



Munich Personal RePEc Archive

# **Air, Money and Space: How Amsterdam Airport Schiphol Transformed the Region**

El Makhloufi, Abdel and Davids, Karel

VU University Amsterdam

November 2013

Online at <https://mpra.ub.uni-muenchen.de/74595/>

MPRA Paper No. 74595, posted 18 Oct 2016 11:36 UTC

# **Air, Money and Space: How Amsterdam Airport Schiphol Transformed the Region<sup>1</sup>**

Abdel El Makhloufi\*      and      Karel Davids\*\*

\*, \*\*. VU University Amsterdam, Faculty of Arts

Dept. Social & Economic History

De Boelelaan 1105, 1081 HV Amsterdam

The Netherlands

## **Abstract**

This paper explores and analyses the change in collective arrangements, such as the changing organizational structure and form of the airport, and its effects and consequences on the spatial and economic development of the airport itself and its surrounding areas at the metropolitan level. We use Schiphol airport as case study, and focus our analysis on three main analytical levels: air (development in the aviation sector), money (economic performance), and space (airport spatial expansion and urban planning). The paper shows that new collective arrangements may lead to a radical shift in the position and the power of local actors and hence on the decision making concerning the spatial and economic development of localities (in this case the Schiphol and Schiphol region) and the metropolitan regions.

JEL Code: R10, R11, R38, R40, R58, N94, O21

Keywords: urban nebula, airport development, collective arrangements, spatial and economic transformation.

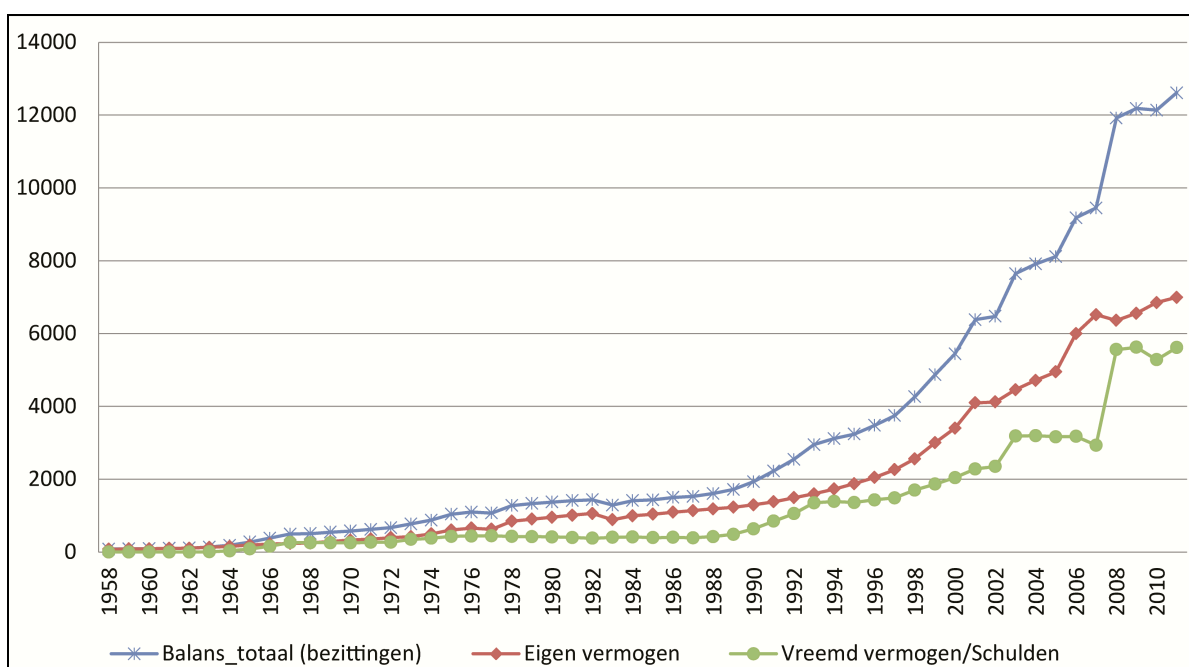
---

<sup>1</sup> This paper is published in the co-edited book titled: Megastructure Schiphol; design in spectacular simplicity. NAI Publishers, 2013. ISBN. 978-90-5662-852-9.

