

Hinterland Access Regimes in Seaports

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Seaports serve hinterlands. Various inland modes such as road, rail, inland waterways and pipeline are used to access the hinterland. The quality of the access to and from the hinterland differs between seaports and affects their competitiveness.

The quality of the hinterland access depends among others on the behaviour of a large variety of actors, such as shipping lines, terminal operators, forwarders, the port authority and the national/regional government. Therefore, effective hinterland access is at least partially an organisational challenge. Together these actors create a 'hinterland access regime'. The analysis of this regime is central in this paper.

First, the relevance of hinterland access for seaports is briefly discussed. Second, the term 'hinterland access regime' is defined and the theoretical framework presented in De Langen (2004) is used to analyse the quality of the hinterland access regime. Third, survey results on the quality of the hinterland access regime in three seaport clusters, Rotterdam, Durban and the Lower Mississippi Port Cluster (LMPC) are discussed. This analysis shows major differences between hinterland access regimes. Fourth, opportunities to improve the hinterland access regime in these three ports are discussed.

1. Introduction

Various scholars have argued that hinterland access is important for the competitiveness of seaports (Notteboom, 1997, and Kreukels and Wever, 1998). Central in studies of the competitive position of seaports in the hinterland, are differences in (generalised) transport costs from different ports. A distinction between a *captive* hinterland, where generalised transport costs to one port are substantially lower than to other ports and a *contestable* hinterland where differences in generalised transport costs are limited, is widely used.

Especially economic geographers have studied port hinterlands (Sardent, 1938 is an early scholar). Hoyle (1988) and Pinter (1992) have added to that literature, predominantly by

analysing (the geography of) *transport networks*. Another set of scholars, most prominently Slack, (1985 and 1999) has added to the literature by including *strategies* of both liner shipping companies and terminal operators in the analysis of the evolving structure of transport networks. Furthermore, in relatively recent contributions more emphasis has been paid to *implications* of spatial changes for policy and management in seaports (Van Klink, 1995). The strategy of developing port networks with hinterland nodes and dry ports in the hinterland has become widely accepted as a viable strategic option. In order to implement this strategy, changes in the administrative structure of port authorities can be necessary (Van Klink, 1995).

In the majority of these studies an analysis of *trends and developments* is centre stage. Such studies are frequently finalised with relatively general suggestions for policy and management. However, an in depth analysis of policy and management in seaports is lacking¹. This paper contributes to the literature by approaching hinterland access as a *governance issue* (De Langen, 2004).

2. Analysing the hinterland access regime

Because of fundamental changes, like economic and political integration and developments in information and communication technologies, the market environment of ports is changing, especially in the container market. Ports become parts of intermodal networks, with competition increasingly taking place between complete transport chains instead of between ports. In this new environment, ports will have to pay more attention to the quality of the hinterland services.

Welters (2003) identifies two important variables of the competitiveness of a port: 'port performance', in the sense of a competitive service to shipping lines, and the ability of a port to serve markets in the hinterland efficiently. As efficient terminal handling increasingly becomes a 'commodity', available in almost every port, more pressure will be put on the ability of ports to serve the hinterland. This can be done by improving the quality of hinterland transport services.

Improving the hinterland access of seaports is, at least partially, an *inter-organisational* challenge, because the quality of the hinterland access depends on the behaviour of a large variety of actors, such as terminal operators, freight forwarders, transport operators, and port authorities. These different firms benefit from improving hinterland access, but since individual firms cannot fully appropriate the benefits of improving hinterland access, inter-organisational arrangements (coalitions) are necessary to invest in improving hinterland transport services (or transport infrastructure). This leads to a 'collective action problem' (CAP) (see Olson, 1971): even though collective action is in the interest of all firms in the port cluster, it does not arise spontaneously. Thus, *organising capacity*² (Van den Berg et al., 1997) is very important in seaports.

¹ Authors such as Goss (1990) have discussed the role of port authorities, but the claim of this paper is that port authorities are only one (albeit important) actor in seaports.

² Organising capacity can be defined as 'the ability to enlist all actors involved and with their help generate new ideas and develop and implement a policy designed to respond to fundamental developments and create conditions for sustainable development' (Van den Berg et. al, 1997).

Applying the concept of ‘organising capacity’ to the issue of hinterland access of seaports requires an analysis of ‘*hinterland access regimes*’ (HAR’s) that are created in different ports. The hinterland access regime (HAR) can be defined as ‘*the set of collaborative initiatives, taken by the relevant actors in the port cluster with the aim to improve the quality of the hinterland access*’.

An analysis of the HAR requires attention for the roles of different *modes of coordination* in this regime. We distinguish six general modes of coordination (see Hollingsworth and Boyer, 1997 and Williamson, 1985): markets, corporate hierarchies (firms), interfirm alliances (joint ventures), associations, public-private partnerships, and public organisations.

Markets are used when *coordination beyond price* is not required while hierarchies are used when activities can best be integrated in a single firm. Corporate hierarchies often result from vertical integration, for instance to reduce uncertainty. Public organisations provide services with a ‘public good character’, such as ‘safety’ and in many countries ‘transport infrastructure’.

Apart from these three ‘ideal type’ forms of coordination, three coordination mechanisms that are a mixture of the above mentioned three forms, are frequently distinguished: interfirm alliances, associations and public private partnerships. *Interfirm alliances*³ are used to facilitate cooperation between a relatively small number of firms. Alliances between firms are more responsive to dynamic environments than corporate hierarchies (Best, 1990). *Associations* are collective organisations of firms in similar or related markets that provide collective goods (Hollingsworth et al, 1994) for the members of the association. Associations are set up to enable cooperation between a large group of firms with shared interests. *Public-private organisations* are used to enable cooperation between public and private actors.

