

A new phase in the port-city interface?

Case study on changing spatial relations between the Port and the City of Amsterdam

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ABSTRACT

In this paper, we investigate whether a new phase in port-city development is emerging. We have done this by analysing the present and future spatial developments of the harbour of Amsterdam in the Netherlands in terms of the spatial and environmental policies and the viewpoints of firms. It appears that in the Port of Amsterdam, but also in other ports, the expansion pace of the port area is slowing down, while at the same time the city is expanding in the direction of the port at an increasing speed. In the beginning, this conflict was rather passive, in the sense that the conflict was about *how* the redevelopment should take place. However, the conflict has evolved further to questioning *whether* any redevelopment should take place. There appears to be a problematic urban frontier, which is steadily moving into the older parts of still active and vibrant port areas.

KEYWORDS: port-city interface, port development, regulation, spatial development

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1 Introduction

In the past, port areas have regularly expanded to accommodate the increase in cargo volume handled. At the same time, the morphological heart of many ports has moved downstream, away from the (port) city. This development of port infrastructures in time and space is described in the well-known Anyport-model developed by Bird (1971). The model is useful for the analysis of the morphological development, but pays no attention to the changing relationship between the port and the city concerned. A model emphasizing these changing and mainly weakening spatial and functional links between port and city was developed by Hoyle (1989), who stated that:

“Economically and geographically, port and cities have grown apart” (p. 430). An example of the changing linkages between port and city is the redevelopment of older port areas for urban uses, which include many urban waterfront developments (such as housing, commercial functions, and offices). Norcliffe et al. (1996) also discuss the changing relationship between port and city, and observe a shift from an emphasis on production to consumption at waterfronts, and conclude that there is a “reversal of the direction of influence between city and waterfront so that the latter now mirrors the cultural trends of the former and its wider society rather than the city reflecting the economic vitality of the port” (p. 132).

In recent years, an increasing number of ports in the Hamburg-Le Havre range have encountered difficulties, as they are no longer capable to (fully) accommodate all the demand for business sites. Although, this has led to the development of new port areas, it appears that in many ports the last extension of the port area has taken place. A next phase of increase in the port area is becoming almost impossible due to a change in environmental perspectives in the last few decades which has resulted in a growing community resistance and lack of political support for the transformation of shorelines and coastal areas into harbour areas. This means that it is mainly those areas located at quays with deep water access which will increasingly be in short supply. At the same time, many older and former obsolete port areas have been transformed to new types of land uses which are increasingly encroaching into the port area (Daamen, 2007; City of Le Havre, 2007). It appears therefore that the port-city interface is developing into the systems already formulated by Hayuth in 1982; namely, the spatial system (mainly comprising the changing land use in the port) and the ecological system (mainly comprising environmental issues). In much of the literature published since then, these issues were dealt with separately, and were hardly related to the vast amount of literature on cities and their waterfront developments. This, together with our observation that at least in some ports there is a spatial limitation to their expansion raises the questions: Are we entering a new phase in port development in a geographical and morphological sense? And will this influence the relationship between city and port?

In this paper, we will investigate if such a new phase in the development of ports and port cities is emerging, and whether this could be an additional phase to the Anyport model of Bird and port-city interface models. We will analyse this question by looking at the present and future spatial

developments of the harbour of Amsterdam in the Netherlands in terms of the spatial and environmental policies and the behaviour of firms. This paper is structured as follows: next in Section 2, we briefly review the literature on spatial port development and the port-city interface, and present our analytical framework; in Section 3, we introduce the Port of Amsterdam and give an overview of the recent developments in the Port and the policies governing such developments; in Section 4, we give an overview of the interviews with port companies in Amsterdam; and, in the final Section 5, we draw the conclusions.

2. Port development, the port-city interface, and land use by firms

Although spatial and transport scientists have been interested in ports for many decades, it was the research by Bird (1963) which led to the first conceptual model of port development. In his Anyport-model, Bird conceived the port as a direct relationship between port form and port function, and port space is seen as a chronological and linear succession of historically distinct development phases (Olivier and Slack, 2006). The model consists of six phases (Bird calls them ‘eras’), each involving an addition to, or change in, the physical layout of the port, and helping to build up to the complex pattern of a modern major port^c. Bird explains that each of the eras was marked by the growth of shipping volume or technical advancements in the carriage of goods by sea or of the handling in ports. In each era, the new port facilities were built more downstream than the facilities in the former ‘era’, resulting in a growing geographical separation of port and city. This latter phenomenon was also observed in the development of Asian ports by Robinson (1984). Charlier (1992) developed a life-cycle concept of port areas which refers not to the development of the entire port but only to a port facility of a particular port area. This concept envisages that a given port facility will progress through five stages, namely:

1. Growth, resulting from investment to create and expand the facility;
2. Maturity, in which the full potential of the facility is obtained;
3. Obsolescence, which sets in as more modern, higher-capacity facilities at better locations take over business;
4. Dereliction, after the berths are abandoned by shipping; and
5. Redevelopment which signals the start of a new and non-port economic cycle.

