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Metropolitan delta landscapes

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Introduction

Throughout history, the fertile river deltas have been the most favourable regions for human life. Many of them are strongly urbanised and have developed into metropolitan deltas. In this paper we will compare the metropolitan delta of North-western Europe to others and we will briefly discuss the main spatial planning problems that are at stake.

Metropolitan deltas as specific form of urbanisation

The great metropolitan areas are the centres in which in the 21st century global competition is taking place. The process of global urbanisation will increase, especially in low income countries, that in 1995 contain about 60% of the global population (Ingram, 1997). At this moment there are 20 metropolises with a population of more than 10 million people. If the developing world will follow the urbanisation process that has occurred in Europe and North and South America, it is expected that by 2030 nearly two-thirds of the world's population will be urban (The Economist, 2002).

Throughout history metropolitan areas have developed around centres of government. However, in Europe and South and East Asia due to the presence of large river deltas another type of metropolis can be distinguished, the *Metropolitan Delta*. A metropolitan delta can be defined as the delta of a big river with a large conurbation, sometimes functioning as a port for its hinterland. Urbanisation, industry, infrastructure development, intensive agriculture, nature conservation and water management are struggling for space.

The emergence of these metropolitan areas has been mainly concentrated along great rivers that have formed major transport arteries to the hinterland since time immemorial. In this way it was possible for these societies to transport large loads resulting in larger urban development around these transit ports in the late Middle Ages. In the rest of the Old World the camel was still the main mode of transport and loads of around 150 kilograms were transhipped in the caravanserais, which themselves grew into small trading centres at intersections in the caravan routes. Where even the camel could not gain access people (mainly women) carried small loads from village to village and transhipment locations had no relevance whatsoever. In China and Europe, however, the transit ports became the metropolises, which in one hand were in contact with the rest of the world by sea and on the other hand connecting the hinterland by the river system. On the American continent the European model of metropolitan development was copied following the colonisation of the Dutch, the French and the British (McNeill, 1987).

The Northwest European Metropolitan Delta

The North West European Metropolitan Delta is a poly-nuclear or network metropolis that is developing in the triangle between Lille, Amsterdam and the Ruhr area. It is a new, large, hybrid urban pattern of urban concentration areas, suburban zones and open spaces (Wijermans & van Mansfeld, 2000).

The Northwest European Metropolitan Delta is the area between Lille (France), Amsterdam (The Netherlands) and Cologne (Germany) as shown

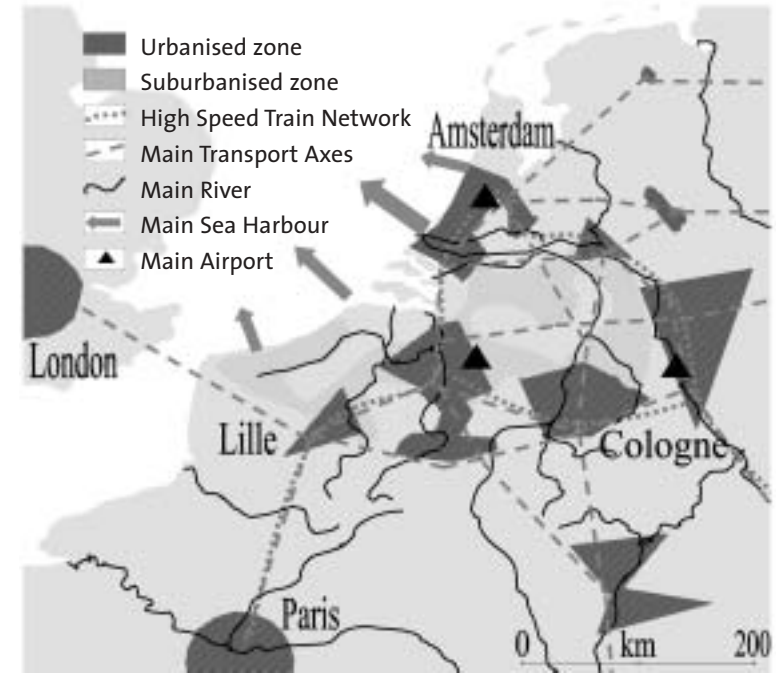


Figure 1: The Northwest European Metropolitan Delta

on this map (figure 1) derived from the Structuurschets Benelux, a common report on spatial planning by the governments of Belgium, The Netherlands and Luxemburg (Van den Broeck et al., 1996).