Each mode has advantages and disadvantages. Consequently, different modes play complementary roles in a (hinterland access) regime. Since a regime consists of *collaborative* initiatives, modes of coordination are only relevant when they enable collaboration. Thus, market coordination does not play a role in a regime and the role of corporate hierarchies is only relevant when their investments have positive *spill-over effects* for other firms in the cluster.

The roles of different coordination mechanisms in a regime is relatively stable and *path dependent*⁴. Past investments in a regime lead to high adaptation costs (see Westlund, 1999). Furthermore, a regime becomes taken for granted. Finally, firms do not necessarily have the incentive to change a regime. *Therefore, relatively inefficient regimes can persist*. Consequently, regimes differ substantially, between countries, industries and clusters. Hollingsworth et al (1994), even argue that differences in regimes are central in the competition between clusters.

Five variables influence the quality of the HAR⁵ (see De Langen, 2004, for a discussion of these five variables):

³ The term ‘interfirm alliances’ encompasses only relatively tightly coupled networks of firms, and is more appropriate than the general term ‘networks’.

⁴ Campbell et al (1991) argue that ‘When actors have already established associations (...) and thus the capacity for selecting far sighted cooperative strategies, they can more easily devise new multilateral governance mechanisms than actors from a sector where short sighted bilateral mechanisms dominate the governance regime (Campbell et al 1991, p. 331). This shows the path-dependence of regimes.

⁵ These five variables are to some extent ‘endogenous’: actors in the port cluster can change them. Exogenous variables, leading to ‘pressure’ on a regime to be effective are not included. These variables however may be

- The *presence of an infrastructure for collective action*, consisting of *associations and public-private organisations*. These organisations provide a fertile ground for collective action, but do not develop automatically.
- The *role of public organisations in a regime*, since public organisations often contribute to the formation of and are important partners in coalitions.
- The *voice* (see Hirschmann, 1970) of firms. Voice means that firms, when not satisfied with a solution to a collective action problem strive to improve it. Voice adds to the performance of joint initiatives.
- A *'sense of community'* (Bennet, 1998), since a higher willingness to invest in the 'port community' enables the formation of coalitions.
- The involvement of *leader firms*, since these firms have incentives and resources to invest in improving the hinterland access and can play a leading role in the development of coalitions.

In the next section, this framework to analyse the quality of hinterland access regimes is applied to the HAR's of three cases.

3. The quality of the hinterland access regime, survey results from three cases

The hinterland access regime is likely to be especially relevant in ports that serve large hinterlands, where the throughput volume is substantial and the number of relevant actors is large. For these reasons, the cases Rotterdam, Durban and the Lower Mississippi Port Cluster (LMPC) were selected. The three case study ports are all 'transit ports'; a large share of the cargo is destined for inland locations. Thus, hinterland access is relevant in all three cases.

Furthermore, it can be argued that these three port clusters are the largest of their continents, with sufficient scale to develop a good hinterland access regime. Finally, the environments the ports operate in and the institutional setting differ substantially between the ports. Thus a comparison should yield interesting results. Table 1 shows some characteristics of the three ports.

The case studies were based on desk research, an open interview with port experts and a survey filled out by the majority of these experts during the interview. The interviews for the case of Rotterdam were conducted in spring 2002, Durban in June 2002 and the Lower Mississippi in September 2002.

The quality of port experts is crucial for the quality of the outcomes of the empirical research. Only a limited number of all individuals working in the port cluster qualify as experts. The number of industry experts in a port cluster cannot be determined.

relevant as well; examples include public pressure to reduce negative effects of freight transport, and critical demand from large shippers in the hinterland of a port.

Table 1. Characteristics of the three cases (figures for 2002)

Port	Total throughput	Container throughput	Major commodities	Important hinterland modes	Estimate of inhabitants in the metropolitan region
LMPC	About 381 million tons (420 million metric tons)	About 0.3 million TEU	Crude oil Break bulk Containers	Inland waterways Road Rail	About 1.4 million inhabitants
Durban	About 48 million tons	About 1.2 million TEU	Containers Dry bulk Breakbulk	Road Rail	About 1.2 million inhabitants
Rotterdam	About 320 million tons	About 6 million TEU	Crude oil Containers Dry bulk	Road Inland waterway Rail	About 1.2 million inhabitants

Sources: PoR (2003) Louisiana Ports Association (2003) National Port Authority of South Africa (2003)

A 'hierarchy' of experts exists, with senior managers of cluster associations, important public organizations (especially the port authority), the largest firms in the cluster and 'embedded small and medium sized firms' at the top of the hierarchy. Industry experts were identified on the basis of three criteria:

Job position: individuals with a job that requires an understanding of the cluster are likely to be knowledgeable with regard to cluster issues. The majority of the industry experts have senior positions with port firms of substantial size, port specific associations and the (public) port authority.

Experience in the industry: newcomers to the industry are not likely to have accumulated sufficient knowledge. Therefore, the majority of industry experts are experienced in the industry. Newcomers are only included in the 'expert list' if suggested by other experts.

Involvement in cluster governance: individuals that are involved in cluster governance, for instance through membership of steering committees are more likely to be knowledgeable with regard to cluster issues. The majority of the experts were either involved in governance at the moment of the survey or had been a member of one or more boards of associations before.

For each of the three case studies we developed an 'initial expert list' of about 20-30 industry experts, on the basis of internet sources (board members of associations, CEO's of firms in the cluster) and suggestions from one 'embedded academic'. Prof. Welters identified experts in Rotterdam, Prof. Jones in Durban, and Dr. Renner in the LMPC.