Charlier (1992) argues that, with the exception of the latter two stages, his sequence may be integrated in the ‘Anyport-model’. The Anyport-model, however, makes no specific provision for the closure of upstream facilities and their return to general city uses. Instead, Bird (1963) argues that the port will retain much of the existing layout adapted to new uses, and develop new layouts

^c Although the Bird model is well known, there are other models which describe the morphological development of ports. One of them is by Meyer (1999), who distinguished four phases: (1) Entrepôt port: a port within an enclosed city; (2) Transit port: port alongside an open city; (3) Industrial port: a port alongside a functional city; and (4) the Distribution port and network city: the port is rediscovered by the city as a part of the urban landscape. Surprisingly, Meyer, who is an urbanist, does not refer to the work of Bird.

and installations suited to new ship types and new methods of cargo handling in new port areas. Nevertheless, Charlier's work fits well within the body of literature relating to cities and their waterfronts redevelopment, but there is one particular element of his work that is distinguishing. He argues that an alternative to city-waterfront development is to regenerate the port functions of the derelict areas. He suggests that, before these sites are transformed to city functions, the "residual maritime potential" should be assessed because this is "non-renewable".

One of the main shortcomings in Bird's model is the absence of the functional relation between the port and the city. Although Bird included a spatial relation in his model, he could never envisage what the effects of maritime, technological, and logistic developments would be on the scale of modern ports, the networks in which they operate, and the relative importance of ports for the city's economy. Nor could Bird foresee the impact of environmental policies and the sustainable paradigm shift in the development of ports. Therefore, a different approach has to be adopted in order to deal with new empirical realities and/or theoretical developments (Robinson, 2002; Olivier and Slack, 2006; Daamen, 2007). Robinson and in particular Olivier and Slack give a good recent review of the port research literature, but propose different directions for future research. Robinson proposes a new paradigm in which the economics of the port in a value-driven chain system forms the cornerstone. Olivier and Slack, although also emphasizing the economics, take a more holistic view and propose an interdisciplinary dialogue between transport and economic geography, particularly by giving more attention to a behavioural approach, which is well known in economic geography, but less in freight transport research. However, they also state that "Fundamental questions remain", such as "Why is the physical environment so absent in port studies? Why have concepts of sustainability not penetrated port studies? What of social-change factors?" (p. 1423). We believe that these questions remain to be answered. We therefore propose to include the port-city interface in the debate.

In studies on the port-city interface such as Hoyle (1989, 2000), Charlier (1992), Norcliffe et al. (1996), Daamen (2007), and particularly Hayuth (1982, 1988), we see that environmental, social and spatial planning have more attention than in the more traditional port studies. Both Hoyle and Norcliffe et al. present an evolution of the port-city interface, in which the spatial separation between the port and the city is emphasized in terms of changes in land use, without actually discussing the links between the city and the port: the port is geographically moving away from the city while at the same time the geographical overlap between the port and the city in terms of land use diminishes. According to Norcliffe et al., in the early stages of this evolution, the port and the city lived in symbiosis (t1) and developed into a city next to a "non-place port" (t3) (see Figure 1). Hoyle (2000) describes more or less the same

development in six stages (see Figure 2) ranging from a close spatial and functional association between city and port (in the 1st stage) via a large-scale port which consumes large areas of land (expanded over the course of the 2nd, 3rd and 4th stages), and then to urban renewal of the original port area (in the 5th stage), and ultimately to an enhanced port-city proximity reflecting patterns of urban change and a renewal of the port-city link (in the 6th stage).