## A New Form of Management

The year 1957 was a decisive moment in the history of Schiphol. A new form of management was completed for the airport. On 22 January 1958 Schiphol changed from a department of the City of Amsterdam into a corporation, the 'Luchthaven Schiphol N.V.'. The Dutch state held 65 per cent of the shares in the new private limited company, Amsterdam 34 per cent and Rotterdam 1 per cent. The authorized capital of the enterprise was set at 200 million guilders, 73.5 million of which was deposited upon the company's launch. The remainder of the capital was made up in full by contributions from the state, the City of Amsterdam and the City of Rotterdam.<sup>1</sup> From the early 1960s the capital of the company was steadily increased in order to finance expansion and reconstruction plans of the airport. Increasing amounts of capital were also brought in from third parties, Amsterdam banks in particular, as shown in Graph 1. In 1966, for instance, Schiphol obtained a loan from the ABN bank for 37.75 million guilders, at an annual rate of interest of 7.25 per cent.<sup>2</sup> The ratio of shareholders' equity to external capital fell to about 1.5 to 1 in the 1970s, rose to nearly 3 to 1 in the 1980s and then declined again to a level of about 1 to 1 around 2010.

Graph 1. Overview of Amsterdam Airport Schiphol's assets, debts and shareholders' equity from 1958 to 2011.



Source: Schiphol Group Annual Reports, 1958–2009

The organizational structure of the new enterprise gave a rather significant amount of power to the board of directors. The stakeholders assigned all authority for administration and management to a board of three directors, who were also given a broad mandate to implement the expansion of the airport. The board of directors was made accountable to a supervisory board. This board had 11 members, six of whom were appointed by the minister for Transport, Public Works and Water Management, four by the City of Amsterdam and one by the City of Rotterdam. Although this structure had been proposed by Amsterdam in order to compensate for the state's overwhelming predominance among the stakeholders, this nevertheless meant the city's hold on the airport diminished. From this point on, Amsterdam was in the minority at every level. For the first time in its history, Amsterdam Airport Schiphol was able to operate relatively independently of the city. Schiphol began to behave like a private business company. At the same time, however, the unique organizational structure ensured that Schiphol enjoyed the protection of higher political and administrative powers than most ordinary business enterprises. The airport became a powerful actor at local, regional and national level, and an enclave in an economic, political, administrative and spatial sense.

The institutional transformation of the airport that took place in 1958 would have far-reaching consequences for the development of the surrounding region, as we will see below. The growth of Schiphol would contribute significantly to the development of a nebula urban structure in the Amsterdam-Schiphol region in particular, and the Randstad in general e.g. the urban conurbation of the western region of the Netherlands.<sup>3</sup>

## **Air**

Why did Amsterdam relinquish control of Schiphol? The reason was that the city was no longer able to constantly pump money into the airport in order to keep pace with the rapid developments in aircraft technology and civil aviation after the Second World War. The transition from propellers to jet engines, the advent of

larger aircraft, declining ticket prices and the expansion of passenger and cargo traffic activities that accompanied these revolutionary changes<sup>4</sup> meant huge investments had to be made to increase the capacity of the airport -Longer and sturdier runways, larger aprons, more spacious terminal facilities –, Amsterdam simply no longer had the means to pay for all that. And after all the government had acknowledged the national significance of Schiphol in 1945 by designating it as the ‘world airport’ of the Netherlands.

A subsequent round of airport reconstruction and expansion was sparked by an institutional revolution in the airline industry that began in the late 1970s. Air travel was increasingly turned over to the free market forces e.g. liberalisation and deregulation of the air market. The expectation was that growing competition would lead to a drastic decrease in ticket prices. Liberalization and deregulation began in the domestic market of the United States, subsequently expanded to transatlantic routes and finally extended to air travel market within Europe as well.<sup>5</sup>

Airlines were now able to select their routes based on market conditions. As a result, the idea of hubing became popular, seen as the most efficient way of interconnecting different air networks of far-flung destinations (e.g. spokes). Airports seized on the hub-and-spokes concept to establish a secure position in a market that displayed growing instability and uncertainty. Given the fact that not every route could turn a profit, airports that aimed to become hubs strived to schedule arriving and departing flights at peak times in as precise accordance as possible with one another, so that connections could take place quickly. Successful hubs were able to attract more traffic and reinforce their market position .<sup>6</sup> Such a strategy was more likely to succeed if an airport had sufficient additional space/land to expand.