Although it has its roots in the delta of the river Rhine, since the mid 19th century the ongoing urbanisation is based at least partially on rail and road infrastructure in addition to waterways. These bundles of infrastructure are the backbone of so called corridors in which the North-western European development process is supposed to take place (Verkennis & Groenewegen, 1997). And even though, according to these two authors, the corridor concept

should not be used in retrospective, the metaphor nevertheless offers a perfect description of the development of the small, medium and large sized Dutch cities, from the trade network of the Hanseatic cities onto the development of the Randstad in the last century.

Delta metropolis quantified

In the study of Van Steekelenburg (2001) urbanised areas with a radius of 100 and 300 kilometres were compared worldwide on population density. In this study the North West European Metropolitan Delta climbs to the global top 25 of urban regions, illustrating its highly urbanised identity at the sub-continental level of scale.

Van Susteren (2003) compared the Dutch part of the North-western European Metropolitan Delta (the so called *Randstad Holland*) with 75 other conurbations in the world. The scope of this study, however, was a 30 km radius. The selection of conurbations for this study has been derived from three global rankings. First the world's 25 largest river deltas, as defined by the Times Atlas of the Oceans, have been selected upon their drainage area, which represents the catchment area of the river delta. Secondly the world's 25 largest cities, as defined by the Times Atlas of the World, have been selected upon their number of inhabitants, which represents the world's most urban areas. Thirdly the world's 25 largest air-, sea-, and telecom ports, as defined by IATA, MARAD and Telegeography, have been selected on their performance within the global trade networks, representing the world's largest ports. As a result of this study 15 of the 25 global river deltas could be discriminated as urban deltas. These 15 urban deltas are illustrated in figure 2. As indexes are often used in order to compare relative characteristics, the quantification has been elaborated to the *Deltamet-index*. This index compares the world's top 15 of urban deltas ranked by the quotient of the population density and the total drainage area of the delta. It can be concluded that the Randstad conurbation in the Netherlands can be considered as one

Figure 2: The 15 largest urban deltas of the world.



of the most densely populated river mouths of the 15 studied urban deltas (table 1). Also three compositions of contemporary urban deltas could be distinguished: (i) *Urban deltas* that are heavily urbanised but have no connection (jet) with the global trade network via air-, sea-, or telecom ports (i.e. Dakha, Karachi). (ii) *Delta ports* that are hardly urbanised but have a very important (based on their ranking) connection with the global trade network via air-, sea-, or telecom ports (i.e. Anchorage, New Orleans) and (iii) *urban delta ports* that are heavily urbanised and have very important (based on their ranking) connections with the global trade network via air-, sea-, or telecom ports (i.e. *Randstad Holland*, Hongkong).

In order to determine the relevance of these delta ports within the global networks Van Susteren developed the *Mainport-index*. This index is based on the combined position in cargo-traffic, air-traffic and ICT-backbone. When the relative position in these characteristics is used in the algorithm, the top 5 of this MainPort-index is Los Angeles, Randstad, London, New York, and San Francisco. When absolute values of cargo-traffic, air traffic and ICT backbone are being used the top 5 is New York, London, Singapore, Los Angeles and Randstad.