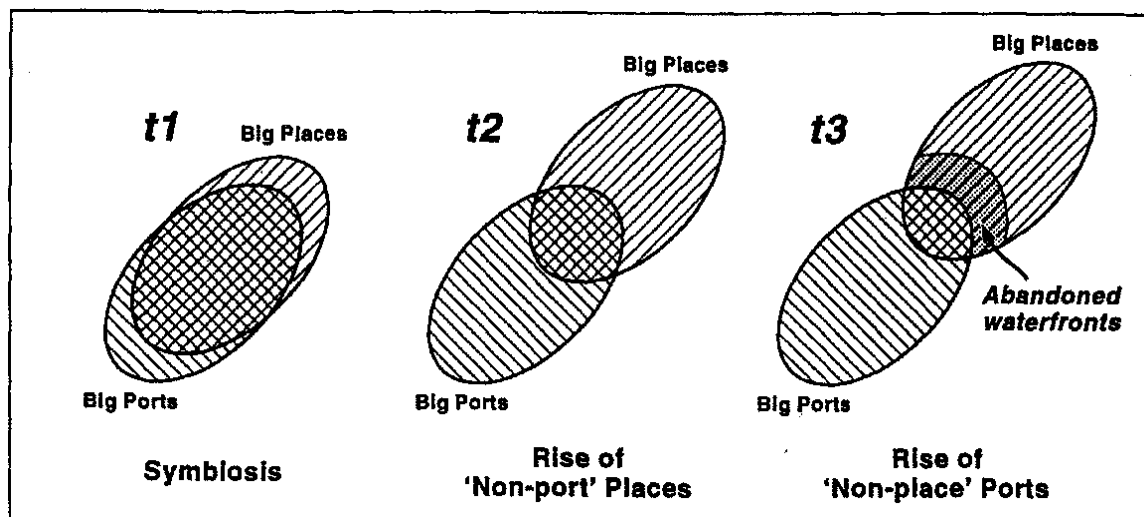


Figure 1 The evolution and separation over time of cities and their ports according to Norcliffe et al. (1996: 126)

STAGE	SYMBOL ○ City ● Port	PERIOD	CHARACTERISTICS
I Primitive port/city	○●	Ancient/medieval to 19th century	Close spatial and functional association between city and port.
II Expanding port/city	○.....●	19th - early 20th century	Rapid commercial/industrial growth forces port to develop beyond city confines, with linear quays and break-bulk industries.
III Modern industrial port/city	○.....●	mid - 20th century	Industrial growth (especially oil refining) and introduction of containers/ro-ro require separation/space.
IV Retreat from the waterfront	○	1960 s - 1980 s	Changes in maritime technology induce growth of separate maritime industrial development areas.
V Redevelopment of waterfront	○	1970 s - 1990 s	Large-scale modern port consumes large areas of land/water space; urban renewal of original core.
VI Renewal of port/city links	○.....●	1980 s - 2000+	Globalization and intermodalism transform port roles; port-city associations renewed; urban redevelopment enhances port-city integration.

Figure 2 Stages in the evolution of the port-city relationships according to Hoyle (2000: 405)

Hayuth (1982) is one of first authors who analysed the changing intrinsic relationship between the port and the city. In 1982 he saw changes in the ecological and spatial system, and in 1988 also included changes in the economic system. Changes in these systems led to the growing spatial and functional segregation of city and port and the changing landscape of the city waterfront. The changes in the spatial and economic systems more or less represent the same trend that other authors portray, but what is of particular interest is the ecological

system which involves environmental issues (mainly water and air quality). This is particularly apparent in Daamen's (2007) study on the port-city interface in Rotterdam and Hamburg which reports that local authorities are actually planning the redevelopment of current port areas and the development of new city areas geographically very close to the port. It is no longer only the abandoned port areas which are being redeveloped for city uses, planners are also proposing to redevelop parts of the port near the city which are actually still in use for port activities. According to Daamen, both the city and the port are engaged in "a similar battle to attract people and business" and it is "often the city-waterfronts where the battle materializes, creating competing space-use demands and a zone of conflict for city and port authorities" (Daamen 2007: 19).

For our analysis of the port-city interface we use a framework which is partly based on Bird (1963) who makes a distinction between port form and port function. We add port regulations to this, because these are also important for companies who settle in port areas, but were probably less important at the time Bird developed his model. The port form represents the geographical and morphological shape and layout of the port. On the firm level, this relates to the firms' location in the port and the amount of land they use. The port function relates to the core business operations (for instance logistics) of port companies and the Port Authority and their interaction. Port regulation refers all sorts of regulation concerning port activities such as environmental regulations (concerned with noise, fine dust, CO₂, water quality, odour), transport (modal shift, tons handled per quay), spatial planning (land use), labour, safety and security. Port form, function and regulation are related (see Figure 3).