From the mid-1980s, the ‘N.V. Luchthaven Schiphol’ also adopted the hub-and-spokes concept as the basis for its operational policy. Schiphol aimed to become a ‘mainport’: a hub on the level of Frankfurt, Paris or London, not one in the Zaventem or Dusseldorf category. The mainport strategy outlined by the company dovetailed perfectly– and not coincidentally – with the government’s stated ambitions to turn the Netherlands into Europe’s ideal ‘distribution land’. Surely Dutch Distribution Land could not do without a first-class hub for air traffic?

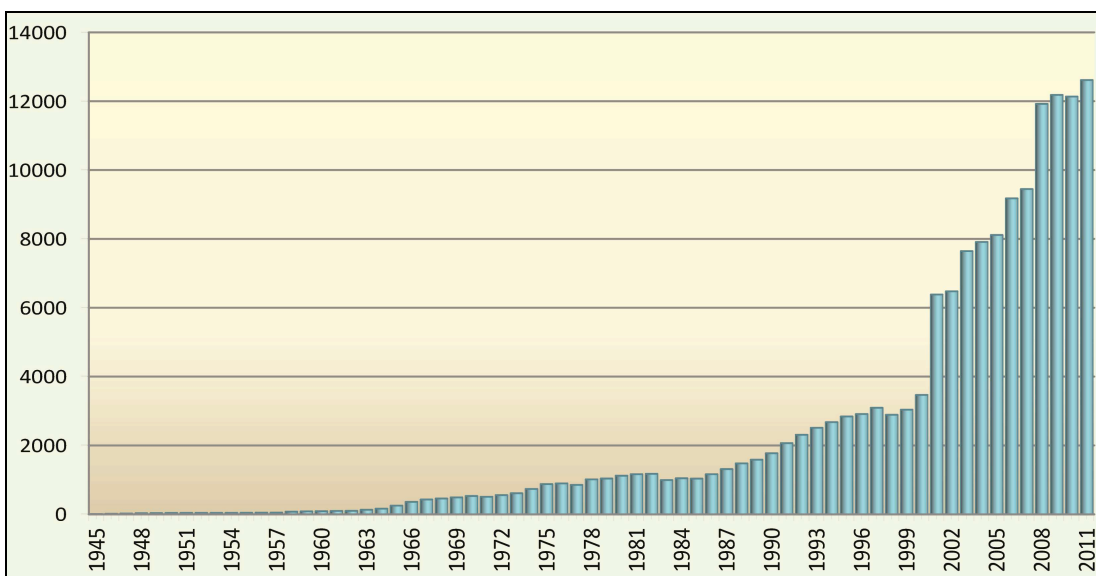
Implementing the mainport strategy not only meant that facilities for accommodating aircraft had to be significantly expanded, but also that the size and

scope of airport facilities and landside activities had to be significantly expanded. The airport would have to be designed as the world's best 'transfer-friendly' configuration in order to ensure that passengers could walk easily from one gate to another and that larger quantities of transfer baggage could as quickly as possible be processed. Runways and aprons, as well as support services like baggage handling and terminals, had to be designed to handle much higher numbers of airplanes and passengers at peak hours than before.

## Money

Since the institutionalisation as a national airport Schiphol has expanded and renewed itself in waves. Graph 2 shows how its non-current assets increased: more than doubling in the latter half of the 1960s and again at the end of the 1970s and, after a period of relative stagnation in the 1980s, doubling again in the mid-1990s and in the first decade of the twenty-first century. The inauguration of the new airport in 1967 was merely a first phase in an expansion that unfolded in leaps and bounds. Each time there was investment on a massive scale in runways, taxiways, aprons, roads, equipment, terminals and other buildings.