The initial list was expanded during the case study by asking industry experts to add new experts, if they felt the list was incomplete. Individuals that were suggested by at least two experts were added to the list⁶. Table 2 provides information on the port experts.

⁶ Since the initial list in all three cases consists of experts with different backgrounds (from public and private organizations and associations, and from firms engaging in different cluster activities), and since the cluster 'community' has a dense network of relations (all experts know the vast majority of the other experts), a biased expert list is unlikely.

Table 2. Selection of port experts

Case	Number of identified experts	Participating experts	Response rate	Percentage experts involved in cluster governance
LMPC	38	31	80%	71%
Durban	37	34	92%	68%
Rotterdam	49	43	88%	90%

In all three cases, the response rate was very high: the vast majority of all the experts that were identified did participate in the study. For this reason, we are confident that the survey results do reflect the expert opinion⁷.

Furthermore, due to the fact that the survey questions were answered during the interviews, so that unclear questions could be explained, the interpretation differences between the experts are very limited⁸. This makes the expert opinion more reliable.

The port cluster consists of five components: cargo handling, transport, logistics, manufacturing and trade (these are discussed later). The experts had to indicate in which component(s) their organization was active. The background of the experts is given in Table 3.

Table 3. Background of experts

Component	LMPC	Durban	Rotterdam	Total three cases
Cargo handling	32%	24 %	27%	27%
Transport	34%	30 %	29%	30%
Logistics	24%	31 %	29%	28%
Port-related Manufacturing	4%	11%	9%	9%
Trade	7%	4%	5%	6%

Experts with a background in the cargo handling industry are somewhat overrepresented in the sample of experts, while experts with a manufacturing background are somewhat underrepresented.

The experts answered a large set of survey questions on the relation between governance in ports and the performance of ports. In this paper, the questions with regard to the hinterland access regime are discussed. The survey questions were explained to the experts when necessary and the experts were asked to explain their answers. This increases the reliability of the survey results.

The first relevant survey question addresses the question whether hinterland access is a 'collective action problem'. Five potential collective action problems were identified, based on a literature review. All five were regarded as relevant in seaports by the experts. Table 4 shows the results with regard to hinterland access.

⁷ Most of the sample size logic and 'statistical significance' issues are less relevant in this research, since the survey is not a random sample of a large population of industry experts. We claim to have surveyed the (vast) majority of cluster experts. Statistical significance tests are used, but not with the purpose of demonstrating that the expert opinion is 'representative'.

⁸ Not all experts answered all questions; if they felt they were insufficiently informed to give an answer, the question was left blank.

Table 4. Answers to the question ‘indicate whether or not the collective action problem is present in the case of hinterland access?’

Port cluster	Collective action problem in hinterland access?	
	Present	Absent
LMPC	24*	2
Durban	32*	0
Rotterdam	37*	4
Total	93*	6

* Significant majority

Experts were also asked to indicate the *importance* of the five collective action problems that were identified. The results are shown in Table 5. Hinterland access is regarded as the most important CAP in all three ports, more important than other CAP’s such as training and education and marketing and promotion. The ‘absolute’ score, an average of 4.7 on a scale from 1 to 5 also shows that, according to the experts, an effective HAR is essential for the performance of the port cluster.

Table 5. The importance of five collective action problems in seaports

CAP	LMPC	Durban	Rotterdam	Overall importance
Hinterland access	4.8	4.8	4.6	4.7*
Training & Education	4.1	4.8	4.4	4.4
Marketing & Promotion	4.6	4.0	4.3	4.3
Innovation	4.5	4.4	4.1	4.3
Internationalisation	4.4	4.0	N.R.	4.1**

Scores on the scale of 1 (not important) to 5 (very important)

* Significantly more important than other regimes

** Significantly less important than other regimes

Table 6 shows the expert evaluation of the quality of the HAR in the three cases. The experts were asked to evaluate the quality of the five variables of the quality of the HAR, discussed in section 2, on a scale from -5 to +5. The answers provide insights in the quality of the HAR compared to the other cases, as well as strengths and weaknesses of the HAR. The survey answers are analysed in two ways: first, an analysis of (the significance of) differences *between the cases* is made. Second the significance of differences of the five variables compared to the overall judgement of the quality of the HAR is made. This shows the strengths and weaknesses of each regime. For instance, the score for leader firms in Rotterdam is 2.0, significantly higher than the overall score of the HAR in Rotterdam. Thus, the behaviour of leader firms is a strength of Rotterdam’s HAR.

Table 6. Expert evaluation of the quality of the HAR

Variable	LMPC	Durban	Rotterdam
Leader firms	0.2	-0.4***	2.0 ***
Public actors	0.8	0.4	2.0 ***
Organisational infrastructure	0.3	0.1	0.7
Community argument	0.1	0.8**	0.9
Voice	0.4	0.8**	1.0
Overall judgement ⁹	0.3	0.1	1.1*

Scores on the scale of -5 (very bad) to 5 (very good)

* Significantly higher than in other two port clusters

** Significantly higher than overall score of the same port cluster

*** Significantly lower than overall score of the same port cluster

On the basis of these results the following conclusions can be drawn.

- None of the regimes is very effective. The average score of the HAR in Rotterdam –the regime with the best evaluation- is no more than 1.1 on a scale from –5 to +5.
- The regime in Rotterdam is the best HAR. This result is statistically significant.
- The strengths of the HAR in Rotterdam are the involvement of leader firms and the role of the public actors, most importantly the port authority.
- In Durban, the HAR is not effective. This is predominantly due to the lack of leader firms. Firms in the cluster are willing to raise their voice and act in the interest of the community as a whole, but no firm or joint organisation has the incentive and ability to take the lead.
- The HAR in the LMPC is moderate across the board. Public actors are certainly not the dominant weakness of the regime.