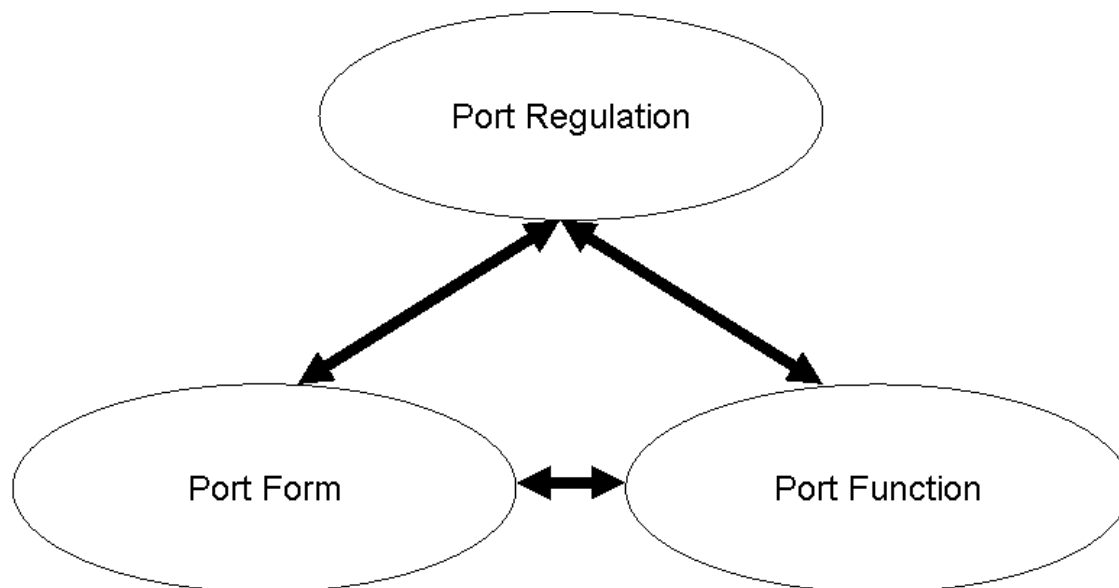


Figure 3 Relations between port form, port function and port regulation

3. The Port of Amsterdam: development and policies

In the development of the port form, the Anyport model can be observed for the port of Amsterdam. At first the port and the city were integrated at the current city centre. In later stages (already in the 17th century) purpose-built harbours were developed to the East of the city centre. After completion of the Noordzeekanaal, which connects the port to the North Sea in 1876 the development began to the West of the city centre. Particularly after the Second World War large new port areas were developed on this west side. Then, in the 1980s the transformation of the former Eastern Dockland to new residential uses began. In the 1990s, the transformation of the area called the IJ-banks (the waterfront of the city centre) also began (see Figure 4) and is now under development^d.

^d For an analysis of the IJ-banks development, see Bongenaar and Malone (1996).

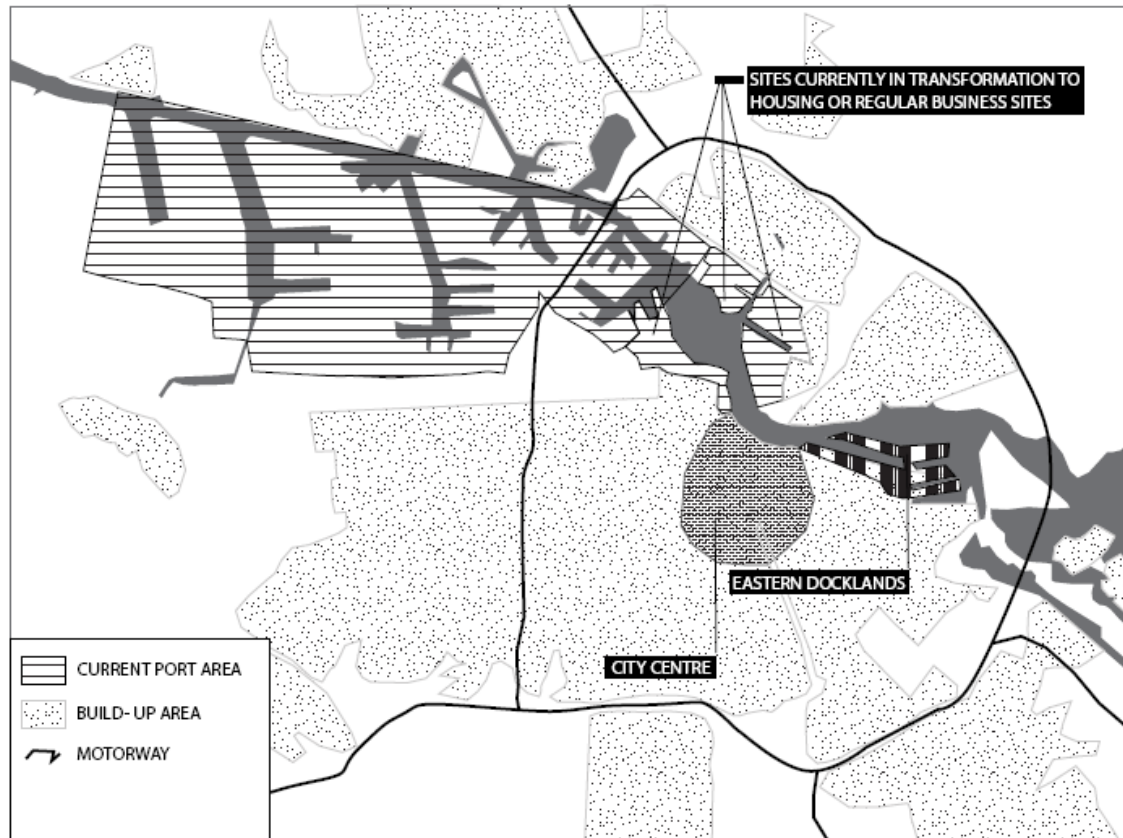


Figure 4. Map of the port of Amsterdam with former and current transformation sites.

Source: www.portofamsterdam.com (adapted by Itziar Lasa).