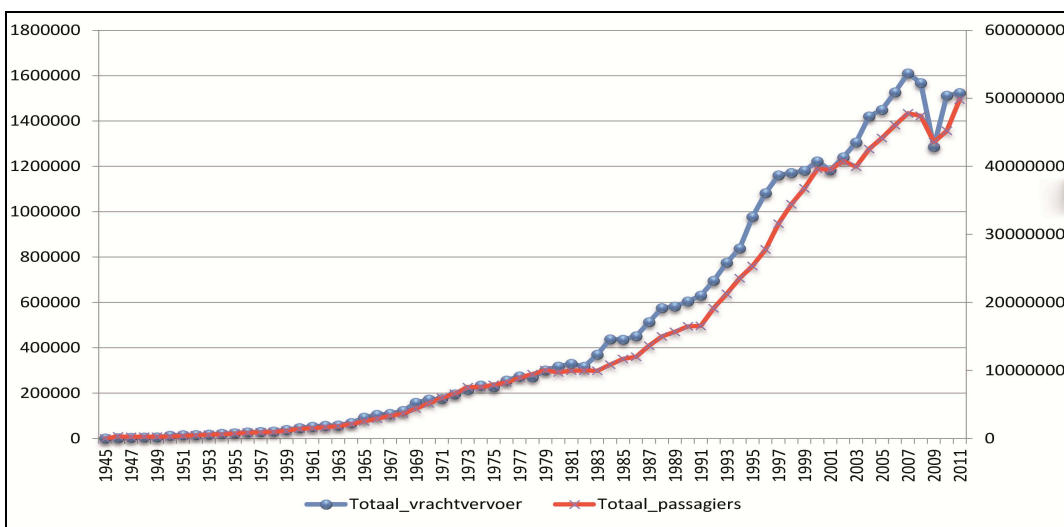
Graph 2. Growth of current assets of Amsterdam Airport Schiphol from 1945 to 2011.



Source: Schiphol Group Annual Reports, 1945–2011

These investments, of course, were partly related to air traffic. However, other factors, such as technological innovations in the aeronautic sector, increasing welfare, disposable incomes en free time, the democratization of the air transport market and increase in international trade, played key role in explaining the significant increasing demand for air transport (passengers and cargo), and consequently the fast increase in air traffic (see Graph 3).

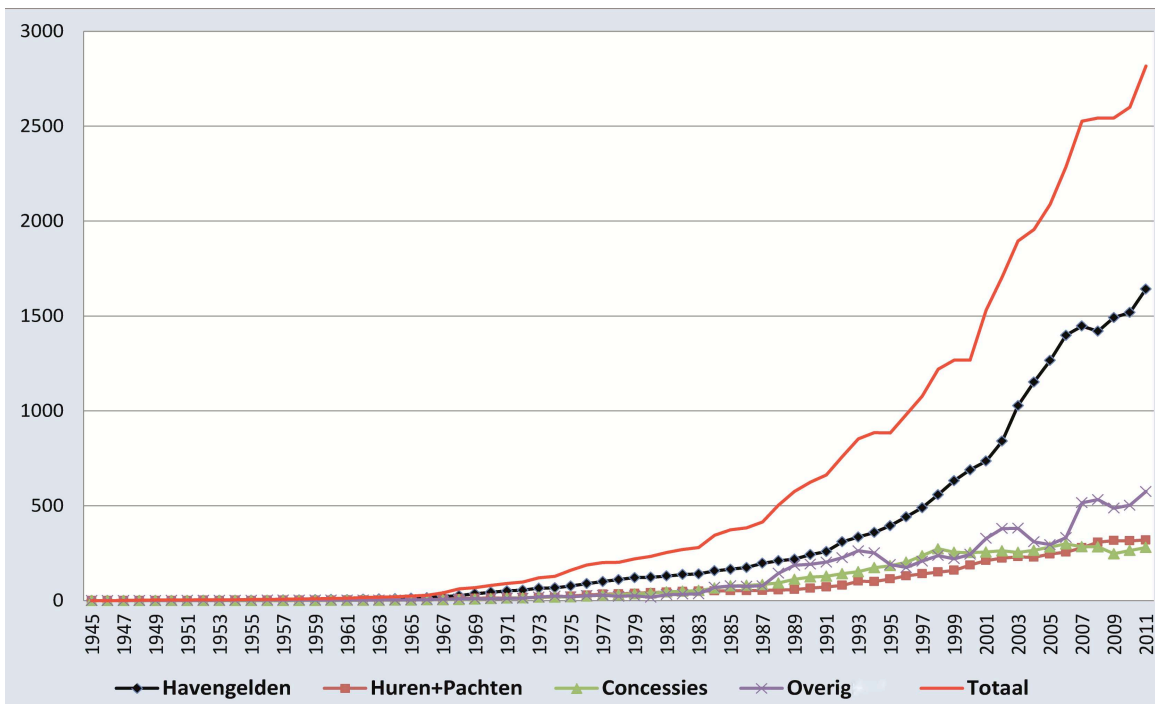
Graph 3. Passengers (right axis) and cargo transport figures (left axis) on regular and irregular flights out of Schiphol between 1945 and 2011.