The survey results show that each regime has specific strengths and weaknesses. A more detailed analysis of the HAR in the LMPC, Durban and Rotterdam is discussed in this section. A comparative analysis is made of, first, the modal split and traffic composition, and second, the institutional position of port authorities. In paragraph 4.3 to 4.7, the contributions of each of the modes of coordination (corporate hierarchies, interfirm alliances, associations, public-private partnerships and public coordination) in the three port clusters are discussed. Finally, opportunities to improve the HAR in the three cases are described. These opportunities are based on conversations with the experts and desk research. Once certain opportunities were identified, these were discussed further with the other experts. Furthermore, reports and publications, in most cases recommended and provided by the experts, were analysed.

⁹ The overall score of the HAR is computed by multiplying the score given by an expert to each of the variables with the importance attached to that variable by the same expert. The maximum score is +5 and the minimum score –5.

4. Comparative analysis hinterland access regimes of LMPC, Durban and Rotterdam

4.1 Modal split and traffic composition

The LMPC is located in the South of the U.S.A., in the state of Louisiana and strategically located at the mouth of the Mississippi river. The vast majority of cargo is transit cargo to inland destinations, mostly in the Mid-West of the U.S.A. The most important inland mode in the LMPC is inland waterways. Especially (dry) bulk commodities are transported over the vast Mississippi river network. Oil is to a large extent processed on-site. Another part is transported by pipeline. Oil and chemical products are also shipped by barge. The inland shipping system for bulk commodities is efficient. Due to the widespread use of push-barges, economies of scale are realised while allowing for efficient equipment utilisation. This system is already in operation for decades. Improvements to the system are limited and incremental. With the gradual increase of container volumes, rail is of increasing importance; about 35% of the containers are put on rail. The LMPC is well connected to the national railway system. Road is especially important for breakbulk and containers.

Durban is situated in the South East of South Africa in the province of Kwazulu-Natal. The port is predominantly a general cargo port and handles 20% of South Africa's total port traffic. The port of Durban serves a large hinterland: cargo with origin or destination in other regions of South Africa as well as other countries, such as Zimbabwe and Botswana. The two dominant hinterland modes in Durban are road and rail transport. The road transport system in South Africa is relatively well developed and not heavily congested. The quality of rail services to the hinterland differs for bulk transport and container cargo. The public organisation *Spoornet* is the single provider of train services. Spoornet is relatively good in handling bulk cargo, and also regards bulk cargo as core business. Bulk is handled in Durban, but the major volumes are handled in other ports, such as Richard's Bay. Container rail services are hardly developed, because of a lack of equipment and management attention from Spoornet. Consequently, the vast majority of containers move by road.

The port of Rotterdam is located centrally in the Northwest of Europe at the end of the rivers Rhine and Maas, Europe's most important inland waterways. Therefore it is no surprise that in Rotterdam, inland waterways are the largest inland mode, with a market share of about 47% of all transport volumes passing through the port. The position of inland shipping is especially strong in dry bulk. Inland shipping is also widely used for liquid bulk, even though pipeline is even more important for this commodity. The market share of inland shipping in the container market has increased substantially, to over 35% in 2003. Road (22%) and pipeline (27%) are of considerable importance in the modal split, while rail has only a modest share in the modal split (4%). The share of rail in container transport, where the issue of hinterland access is the most pressing, is larger: 8% (PoR, 2002). In Rotterdam, bulk is hardly transported by rail.

4.2 Institutional structure of the port authority

The LMPC is not administered by one port authority, but by five different port authorities, each with a jurisdiction over a part of the river system. Table 7 shows some characteristics of the five port authorities.

Table 7. Description of the port authorities in the LMPC

Port authority	Annual volume (2001)	Activities of port authority	Major commodities
Plaquemines	60,700,000	Very limited, all facilities are privately owned	Liquid bulk
St Bernard	Less than 1,000,000	St. Bernard owns one terminal that is leased to private firms	General cargo
New Orleans	85,600,000	Port authority owns relatively much terminals that are leased to private operators	General cargo, especially containers, steel and coffee
South Louisiana	212,600,000	Limited, almost all facilities are privately owned	Dry and liquid bulk
Baton Rouge	61,400,000	Port authority owns relatively much land; leases land and facilities to private operators	Steel, fruit, containers, liquid bulk

Source throughput: American Association of Port Authorities (2003)

The port authorities charge vessels for anchorage and berthing in their jurisdiction. In general, bulk facilities along the river are located on privately owned land. The involvement of the port authority in these terminals is very limited. Most general cargo facilities are owned by the port authorities and leased to the private sector. None of the port authorities has an explicit hinterland strategy.

The National Ports Authority (NPA) of South Africa administers the major South African ports, (Port of Richards Bay, Port of Durban, Port of East London, port of Port Elizabeth, port of Cape Town and the Port of Saldanha). The NPA operates as a landlord and is in charge of safety and responsible for maritime access.

Apart from NPA, a second public organisation, South African Port Operations (SAPO) is active in the port. This organisation runs some terminals in Durban, most importantly the only container terminal in Durban and most breakbulk facilities. SAPO and NPA were formerly part of one public port organisation (PORTNET), but are now separated and operating independently.