Table 1 DeltaCities

Nr.	Riverdelta		Deltacity at		Deltamet-Index (inh/km ²)	Ranking*					
	drainage area (millions km ²)		rivermouth Population (millions)			A	B	C	D	E	F
1	Mississippi	3.2	New Orleans	1.0	0.3	-	7	-	-	-	-
2	Nile	2.9	Cairo	10.8	3.7	17	-	-	-	-	-
3	Rio de la Plata	2.7	Buenos Aires	12.4	4.6	10	-	-	-	-	-
4	Niger	2.1	Lagos	13.4	6.4	7	-	-	-	-	-
5	Yangtze	2.0	Shanghai	14.2	7.1	12	8	-	-	-	-
6	Volga	1.4	St. Petersburg	5.9	4.2	-	-	-	-	-	-
7	Ganges	1.1	Calcutta	12.9	11.7	9	-	-	-	-	-
8	Yukon	0.9	Anchorage	0.3	0.3	-	-	-	-	7	-
9	Mekong	0.8	Ho Chi Minh	5.1	6.4	-	-	-	-	-	-
10	Indus	0.6	Karachi	11.7	29.5	13	-	-	-	-	-
11	Irrawaddy	0.6	Rangoon	4.7	7.8	-	-	-	-	-	-
12	Pearl	0.5	Hong Kong	5.5	11.0	-	5	-	22	2	16
13	Brahmaputra	0.4	Dakha	10.9	27.3	15	-	-	-	-	-
14	Fraser	0.2	Vancouver	1.5	7.5	-	-	-	-	-	-
15	Rhine	0.2	Deltametropolis	6.4	32.0	-	2	25	10	15	3
16	Sacramento	0.1**	San Fransisco-B.A.	5.8		-	12	-	9	22	5

*Ranking: A: Megacity B: Worldport C: Air movements D: Air passengers E: Air cargo F: ICT-port

**other source used (Water Resources eAtlas of IUCN, IWMI, WRI and the Ramsar Convention on Wetlands)

Planning problems in metropolitan deltas

Metropolitan deltas have similar problems as all big metropolises in the world through time such as poverty, traffic congestion, environmental problems, struggle for space and urban sprawl. Within the specific delta-composition they distinguish themselves by three additional problems: ongoing intensification and extensification of agriculture, complex water management,

and last but not least its high biodiversity under threat. Together with urban sprawl, these specific problems of metropolitan deltas occur mainly in what in the Dutch spatial planning jargon is referred to as the green space. Green space means rural areas that in former days encircled the cities and still are present, fragmented and surrounded by the heavily urbanised space of the metropolitan delta. De Geyter et al. (2002) refer to these former rural areas as the negative space. This is because the maps that these authors draw of the negative space are literally the negative of the combined maps of the build environment and the infrastructure, that together make up the positive or planned space. So this denomination also indicates the difference in planning intensity of these areas compared to the urban areas. The negative space can be considered as an integral part of the metropolitan delta because it determines important qualities of the delta as a whole, as will be discussed below.

Agriculture in metropolitan deltas

There is a common misunderstanding that the pioneering role that a country as the Netherlands has played in the development of modern agriculture is linked to the rural areas. In fact it is linked to the urban areas. Historical descriptions even refer to the agro-industrial complex as one of the fundamental pre-conditions of the origin of the urbanised society (Wallerstein, 1980). Within the Northwest European Delta Metropolis there is no question of a marginalization of agriculture (Bethe et al., 1997). Development is taking place rapidly in two directions: intensification and increase of scale, on the one hand, and the development of a pluri-activity agriculture on the other (Van Eck et al., 2002b).

The main strategy can be characterised as intensification and scale increase, spurred by an increase in land prices and leading to a knowledge-intensive, highly specialized and spatially concentrated agricultural sector delivering high-quality products (Rabbinge et al., 1996). Two forms can be distinguished. In or close to the urban concentrations, the metropolitan delta at-

tracts footloose agricultural activities such as greenhouses and intensive pig and poultry production (Van Eck et al., 2002a). At some distance of the urban concentrations the agriculture is more land dependent: dairy farming or the specialised production of vegetables, seeds, bulbs etc (Van Eck et al., 1997). The metropolitan delta offers a combination of locational advantages that are determining the ongoing development of this food production chains into global networks such as (i) high levels of knowledge amongst entrepreneurs and management in agriculture itself and amongst people and firms on their periphery (financial and veterinary services, equipment, maintenance etc.), (ii) good infrastructure and logistics, (iii) direct access to huge nearby markets in the form of many (critical) consumers, (iv) a large pool of cheap labour, (v) a large supply of ancillary and by-products for waste processing and chain management, and (vi) main port function to import fodder and export goods.