Source: Schiphol Group Annual Reports, 1945–2011

This development also generated enormous income for the airport. Revenues from airport dues (landing and parking rights, compensation for passenger accommodations and the like, which the airport levied on its flying clients) increased significantly with every phase of Schiphol's expansion and renovation and remain the biggest single source of income for the company (Graph 4).

Graph 4. Amsterdam Airport Schiphol revenue from various sources of income between 1945 and 2011 (in million guilders).



Source: Schiphol Group Annual Reports, 1945–2011

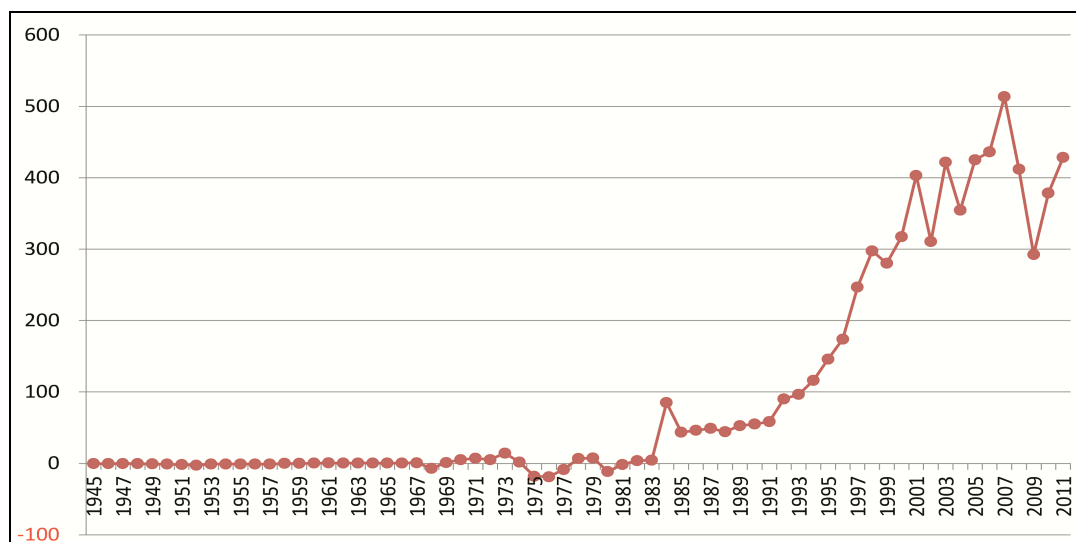
From the 1950s on, however, Schiphol evolved into much more than a transfer airport in international air-networks/or international flight routes. In addition to the airside, landside activities became increasingly significant to the operations of the airport, and as additional source of revenues. Although admission fees for visitors (which around 1957 still generated about the same revenue as airport fees for aircrafts) were abolished in 1971, but other sources of revenue began to generate more and more income to the airport. The first duty-free shops were opened in 1957. KLM obtained concessions to sell tobacco, liquor and chocolate; Amsterdam businesses were allowed to sell cameras, watches and perfume at Schiphol. After 1980, retail concessions grew into the airport's second-highest source of revenues. The selection on offer became more and more diverse. Alongside duty-free shops, numerous other businesses made their appearance at the airport, in an effort to respond to the boundless spending appetite of travellers and visitors – from shops, cafés and restaurants to banks, hotels, casino, sauna, museum, entertainment venues and car hire companies. The third major source of revenue, after airport fees and concessions, was rents and leases. Prior to the 1980s and again around 2010, renting and leasing land, offices, and the like generated more income for Schiphol than retail concessions (see Graph 4). Flying, consumer operations and real estate were fused at the end of the twentieth century into a new concept with which