Port of Rotterdam (PoR) changed recently from a municipal organisation to a public corporation (Havenbedrijf Rotterdam N.V.). This transformation will enable participation in private ventures and investments outside Rotterdam. PoR leases sites to businesses and is responsible for safety in the port. The Port of Rotterdam also takes care of the port infrastructure (waterways, some access roads, rail terminals and other facilities) in the port.

The Port of Rotterdam actively stimulates and facilitates economic activity in the port cluster. Since a couple of years, the port authority is more actively involved in improving the hinterland access of Rotterdam. The port authority not only invests in port infrastructures, but also acts as an intermediary or 'bridging tie' between the various port actors, an initiator of projects, and a manager of initiatives with collective benefits.

The globalisation of the transport industry has led to large global firms (liner shipping firms, terminal operators and logistics service providers). These firms have limited ‘ties’ to the port of Rotterdam. Therefore their efforts to attract cargo in the hinterland of Rotterdam have declined. According to the port authority, this trend asks for a more active role of the port authority. In 2002, the port authority of Rotterdam formulated a clear hinterland strategy for container traffic, with the following main points:

1. Intensify efforts in natural hinterland;
2. Enlarging hinterland through development of specific corridors;
3. More attention for merchants (like shippers and freight forwarders);
4. Improvements in the supply chain through ICT;
5. Focus on inland shipping and rail transport.

4.3 The role of corporate hierarchies in the HAR’s

Corporate hierarchies offer and continuously improve their services. However, in this paper only the initiatives of firms with clear *spill-over effects* for other firms in the port are discussed. The number of such initiatives is limited by nature, since firms do not have incentives to make investments with benefits for the port as a whole. The most important initiatives/investments of major firms in the ports clusters of the LMPC, Durban and Rotterdam are summarised in table 8.

Table 8. The roles of hierarchies in the HAR of the LMPC, Durban and Rotterdam

Port Cluster	Role of corporate hierarchies
LMPC	Individual firms have not made investments with significant spill-overs to other firms in the port cluster. The major railroads do not invest since the LMPC market is relatively small, and barge operators do ‘business as usual’. Trucking firms have not made port specific investments with spill-overs.
Durban	Individual firms have not made investments in hinterland access, with significant spill-overs to other firms in the port cluster. Spoornet’s monopoly in the rail market prevents entry, while Spoornet itself has not made major investments in Durban. Trucking firms have not made investments with benefits for other firms in the port.
Rotterdam	A small number of firms have made investments with clear effects on the performance of the port as a whole. ECT, the largest container terminal operator participates in inland terminals in the Netherlands, Germany and Belgium. This enables an integrated transport services to these inland ports, with benefits for other firms in the port cluster, such as logistics service providers. Vopak invests in innovative chemical tanker barges. These innovations spill-over to other barge operators.

The results of table 8 are consistent with the judgement of port experts indicating that the involvement of leader firms in Rotterdam is strong compared to the port clusters of the LMPC and Durban (see table 4). Leader firms include ECT, who created a port network and Vopak, a leader in barge shipping of chemicals and innovative in new (safer, larger) barges (see De Langen and Nijdam, 2003).

4.4 The role of interfirm alliances in the HAR's

Strategic alliances between firms that provide a part of the transport and logistics chain are very important in creating economies of scale- and scope. This results in lower transport prices and higher frequencies. Especially in inland shipping, strong coordination between container operators exists, which creates 'economies of scale'. Table 9 shows the roles of interfirm alliances in the HAR's of the LMPC, Durban and Rotterdam.

Table 9. The roles of interfirm alliances in the HAR's of the LMPC, Durban and Rotterdam

Port Cluster	Role of interfirm alliances
LMPC	The number of strategic alliances to improve the hinterland access is very limited. Trucking firms and rail operators do not cooperate at all. In barge shipping equipment sharing is the dominant form of cooperation. This form of cooperation leads to higher efficiency in barge shipping, but is already in practice since decades. Recently, no major efforts to improve equipment or services are made.
Durban	Due to Spoornet's monopoly position in freight, no interfirm alliances have been developed to improve rail accessibility. Trucking firms have also not developed cooperation to improve the HAR of Durban.
Rotterdam	ERS, a joint venture of P&O Nedlloyd and Maersk/Sealand started container shuttle services from Rotterdam in 1994 ¹⁰ . Since, it has developed into a leading European container railway. ERS has substantially improved the number of destinations that can be reached by shuttle from Rotterdam. This has clear benefits for other firms in the cluster. A joint venture of ECT, Duisburger Container Terminalgesellschaft, Conliner, Kombiverkehr and Hafen Entwicklungsgesellschaft Rostock (via Duisburg). This shuttle service was launched in November 2003. This joint venture also improves the quality of rail services from Rotterdam. Container barge operators cooperate to provide joint services with large barges and high frequencies.

Table 9 shows that the role of interfirm alliances in improving the HAR is very limited in the port clusters of the LMPC and Durban. In Rotterdam, alliances exist in rail transport and inland shipping. These alliances lead to better services to the hinterland.

4.5 The role of associations in the HAR's

Associations initiate joint projects and can serve as platforms for the formation of coalitions. Table 10 shows the roles of associations in the HAR's of the LMPC, Durban and Rotterdam.