In the past few decades, the Port of Amsterdam has been growing rapidly also because sufficient new port areas were available. The total Amsterdam port area is about 2,600 hectares, of which 1,600 hectares is for companies and 1,000 for the harbours and other infrastructure. As a result of the growth in port activities in Amsterdam, the supply of vacant business sites has decreased sharply from 426 hectares in 2003 to 270 in 2009 (Gemeente Amsterdam, 2003, 2009). In terms of tonnes, the Port of Amsterdam belongs to the top five in Europe. In recent years handling in the port has grown significantly. In 2008, the transshipment was 75,755 million tonnes, of which crude oil and oil products formed more than one-third. For the future a continued growth is expected, particularly in the container sector (see Table 1).

Table 1 Current and future handling in the Amsterdam port area in million tonnes

Market segment	1995	2000	2007	2008	2020	2040
Oil products	8,177	11,595	24,866	30,566	45,000	48,000
Coal	4,760	11,289	14,734	17,383	24,000	36,000
Agribulk	7,529	10,044	8,326	9,004	11,000	16,000
Other dry bulk	3,952	4,623	6,641	7,310	8,000	12,000
Containers	1,111	782	3,442	3,905	26,000	69,000
Other	5,695	6,282	7,344	7,587	10,000	13,000
Total	31,225	44,614	65,353	75,755	124,000	194,000

Source: Haven Amsterdam, 2009.

In Europe, many ports are identified as either gateway ports or hub ports (Ferrari et al., 2006;

Notteboom, 1997). But this classification is based on containers being an important sector for the port concerned. The Port of Amsterdam is, however, neither a hub nor a gateway port, but is more a 'kind of' commodity port in which the manufacturing of the handled goods forms an important part of the activities in the port area. This port has many different sectors and the producing industry that uses the incoming freight flows is well represented in the port area.

Due to the rapid growth in the past and forecasted growth, the Port of Amsterdam is faced with (in its own words) 'challenges' in the fields of the accessibility of the port area, the land supply and the environment. The solutions to these challenges are laid down in a new Strategic policy document called 'Slimme Haven' (Smart Port), which was approved by the City Council in 2008 (Haven Amsterdam, 2009). In general terms, the same challenges apply to the other ports in the Hamburg-Le Havre range and can be seen as a shift to more sustainable policy, although the timing and intensity of development can be different (City of Le Havre, 2007).

3.1 Spatial policy: a limited supply of land

In the port area, the public Port Authority is the main supplier of land, and the municipality is the planning authority. According to the new policy up to 2020, the growth of the Port of Amsterdam has to be realised within the existing area, and the port form will not change until 2020. To accommodate the forecasted growth in handling, several measures have been proposed:

- Redevelopment of existing business sites which are currently underutilised. This is, however, not a new policy. Between 1990 and 2007, the municipality acquired 307 hectares of previously developed land from companies in the port area. In the same period it released 560 hectares.
- Intensifying land use. This could mean developing multi-storage buildings, but also connecting currently dry business sites with quays that have deep water access, or reducing harbours in order to develop new business sites and/or quays. In general, this requires larger investments.
- Higher rents and additional lease conditions. Because the Port Authority and the municipality only lease out land and do not sell it they can attach conditions to land leases. These conditions and the rents will be linked to the intensity of the land use. Also shorter lease periods have been announced.

In addition, the development of a 'transition zone' between the port and the city is proposed. In this zone, called the Minervahaven (see Figure 5), the economic activities are planned to change from port activities to city activities (in particular the creative industries). Although the area is relatively small (7 hectares) and will remain a business area, it will be no longer be available to port companies, which in effect reduces the port area.

The Port is also confronted with the spatial policies of the Municipality itself. For a few decades, the Municipality has followed a compact city policy which implies that (new) residential

development should preferably take place within, or adjacent to, the existing built-up area. Within this context, since the 1980s, around 10,000 houses have been built in former port areas such as the Eastern Docklands and the IJ-Banks. Additional plans for at least another 5,000 houses in the Houthaven and the former NDSM-wharf were developed in the 1990s and at the beginning of the 21st century within a short distance of the current port (Figure 5). De Roo (2003) analysed the conflict between spatial and environmental planning for the Houthaven, and concluded that the planning process had ended in a “stalemate” (p. 306), particularly because most of the proposed dwellings were planned in a zone in which residential development is restricted because of noise levels (see the Port Zone in Figure 5)^e. Eventually, in 2008, the municipality and three companies agreed that, under certain conditions, residential development in the Houthaven and NDSM-wharf area is possible, but that in the coming 20 years, the Municipality will not start new residential developments which might harm the companies. After 2028 new developments are possible and the municipal spatial planning department and the Port Authority are already performing scenario analyses on the port-city interface between 2030 and 2040 (Dienst Ruimtelijke Ordening & Haven Amsterdam, 2009).