The other strategy consists of the development of pluri-activity by the original landowners, combining traditional agricultural with activities that offer a supplement to their income by providing all kinds of services in demand in the rural areas. These services can take many different forms: nature management, landscape management, recreation, care services, regional products, local products sold on site etc. But there are also other options such as a second job completely separate from the running of the agrarian enterprise. A number of beautifully illustrated books cover many of these possibilities (Van Broekhuizen et al., 1997). However the economic impact and the long-term economic sustainability of these forms of pluri-activity tend to be over estimated (Smeets, 2002).

Water management in metropolitan deltas

A variety of water management related problems have always played a very important role in the metropolitan deltas. The levels of surface water in rivers and sea will rise as a consequence of climatic change and are increas-

ing the risks of large-scale flooding within the delta area, especially in the areas below sea level. Elsewhere, especially on the sandy soils, groundwater quantity is decreasing and its quality is threatened. There is consequently a need for an integrated and well-thought design of multifunctional land use in water catchment areas. The importance of water management aspects in spatial planning is expected to increase in metropolitan deltas (Kamphuis et al., 1996; Kwakernaak et al., 1998; Ministerie van VROM, 2001). Moreover, in the case of the Northwest European Metropolitan Delta that stretches across the boundaries of the Netherlands, Belgium, France and Germany this integral approach needs to be transnational. International authorities will have to be set up, based around river basins, to regulate the water systems in order to reduce the threat of flooding but also to promote the economic functions of water, namely transport, drinking water and water for industrial purposes (Ministerie V&W, 2000).

Nature conservation in metropolitan deltas

The natural variety of river deltas is the basis for relative high species richness in its natural ecosystems. Before land reallocation, use of fertilisers and draining, traditional agriculture added to the landscape variety and species richness in general. This explains the fact that in a country as the Netherlands, only covering a small part of the area of Europe a great amount of habitat types in Europe can be found. But in modern times industrialisation of agriculture, together with urbanisation, both important characteristics of the development of metropolitan deltas, have become important threats for biodiversity.

Species conservation and habitat preservation has become an important international issue embedded in international law. Increasingly, nature and landscape management will become integrated into the spatial planning process. Conservation policy now traverses frontiers in a PAN-European approach that attempts to link nature areas and habitats, to prevent the ex-

inction of species and stimulate their dispersal (Bischoff & Jongman, 1993). The general attitude towards nature conservation is changing from a defensive to an offensive one: economy and ecology are now becoming interlinked. The conservation of semi-natural (small-scale agricultural) landscapes is now considered to be the concern of all land users in the rural areas, not exclusively of the farmers and nature conservation bodies alone. The management of the rural landscape and its intrinsic natural values has also become the concern of water boards, volunteer groups and specialized landscape managers.

Conclusion: Planning of metropolitan deltas needs an integrated approach.

Metropolitan deltas belong to the most important nodes of the global network economy. The Northwest European Metropolitan Delta is the biggest urban concentration in Europe. Important developments concerning the metropolis as a whole (i.e. urban sprawl, intensification of agriculture, nature conservation and water management) are dominant in the urban fringe. The traditional distinction between urban and rural areas is no longer adequate when these characteristic development problems of metropolitan deltas are considered. And these developments show a strong mutual relation. They all compete for limited space and at the same time are part of each others preconditions. The metropolis stimulates development of agriculture that threatens biodiversity that the metropolis wants to preserve. Intensive agriculture demands water management measures that are conflicting with the needs of nature conservation or with measures aiming at preventing flooding. It follows that in the planning process of metropolitan deltas an integrated approach is needed that not only combines traditional urban and rural planning. It has to address the interconnected sectoral problems of urbanisation, water management, and agricultural development etc. at the same time. Other contributions in this book demonstrate the perspectives of such a transdisciplinary approach in landscape research as described by Tress & Tress (2001).

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