Schiphol established a market presence beyond the Netherlands as well: the AirportCity. The AirportCity, in the Schiphol Group website's honeyed words in 2011, was 'a dynamic environment integrating and enhancing people and businesses, logistics and shopping, information and entertainment. This efficient, multi-modal hub for air, rail and road transport is a seamless link in the travel process that provides visitors a unique experience.'<sup>6</sup>

The growth in airside as well as landside revenues more than compensated for the cessation of Amsterdam subsidies after 1957. Within a very short time, Schiphol was not just able to support itself for the first time in its history: from 1970 on (except for the period around 1980) it reported spectacular profits year after year. Graph 5 illustrates this evolution.

Graph 5. Amsterdam Airport Schiphol net results from 1945 to 2011 (in millions of guilders).

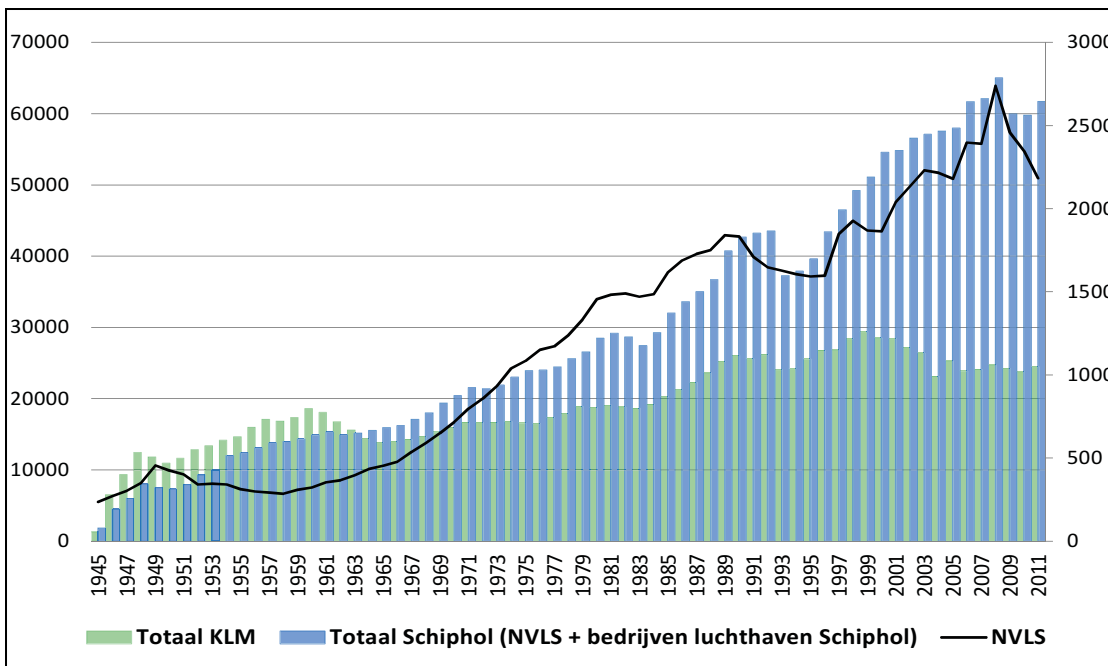


Source: Schiphol Group Annual Reports, 1945–2011

The expansion of airside and landside activities also meant a massive increase in jobs. Schiphol became one of the fastest-growing employment centres in the Netherlands. Graph 6 shows how employment developed at the airport as a whole, at the airport operator itself (the N.V. Luchthaven Schiphol) and at the main airline based at Schiphol, KLM. The total number of businesses at Schiphol grew from 250 in 1967, when the new airport had just been opened, about 370 in 1980, 420 in 1990 and 508 in 2000 to nearly 600 in 2010 (Graph 7). Total employment at the airport over the last year was almost four times that of half a century earlier. In 1957,