¹⁰ See <http://www.ersrail.nl>

Table 10. The roles of associations in the HAR of the LMPC, Durban and Rotterdam

Port Cluster	The role of associations
LMPC	The barge fleeting association, the freight forwarders association and the steamship association promote the interests of their members. They lobby for more/better infrastructure and business friendly regulation. The associations are not involved in innovation projects to improve the innovative capabilities of their members.
Durban	The port interests are represented in the Chamber of Commerce's Port Liaison Committee. The main task of the committee is lobbying, there are no efforts to enhance cooperation or innovation. A 'rail user forum' is lacking, even though such a platform could be useful to address Spoornet's monopoly.
Rotterdam	Deltalinqs, the association that represents all firms in the port cluster, lobbies for better hinterland connections. The association is not directly engaged in projects to improve hinterland access. Other associations (CBRB, TLN, VRS en Fenedex) also focus on interest representation. CBRB (inland shipping) is relatively advanced in promoting innovation and cooperation among their members. They have initiated the organisation 'office for inland barge innovation' ¹¹ .

Table 10 indicates that in all three port clusters associations are focusing on interest representation. In all three ports, they do not initiate joint projects to improve hinterland access. This explains their moderate evaluation (the evaluation of organisational infrastructure) in table 5.

4.6 The role of public-private partnerships in the HAR's

Table 11 shows the roles of public-private partnerships in the HAR's of the LMPC, Durban and Rotterdam.

Table 10 shows that public private partnerships do play a role in Rotterdam's HAR. The port authority of Rotterdam is actively involved in initiating such partnerships. The port authority is more and more involved in the formation of coalitions to solve collective action problems in the port. Mostly, they act as 'bridging ties' and try to connect two or more actors, which often have no formal (contractual) relationship, but a shared interest in improving services to/from Rotterdam.

In the LMPC, the value added of Metrovision's initiative is widely recognised. However, more private involvement in the partnership is still required to have impact on the hinterland access regime.

¹¹ See <http://www.innovatie.binnenvaart.nl/> (in Dutch)

Table 11. The roles of public-private partnerships in the HAR's

Port Cluster	The role of Public-Private Partnership
LMPC	Public-private partnerships have in the past not played an important role in the HAR in the LMPC. Recently, Metrovision, a public private partnership ¹² , has launched a 'maritime cluster initiative'. This initiative has led to a considerable research budget to improve market research in order to understand the competitive position of the LMPC in the hinterland, and to identify business opportunities.
Durban	No public-private partnerships to improve the HAR have been developed.
Rotterdam	Port infolink ¹³ , funded by PoR, engages in projects to improve the 'interface' between the terminals and hinterland modes, for instance by streamlining communication flows and by introducing a 'cargo card' for container truckers. Quality Rail Rotterdam (QRR) in a public private partnership, initiated by PoR, aiming to optimise the quality of rail transport in the port of Rotterdam. Besides PoR, the Dutch association of rail operators, Railion Benelux, ECT and the RSC-Rotterdam participate in QRR. Rotterdam Port Promotion Council, partly financed by the port authority and partly by private firms, organises joint business trips to important (potential) customers in the hinterland ¹⁴ .

4.7 The role of public organisations in the HAR's

Public coordination is used to provide services with a 'public good character'. However, the interviews made clear that, especially in Durban and to a lesser extent in the LMPC and Rotterdam, public organisations are involved in economic activities other than providing 'public goods'. In principle, these activities can also be left to private firms. The public involvement is the most obvious in rail transport. Public organisations invest in infrastructure, operate terminals and provide train services.

In Rotterdam, the gradual opening of the European railway market, has led to increased competition and more innovative and efficient rail operators. Table 12 shows the public involvement in the HAR. In this table, national or state-wide public bodies in charge of infrastructure (in most cases Ministries of Transport) are not discussed, since they provide the conditions for hinterland access but cannot be considered as actors from the port cluster that are involved in the inter-organisational challenge' to improve hinterland access of one particular port.

Table 12 also shows that only in Rotterdam the port authority is active in creating a 'port network' with organisations in the hinterland (van Klink, 1995).

¹² This public-private partnership is discussed in more detail in paragraph 4.8

¹³ See <http://www.portinfolink.com>. Port infolink is considered as a public private partnership because the organization aims at close cooperation with the private sector to develop ICT applications.

¹⁴ See www.rppc.nl

Table 12. The roles of public organisations in the HAR's

Port Cluster	Public organisations
LMPC	The Public Belt Railroad is the most important public organisation in the hinterland access regime. It aims to become an effective 'rail service center' ¹⁵ . The five port authorities hardly contribute to the HAR. They do not invest to improve the hinterland access, though they lobby for port access infrastructure. The port of New Orleans has a (strategic) partnership with the inland port of Memphis, but this partnership has not resulted in joint initiatives.
Durban	The port authority is split up in an operations (SAPO) and an authority (NPA) part. Neither part has to date made an impact on the HAR. Spoornet, the public owned freight rail operator has limited decision making power in Durban. The organisation has a shortage of equipment and concentrates on the large bulk flows from the ports to the hinterland.
Rotterdam	PoR develops market intelligence of all hinterland markets and develops partnerships with regions in the hinterland ¹⁶ . PoR has 'Rotterdam representatives' in the hinterland whose task is to attract cargo, in cooperation with firms from Rotterdam.

4.8 Opportunities to improve HAR

On the basis of interviews and desk research, opportunities to improve the HAR in the three port clusters are identified. These are discussed below.

LMPC

On the basis of the interviews and desk research, three opportunities for joint initiatives to improve the quality of the HAR are identified (see De Langen and Visser, 2004). Some progress with respect to two of the three opportunities discussed in this section has been made since the initial case study period.

Improve market intelligence

Due to, amongst others, the competition between the port authorities and lack of an effective organisational structure of the private sector, the market intelligence in the LMPC was/is seriously underdeveloped. Neither the port authorities, nor any other organisation in the cluster had collected information on (potential) customers and their service preferences. Insights in origin destination patterns of transport flows, strengths and weaknesses of the LMPC and competing ports are lacking. Recently, a coalition with the name 'maritime river corridor initiative' has been set up to improve the market intelligence in the cluster. This coalition is the first of its kind to address strategic issues for the LMPC. The project is in its infancy but an important step towards a more effective Hinterland Access Regime.

