-, residential- or industrial activities likely is difficult without leading to overlaps between port and urban functions. For the redevelopment of the port of St. Johann, there was also great political commitment to bring the project to a successful result and both the port authority and the port companies supported the joint goal of the project. The participants of the round table workshop also put forward the important role of the federal government in this respect. They mediated between the actors involved by pointing at the joint goal, and they provided a nation-wide plan for the development of terminals, which helped in structuring the discussion.

Synthesis: common problems, different strategies

A commonality running through the case-studies is that all port cities are facing the challenge to balance port and urban development. Port authorities deem further development of their activities vital to ensure regional-economic growth. However, their port sites are often located close to urban districts, while at the same time urban governments look to redevelop former industrial sites in the port area for recreational or residential uses. Yet, such redevelopment projects are reducing the suitability of the existing port area to facilitate cargo handling. This is even more critical in a context of positive growth estimates of the port of Rotterdam. This tension potentially leads to conflicts, for instance with regard to noise emissions in residential districts which are related to port activities. The common response in the case-study areas either is to relocate part of the port activities towards more peripheral locations surrounding the city, or to strive for an integrated and balanced port development strategy, which considers both port requirements and interests of urban development.

In doing so, the port cities all seek forms of cooperation which transgress the local level and the institutional boundaries of the port authorities and cities. In some cases, this leads to

Outside-In driven types of development, for instance the involvement of the port of Rotterdam in the port of Moerdijk and the stake of the port of Cologne in the port of Düsseldorf/Neuss (Table 3). This confirms the notion of Van den Berg *et al.* (2011) and Van der Lugt *et al.* (2014) that (deep-sea) port authorities try to influence the hinterland beyond their own perimeters. At the same time, however, cases of Inside-Out driven development, where the inland ports themselves are active in trying to shape the hinterlands and supply chains, were also observed. For instance, in the cases of Düsseldorf/Neuss, Mannheim, Strasbourg and Basel, intraregional cooperation with nearby smaller ports was observed (Table 3). From these findings it can also be concluded that both types of development can be at play at the same time, which is in line with the suggestions of Raimbault *et al.* (2015).

Table 3: Directional development of inland ports along the Rhine-Alpine Corridor

Port city	Outside-In	Inside-Out
<i>Moerdijk</i>	Port of Rotterdam	
<i>Düsseldorf/Neuss</i>	Port of Cologne	Port of Reisholz
<i>Mannheim</i>		Port of Ludwigshafen
<i>Strasbourg</i>		Port of Lauterbourg
<i>Basel</i>		Port of Kleinhüningen

Source: authors' own adaptation

While the problems of the port cities are common, spatial and institutional differences exist between the port cities which lead to different processes and different outcomes in every case. In Moerdijk, the informal process to arrive at a joint development vision has not led to alignment among all actors, which is illustrated by the fierce NIMBY protests. Therefore, new formal laws and regulations as well as forms of compensation planning have to be introduced to ease the conflict. In contrast, in the cases of Düsseldorf/Neuss, Strasbourg and Basel, informal institutions have proved to be strong, leading to successful joint development plans. In Düsseldorf/Neuss and Strasbourg, port companies have been involved in the planning process from early on. In Basel, the path-dependent development of port and city has led to tolerance among the residents for port expansion. In Mannheim, the planning process is still ongoing. Private companies are involved in the process and a quantitative analysis of land-use and site potential has identified the suitability of locations for integrated port and urban development. However, formal regulations and practical constraints may hamper successful co-evolution of port and city in the near future. Still, it seems that in cases in which the port and urban administrations open up the policy process to other private

stakeholders and the public, common governance strategies for inland port development are more likely to occur.

Conclusion and discussion

This paper has explored the extent to which governance strategies regarding the integration of port and urban functions in inland hubs are present and/or differ between countries along a transnational corridor. We have reflected on the findings of a cross-national comparison of governance strategies for inland port development in four different countries along the CEF Rhine-Alpine Corridor (Rotterdam-Genoa). By doing so, we add to recent academic discussions regarding spatial and institutional aspects of port development (Ng *et al.*, 2014), the positioning of inland ports in the hinterland of deep-sea ports (Van der Lugt *et al.*, 2014; Raimbault *et al.*, 2015, Wilmsmeier & Monios, 2015) and transnational corridor development (Witte *et al.*, 2014). These fields of interest are often isolated from each other in the academic literature, but are attempted to be integrated by means of this paper. This approach has enabled us to analyse institutional structures which are possibly shaping port-city challenges in the context of inland port development along a transnational corridor.

Our findings reflect the difficult position of inland ports within a densely populated corridor. All port cities in our analysis seek forms of cooperation which transgress the local level and the institutional boundaries of the port authorities and cities to deal with conflicts between port and urban development. This poses challenges for the governance of inland port, for we observe different ways of dealing with these conflicts. First, in some cases (Moerdijk, Düsseldorf/Neuss) cooperation with other (deep-sea) ports at the interregional level exists, while in other cases (Mannheim, Strasbourg, Basel) ports seek collaboration with smaller ports at the intraregional level. Second, we observe different types of institutions which influence the outcomes. In the case of Moerdijk, formal regulations have to ease port-city challenges which could not be overcome in the informal process. In the cases of Düsseldorf/Neuss, Strasbourg and Basel, however, strong informal institutions have proven to be powerful in leading to successful joint development plans. We therefore conclude that cases in which the port and urban administrations open up the policy process to other private stakeholders and the public, common governance strategies for inland port development are more likely to occur. These outcomes can be relevant in the light of European policies on transnational corridor development, such as the renewed attention to bottlenecks in the core

network corridors of the Connecting Europe Facility, or the recent instalment of the first corridor-wide European Grouping for Territorial Cooperation (EGTC); the Interregional Alliance for the Rhine-Alpine Corridor. For although transnational corridor development is high on the European agenda, further insights on spatial and institutional aspects of inland port development are necessary to prevent strong nodes from turning into weak links.

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