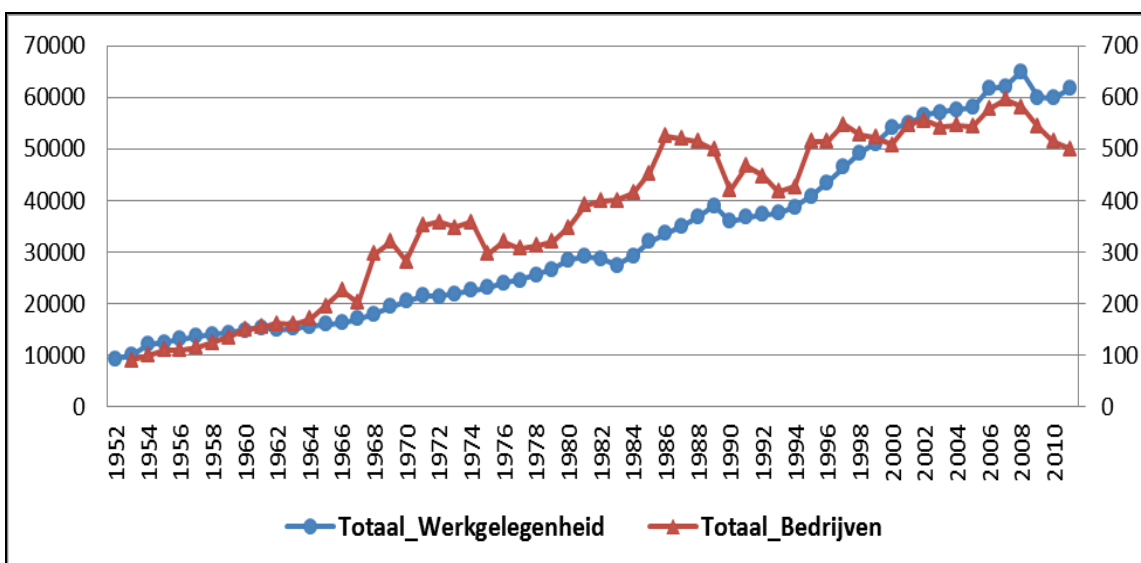
14,000 people worked at Schiphol; they numbered 18,000 in 1968, 28,500 in 1980, 42,600 in 1990, 54,500 in 2000 and more than 60,000 in 2010.

Graph 6. Employment growth at Amsterdam Airport Schiphol itself and in the vicinity of the airport from 1945 to 2011 (left: Amsterdam Airport Schiphol as a whole; right: Schiphol itself).



Source: KLM and Schiphol Group Annual Reports, 1945–2011

Graph 7. Employment growth (left axis) and total number of businesses (right axis) at Amsterdam Airport Schiphol from 1952 to 2011.



Source: Schiphol Group Annual Reports, 1952–2011

Within the airport, the greatest employment growth was not at KLM or the airport operator itself, but at the other enterprises at and around the airport. While employment at KLM and the N.V. Luchthaven Schiphol grew by 28.6 and 64.2 per cent, respectively, between 1980 and 2007, employment at Schiphol as a whole grew by no less than 118 per cent during this period. After 1980, employment at Schiphol expanded much faster than in the Amsterdam region or in the Netherlands as a whole. The balance between the airport and the region began to shift. As a business location and an employment centre, Schiphol began to play a leading role in the development of the region as a whole.