Source: <http://www.portofamsterdam.nl/smartsite42.dws>

Figure 5 Transformation zone and housing plans at the port-city interface of Amsterdam

3.2 Environmental policy: more strict environmental regulations

Because of increasing regulations at the European level, the Dutch state and regional and local

^e For a description, see also De Roo (2003), Chapter 7: ‘Liveability on the Banks of the IJ. Environmental Policy of the City of Amsterdam’.

authorities are obliged to implement these regulations and to enforce them. In particular environmental regulations and the protection of rare species are putting pressure on port activities. These regulations will limit the growth opportunities for the Port of Amsterdam, and there are additional complications because of the proposed intensive use of the port area and advancing residential development. The Port Authority, in cooperation with the port companies, is looking for sustainable innovations in order to become more environmentally-friendly and to create extra 'environmental space' for the growth of port activities. Examples are cleaner ships, cleaner energy production and use, the improvement of air and water quality, noise control, the creation of ecozones^f, and the careful handling of dangerous goods (TU Delft, OTB, 2007 and Haven Amsterdam, 2009).

3.3 Mobility Policy: improving accessibility

The accessibility of the Port of Amsterdam, and in a broader sense also that of the Amsterdam area, is becoming increasingly problematic. Road freight transport in particular is experiencing considerable congestion, but current investments in new roads will ease this. Both the rail capacity and inland waterway capacity are enough for the near future. Sea transport is experiencing accessibility problems as a result of the insufficient capacity of the IJmuiden locks and because they can only accommodate vessels with a maximum depth of 45 ft due to tunnels under the Noordzeekanaal. The plan is to have a second lock ready in 2016. Overall, the modal split for the port of Amsterdam is quite good: road 53 per cent, inland waterway transport 43 per cent and rail 4 per cent. The goal is to further increase the market share of relatively sustainable transport such as inland waterways and rail.

4. Business viewpoint on port form, function, and regulation

As part of our analysis, eight companies in the port area were interviewed in the summer of 2008. Together with the Port Authority, an initial sample of approximately 25 companies was selected. Finally, eight companies were willing to participate. Although small in number, these companies form a representative sample of the port community. The companies are evenly distributed over the port area and active in the transport (2), handling (1) and manufacturing (5) sectors. The interviews were conducted in a semi-structured way to obtain the companies' viewpoints on the current and present port form, function, and regulation.

Many companies were still expecting growth during the year 2008 when the interviews were held. Most interviewed companies thought that their operations at their current sites could continue to grow for about three to five years. This might extend a little more into the future

^f Ecozones are sites which are not in use by companies and are temporarily 'in use' as nature reserves.

because to the financial crisis might slow down the growth rate. The average expected growth that can be accommodated on the current sites is about 10-20 per cent as compared with 'normal' 2008 levels of operation. Several companies have land in reserve in order to be able to extend their operations on the current location. Some companies have different sites in the port of Amsterdam and/or in the Noordzeekanaal zone. Additional space might be created by restructuring these sites into one efficient site for the companies concerned. Other companies, which do not have any reserve land, are experiencing limits to their growth opportunities. Some companies see possibilities to intensify land use on their current site, but this would require large investments (amounts of €1-7 million per hectare are quoted) in either higher buildings or underground structures. This might suggest a role for the Port Authority in order to reduce the high cost of these expensive structures to the company. Storage in the hinterland at the user's site might create extra 'land' in the Amsterdam port area for new port activities.

To accommodate their growth many firms are increasingly looking for alternatives outside the port of Amsterdam. In this connection, other ports that were mentioned several times are Antwerp, Vlissingen, Zeebrugge, Rotterdam, and Hamburg. Some companies are willing to expand in Amsterdam, but they are not allowed to do so because other business operations (in place of existing operations) are preferred by the Port Authority. Some companies are worried by the planned housing near the port area which is delaying or halting planned investments, and they are looking for alternatives. Concerning the port form, cooperation with other ports might create space. Businesses suited for the port of Amsterdam can be accommodated, and businesses better suited for other ports such as the Port of Rotterdam can be advised to locate there. Cooperation could be with Rotterdam, Vlissingen or Groningen, but also in Europe there might be opportunities to cooperate (or even merge) with comparable ports (e.g. Zeebrugge).

The companies perceive that the accessibility of the port is generally good. The majority of the interviewed companies receive about 100 per cent of their incoming freight flows by sea and for them access via deep water is important. However, the expansion of deep water access is very difficult especially given all the legal planning proceedings. Without an improvement of the IJmuiden lock, a further expansion of the Amsterdam port (in volume) is impossible. Outgoing flows from the Port of Amsterdam are by road, rail and inland waterways. The companies expect that rail freight transport will increase due to an increase in coal transport to sites in Germany not accessible by inland waterways and more transport to Eastern Europe. What some companies need is better public transport in the port area.