¹⁵ See <http://www.nopb.com>

¹⁶ See www.portofrotterdam.com

Promote containers on barge

The transport of containers by barge on the Mississippi is hardly developed, at least partially because cooperation to create sufficient cargo is lacking, but is likely to grow in the coming years, for instance because of new investments in inland terminals. For barge containers from the Mississippi, the cost advantage of a LMPC container facility compared to Houston is about US\$ 150 per container. Therefore, containers on barge in the Mississippi can become 'captive' cargo for the LMPC if a competitive terminal is developed and shipping lines are attracted. The private 'Sea Point' project, to develop an offshore terminal close to the open sea, from where containers are shipped by barge to inland locations¹⁷ would be a major step forward for the LMPC. Such an offshore terminal would substantially improve the attractiveness of the LMPC for shipping lines, since it would be located close to the mouth of the Mississippi.

Improve rail accessibility

All six 'class A railroads' (railroads with a national network) have train services to or from the LMPC. However, the vast majority of trains are transit trains. The national railroads specialise in long distance tracks and lack the scale and resources –in the LMPC- for effective local operations. The *New Orleans Public Belt Railroad* has both incentives and ability to improve the quality of the rail services to and from the LMPC. This organisation has the ambition to become a regional communication and dispatch centre that forms 'block-trains' with containers for one destination, manages the train movements in the region and provides information to the railroads. Such a service would improve the LMPC's rail services to the hinterland substantially. Currently, the Public Belt is in charge of local traffic between the rail terminals and has recently taken over the management of the rail terminal of two of the six railroads.

Durban

A huge challenge¹⁸ to improve the rail accessibility to/from Durban is the development of a coalition that is willing to invest in and lease rail equipment to Spoornet under conditions that secure both the efficiency of the deployment of the equipment and their utilisation on tracks from Durban to the hinterland. Such a coalition needs 'institutional access' on a high level. Given the high potential benefits, firms have incentives to be included in such a coalition.

Such a coalition has not been developed, especially because leader firms (such as MSC for containers and Rennie's for bulk) and Portnet have not been active and existing associations or discussion platforms do not have sufficient decision-making power to initiate such projects. The (poor) evaluation of the hinterland access regime supports this conclusion: a below average score is given to leader firms and a modest score to the quality of the organisational infrastructure.

¹⁷ See <http://www.sea-point.net>.

¹⁸ Other opportunities, such as a cargo card or other systems to relieve congestion of trucks at the terminal, or initiatives to reduce the empty hauls of truckers could be viable as well but both less a priority and with high risks of failure.

Rotterdam

Two opportunities to improve the HAR in Rotterdam are identified: automatically guided road transport systems and joint development of intermodal transport systems.

Automatically guided road transport systems

Road transport is an important hinterland mode in Rotterdam. Rotterdam would be one of the first places where automatically guided road transport could be implemented successfully, given the scale of road volumes, congestion on highways, need for efficient land use (limited space for constructing new roads) and technological capabilities in transport. Dedicating one lane of major highway corridors from Rotterdam to the hinterland to automatically guided trucks, perhaps only in (night-time) off peak hours, would improve the accessibility of the port and reduce congestion. Various coalitions investigate the viability of forms of automation, (see 'industry centre technology for road transport', 2003) but none of the initiatives is likely to be implemented in the short run.

Intermodal transport systems

The importance of inland waterway, rail and shortsea shipping make Rotterdam an important intermodal transport node. A key characteristic of intermodal transport is that coordination between various components of the intermodal chain is required. Especially the development of *new* intermodal services requires coordination (Bontekoning et. al, 2003). In many cases, the development of new large-scale intermodal connections requires the formation of alliances of multiple actors. In the absence of firms that take the lead, port authorities can do so (Paixão A.C. and Marlow P.B, 2003). The port authority of Rotterdam aims to initiate such coalitions. An example is the development of a '*barge-train service*' where goods are shipped to Germany by barge and put on train there. PoR plays a pro-active role in the formation of this coalition.

5. Conclusions

A huge majority of cluster experts agrees that hinterland access is a 'collective action problem'. An effective regime will not develop spontaneously; the formation of various sorts of coalitions is required. Major differences exist between the three analysed hinterland access regimes. The HAR in Rotterdam is judged more effective than the regimes in Durban and the LMPC. This judgement is consistent with an overview of the activities of various coalitions: in Durban, coalitions are hardly developed, while in the LMPC the formation of coalitions started recently. These differences between the three ports can partially be explained with historical reasons: the development of a regime is 'path dependent'. While Rotterdam has a long tradition in cooperation in the port community, in Durban one public organisation was dominant, while in the LMPC competition was dominant.

In Rotterdam, the role of leader firms is appreciated. Leader firms include ECT, who created a port network, P&O Nedlloyd and Maersk/Sealand whose joint ERS initiative has improved Rotterdam's rail services and Vopak, leading in barge shipping of chemicals and innovative in new (safer, larger) barges. The role of public authorities is also appreciated. The port authority has a clear hinterland strategy, created a network of inland representatives and develops market intelligence to identify opportunities. The organisational infrastructure in

Rotterdam's HAR is regarded as moderate; this is consistent with the limited involvement of associations. In fact, the role of associations is relatively small (mostly confined to lobbying) in all three cases.