For the port function, the business operations of companies (including the Port Authority) in the Port of Amsterdam were analysed. The business community in the port of Amsterdam has mixed views about the Port Authority and its operation. According to the interviews, positive points are

a flexible, fast and focussed service of the Port Authority and its good location close to European customers which gives it a strong position in trade. However, some opportunities for improvements were identified by the companies: Amsterdam should focus on its own peer ports in Europe rather than on mainports, be more stable in its priorities (the companies perceive many changing priorities), and rely less on bulk flows; the problems with sea lock IJmuiden; the political lobbying of the regional and national authorities could be improved; and the maintenance of the inland waterway infrastructure could be better. Some companies complain about the implemented rental policy of higher rents and shorter rental periods (25 or 30 years instead of 50 years), which shorten their pay back time on investments. This is particularly the case for companies which might want to invest in an intensification of their land use. Also it is said by some companies that the local authority (the mayor and the Board of Aldermen of the City of Amsterdam) shows only a modest interest in the port.

However, the Port Authority begs to differ on this last issue by stating that the Municipality does take the Port of Amsterdam seriously, as it supports the recently prepared new vision for the port. Concerning the rental policy, it was put forward that the European Union requests shorter rental periods, and that competing ports are also reducing the length of lease periods, with the aim of intensifying competition between ports. However, several undesired side effects (e.g. the slowing down of business investments in the Port of Amsterdam by existing companies) might occur. Furthermore, shorter rent periods for several investments may lead to profitability problems. Ultimately, policy is designed to intensify land use (whereby companies need long lease periods), but at the same time port competition is aimed for (whereby shorter lease periods are required).

4.1 Port regulations: the different governmental levels

Port regulations imposed by the different government layers (European, national, regional, and local) cause some difficulties for companies. Aspects that increasingly put pressure on companies are environmental regulations concerning fine dust, noise, CO₂, safety, water quality, security, etc. Several companies have expressed their concern about the strict execution of European regulations in the Netherlands as compared with neighbouring countries. In this respect it is important to note that it is not the Amsterdam Port Authority that imposes environmental regulations on the companies, but the municipal and regional authorities. In this respect, several ports outside the Netherlands have been quoted as being 'more flexible' as compared with the Port of Amsterdam. According to the interviewed companies, examples of more flexibility in other ports can be found in: 1) gassing of insects in cacao; 2) lifting sacks; and 3) fire protection measures. As a result of regulations imposed by the United States, the port security measures have become stricter.

A last problem that was indicated in the interviews concerns housing encroaching former port areas. If housing legally enters port areas (enabled by a land-use plan), and if the inhabitants of

these houses start to complain about port activities and take a legal action, the judge will normally rule in favour of the inhabitants. This is perceived as unfair by companies and at least would call for equal legal treatment of housing and port activities. In general, the building of extra houses in the neighbourhood of existing port companies is perceived as a blueprint for problems. This means increased tensions between living and port functions. The current housing plans of the City of Amsterdam will lead to shorter rental periods for land, which is causing companies to rethink their investment plans and may also lead (if executed) to an actual reduction of land available to port activities.

5. Conclusions

In the past, ports and their cities have seen substantial spatial change. Over time, both spatially and functionally they became increasingly separated from each other. The port itself has evolved from a distinct space, as a single, fixed, spatial entity to a place “where synchronic forces are played out among a pluralistic port community striving for common internal and external goals” (Olivier and Slack, 2006: 1418). The once substantial and longstanding symbiosis between ports and cities has eroded (Norcliffe et al., 1996: 125). In the literature, these developments have, among other things, given rise to a re-conceptualization of spatial port development and the port-urban interface in particular. We argue that, because of recent sustainable spatial policies in West-European city ports, the focus on the spatial aspects of port development is imminent again. Our research in Amsterdam shows the Port Authority is stabilizing the amount of land in the port area available for expansion of firms, while at the same time the Municipality has a substantial target to build houses in the existing built-up area. In spatial terms, this means that the expansion of the port area has stopped, while the urban housing frontier is gradually encroaching on the existing, and now fixed, harbour area.

This new emerging phase in the port-city interface but also in the spatial development of ports is not limited to Amsterdam. Daamen (2007) points to similar developments in Rotterdam and Hamburg, although these have slightly different backgrounds. The question that emerges is: Are we now entering a new phase in port developments which is not included in existing models? And if so, which model is best suited to be expanded? Or, should we develop a whole new model? We state that a new type of model is needed in which the spatial developments of the port and concepts about the port-urban interface are present. The Anyport model of Bird, as a chronological and linear succession of development phases, is an adequate starting point, but lacks the possibility to integrate the problematic aspects of the port-urban interface because this disturbs the linear succession of the historically-distinct development phases. On the other hand, the concept about the port-urban interface which mainly focuses on waterfront developments lacks the spatial component (an important exception is Hayuth, 1982). Therefore, we propose a model in which the morphological development and the changing port-urban interface are

combined, and which is an extension of the evolutionary model by Norcliffe et al. (1996) as shown in Figure 1.

Essential in this proposed extended Norcliffe et al. model (see Figure 7) is that the symbiosis that existed during the first phases of the Anyport model (t1 and t2 in Figure 7) and the successive period in which older port areas were abandoned by port companies and waterfront redevelopments took place (t3 in Figure 7) have now passed, and have been replaced by a zone in which there is a conflict between different kinds of land use. In t2 the port and the city became increasingly functionally separated and in t3 they also became geographically separated. In these phases, the port form still followed the port function. Port regulation was increasing in this phase, especially non-core port regulation (such as environmental regulation). In t4 (the present situation) the geographical separation disappears, while the functional separation remains, which basically causes the current conflicts. We do not claim that t3 was a period without conflict (Kilian and Dodson, 1996; Foster, 1999; Hoyle, 2000), but that the conflict was rather passive, in the sense that the conflict was about *how* the redevelopment should take place. In t4 however, the conflict is about *whether* any active redevelopment should take place. It is not a conflict between proposed new types of land uses, but a conflict between the existing land use as a port and proposed city land uses (mainly housing). In this phase, it is increasingly difficult for port form to follow the development of the port function. Instead, there appears to be a problematic urban frontier, which is steadily moving into the older parts of still active and vibrant harbour areas. This also implies that port regulation is increasingly harming the port development, because the port regulation is influenced by the 'sharpened' societal regulation (environmental- but also labour regulations). It appears that port regulation is slowly starting to influence port form and port function in a limiting way.

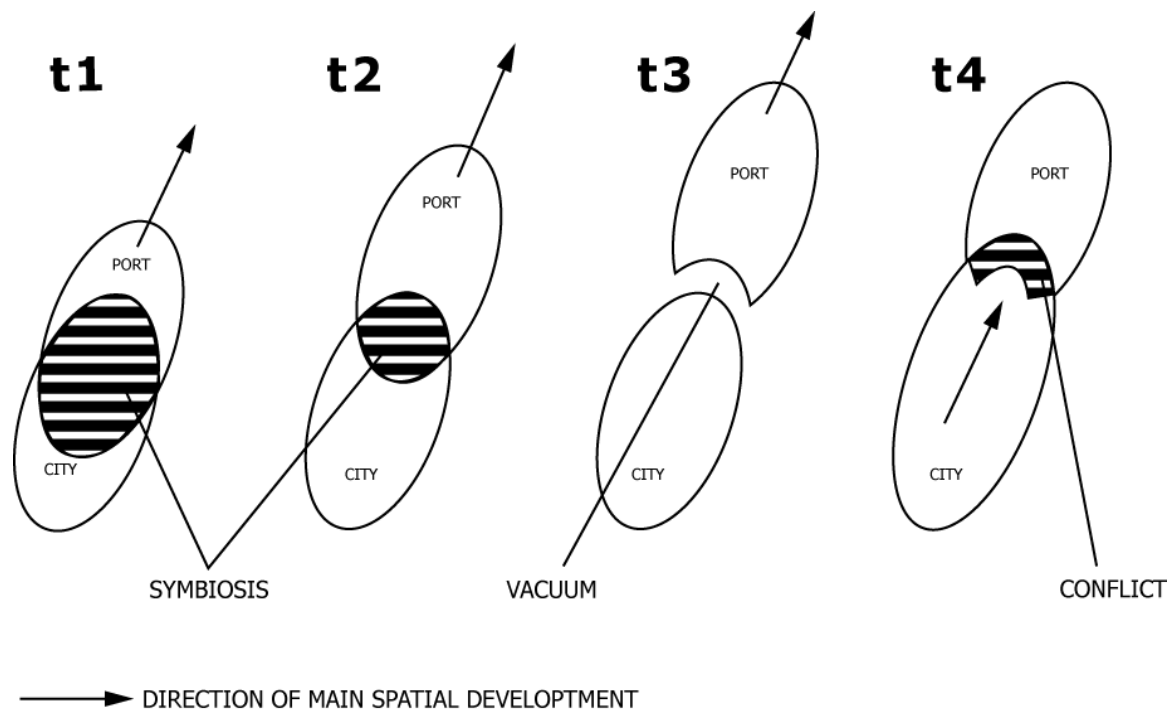


Figure 7 Proposed new spatial port development model including the city-port interface

Source: authors, inspired by Norcliffe et al. (1996).

It is evident that the linear successions of phases with an increasing port area with downstream locations has come to an end. Now, in contrast, it appears that, in Amsterdam, and in other ports the extension of the port area is slowing down, while at the same time the city is expanding in the direction of the port at an increasing speed. In this respect, it seems that the global forces (mainly changing transport and logistics concepts) that were predominantly responsible of the growth of the ports in t2 and t3 are now losing to local forces within the city which are steered by planning and sustainability paradigms. These paradigms also are responsible for policies, at least in Amsterdam, which are bringing the areal growth of the port to a halt. These local forces were not absent in the t3 period (for instance, see Pinder, 1981) but were not powerful enough to be successful. This situation has now changed in the t4 period.

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