The case studies show the importance of some of the variables discussed in the theoretical framework. Examples of the role of leader firms in the HAR include the 'maritime cluster initiative' in the LMPC (initiated by two industry leaders) and the role of P&O Nedlloyd and Maersk/Sealand to improve rail accessibility in Rotterdam. The role of public authorities in coalitions is demonstrated in the case of the Public Belt Railroad and PoR's role in developing market intelligence. Third, the relevance of an organisational infrastructure is demonstrated in the LMPC: the lack of both one integrated port authority and an association that initiates projects with shared benefits reduce the quality of the HAR. The importance of voice of firms in the cluster is shown in the case of the Public Belt Railroad in the LMPC, and the positive effects of community involvement are clear from the 'Port Community Rotterdam' project to introduce a 'cargo card'.

The case studies also provide some preliminary evidence for the relevance of the traffic composition on the quality of HAR's: especially containers require joint efforts, due to the numerous actors involved, whereas for some other commodities (especially dry and liquid bulk), one single or a few actors manage door-to-door chains. In these chains, joint efforts are less necessary and as a consequence, the role of public organisations and associations is smaller. However, this issue requires further attention.

The analysis of the HAR in three ports demonstrates the value added of a 'governance perspective' when analysing hinterland access. The opportunities to improve the HAR vary between the case studies but are similar in one aspect: the complexity of inter-organisational arrangements is high and lack of organisational capabilities constrains the quality of the HAR.

References

- American Association of Port Authorities (2003), *Statistics available from <http://www.aapa-ports.org/industryinfo/statistics.htm>*
- Bennett, Robert J. (1998) “Explaining the Membership of Voluntary Local Business Associations: The Example of British Chambers of Commerce”, in: *Regional Studies*, vol. 32.6, pp. 503-514
- Best, M. H. (1990), *The new competition: institutions of industrial restructuring*. Cambridge, Mass.: Harvard University Press
- Berg, L. van den, Braun, E. and Meer, J. van der (1997) *Metropolitan Organising Capacity: Experiences with Organising major Projects in European Cities*, Asgate, Eldershot.
- Bontekoning, Y, Macharis, C. and Trip, J.J. (2003) Is a new applied transportation research field emerging? – A review of intermodal rail-truck freight transport literature *Transportation Research, Part A*
- Campbell, J.L., Hollingsworth, J.R. and Lindberg, L.N. (1991) *Governance of the American Economy*, Cambridge [etc.]: Cambridge University Press
- Goss, R.O. (1990) “Economic Policies and Seaports: 4 Strategies for port authorities”, in: *Maritime Policy and Management*, vol. 17, no. 4, pp. 273-287
- Hirschmann, A.O. (1970) *Exit, Voice, and Loyalty: responses to decline in firms, organizations, and states*, Cambridge, Mass.: Harvard University Press
- Hollingsworth, J.R., Schmitter, P.C. and Streeck, W. (1994) *Governing Capitalist Economies: performance and control of economic sectors*, New York, Oxford University Press
- Hollingsworth, J.S. and Boyer, R. (eds) (1997) *Contemporary Capitalism: the embeddedness of institutions*, Cambridge [etc.]: Cambridge University Press
- Hoyle, B. (1988) “Development Dynamics at Port City Interface”, in: Hoyle, Pinder and Husain, *Revitalising the Waterfront; international dimensions of deckland redevelopment*, London, Belhaven Press
- Industry Centre Technology for Road Transport, (Branchecentrum Technologie voor beroepsvervoer), 2003, website: <http://www.bct.net/tpsbt.nsf>
- Klink, H.A. van (1995) *Towards the Borderless Mainport Rotterdam – an analysis of functional, spatial and administrative dynamics in port systems*, Amsterdam: Thesis publishers
- Kreukels, T. and Wever, E. (eds.) (1998) *North Sea Ports in Transition: changing tides*
- Langen, P.W. de (2004) *The performance of seaport clusters, a framework to analyze cluster performance and an application to the seaport clusters of Durban, Rotterdam, and the Lower Mississippi*, Rotterdam, ERIM PhD series
- Langen, P.W. de, en Nijdam, M.H. (2003) *Leader firms in de Nederlandse Maritieme cluster; theorie en praktijk*, Delft University Press, ‘Nederland Maritiem Land’ series.

De Langen, P. W. and Visser, E.J. (2004), Collective action regimes in seaport clusters: the case of the Lower Mississippi Port Cluster. Forthcoming in the *Journal of Transport Geography*

Notteboom, Th. (1997) "Concentration and the Load Center Development in the European Container Port System", in: *Journal of Transport Geography*, vol. 5, pp. 99-115

Olson, M. (1971) *The Logic of Collective Action: public goods and the theory of groups*, Cambridge, MA [etc.]: Harvard University Press

Paixão A.C. and Marlow P.B (2003) Fourth generation ports - a question of agility? *International Journal of Physical Distribution & Logistics Management*, vol. 33, iss. 4, pp. 355-376

Pinder, D.A. (1992) *European Port Cities in Transition*, London, Belhaven Press

Sardent, A.J. (1938) *Seaports and Hinterlands*, Black, London

Slack, B. (1985) "Containerisation, Inter-port Competition and Port Selection", in: *Maritime Policy and Management*, vol. 12, no. 4, pp. 293-303

Slack, B. (1999) Satellite Terminals: a Local Solution to Hub Congestion?, *Journal of Transport Geography*, pp. 241-246.

Westlund, H. (1999) "An Interaction - Cost Perspective on Networks and Territory", in: *The Annals of Regional Science*, 33, pp. 93-121

Williamson, Oliver E. (1985) *The Economic Institutions of Capitalism: firms, markets, relational contracting*, New York: The Free Press; etc.