Studies from the early years of the twenty-first century showed that the growth of Schiphol generated many extra jobs outside the airport due to both ‘forward’ and ‘backward’ effects.<sup>7</sup> A significant ‘forward’ effect, for example, was the additional employment for travel agencies and tour operators. On this side, Schiphol indirectly produced an estimated 14,900 to 19,700 jobs in 2001. In that same year, the airport indirectly produced another 27,800 to 32,500 jobs ‘backwards’. That side consisted mainly of employment in transport and shipping companies, cleaning services, security firms, temporary-employment agencies and hotel and catering businesses. About half of all these ‘backward’ effects benefited the regions IJmond and Zaanstreek and the agglomerations of Haarlem and Amsterdam. About 78 per cent of the employment created by these ‘backward’ indirect effects of Schiphol was in the provinces of North and South Holland (e.g. the Randstad), Utrecht and Flevoland.

## **Space**

The more the airport expanded and renovated, the more it made an impact on the space around it. To begin with, this naturally took place because the surface area of the airport expanded significantly. Schiphol swallowed hundreds of hectares of land, particularly between 1957 and 1990, as Table 1 shows.

Table 1. Total area of Amsterdam Airport Schiphol from 1920 to 2011 (in hectares).

1920	1938	1957	1965	1968	1980	1990	1995	2000	2005	2011
76	210	700	1250	1480	1700	2000	2400	2678	2787	2787

Source: Schiphol Group Annual Reports, 1920–2011

The spatial effects of Schiphol's spatial expansion, however, reached far beyond the airport's fences. The airport emerged as a large-scale landowner, a project developer and a unique regional economic centre with exceptional opportunities for shaping and influencing the spatial environment in the Randstad and beyond. This transformation accelerated when the airport switched to a mainport strategy in the late 1980s. Schiphol endeavored to attract more and more firms and businesses by presenting itself as an appealing business location as well. The more businesses would set up premises at or near the airport, the more the airport would grow into a vital multi-modal and hub in air and ground transportation. In other words, Schiphol went into project development and real estate. And once again higher political and administrative powers provided the necessary backing. This was not surprising, however, because the applied spatial policies by the state and regional governments were focused on containing (and controlling) the unplanned spatial development around the airport Schiphol area. The involvement of the central and regional governments, through the application of land use policy and direct investments, would provide them not only with effective instruments to guide the spatial and economic policies, but also in making profits from investments in land and real estate activities.

1987 saw the advent of the Schiphol Area Development Company (SADC), whose objective was to acquire, develop, operate and allocate land for new commercial premises near and around the airport Schiphol area. One quarter of SADC's stock was held by the Airport Schiphol Company (Luchthaven Schiphol N.V.), another quarter by the National Investment Bank, and the rest was equally distributed among the Province of North Holland and the Cities of Amsterdam and Haarlemmermeer. The Province of North Holland provided an administrative umbrella through a new regional plan for the Amsterdam-North Sea Canal area. A large area in the Haarlemmermeer around Schiphol was designated as commercial property to contribute to the expansion policy of the national government, the province and the airport.<sup>8</sup>

The SADC set to work energetically. From the late 1980s onward, it developed extensive commercial estates in quick succession, not just on the fringes of the airport (such as at Schiphol-East), but also further away, on the north side of Hoofddorp, near Aalsmeer, Zwanenburg, Haarlem and in the western districts of Amsterdam, where offices and warehouses for international corporations like Canon, Yamaha, Mitsubishi, Hugo Boss, Unisys, UPC, BAT, KLM and Microsoft and all manner of small and medium-sized companies were built. Office construction underwent explosive growth. Two out of three office buildings currently standing in the Haarlemmermeer were built after 1990.

Project development generated real estate investment. In the late 1990s, the airport created the Schiphol Real Estate company (SRE), which focused on developing, managing and investing in commercial real estate. This activity, however, was not strictly linked to the Schiphol location. The SRE was also seen as an instrument to transplant the Airport City concept elsewhere. The lion's share of the portfolio the SRE has accumulated consisted of investments in office and commercial space at and around Schiphol itself, but it also acquired interests in real estates at airports elsewhere in the Netherlands and abroad. In 2007, 4 per cent of the SRE's portfolio was invested in office and commercial space at Rotterdam and Eindhoven airports and 6 per cent in space at Milan's Malpensa Airport.

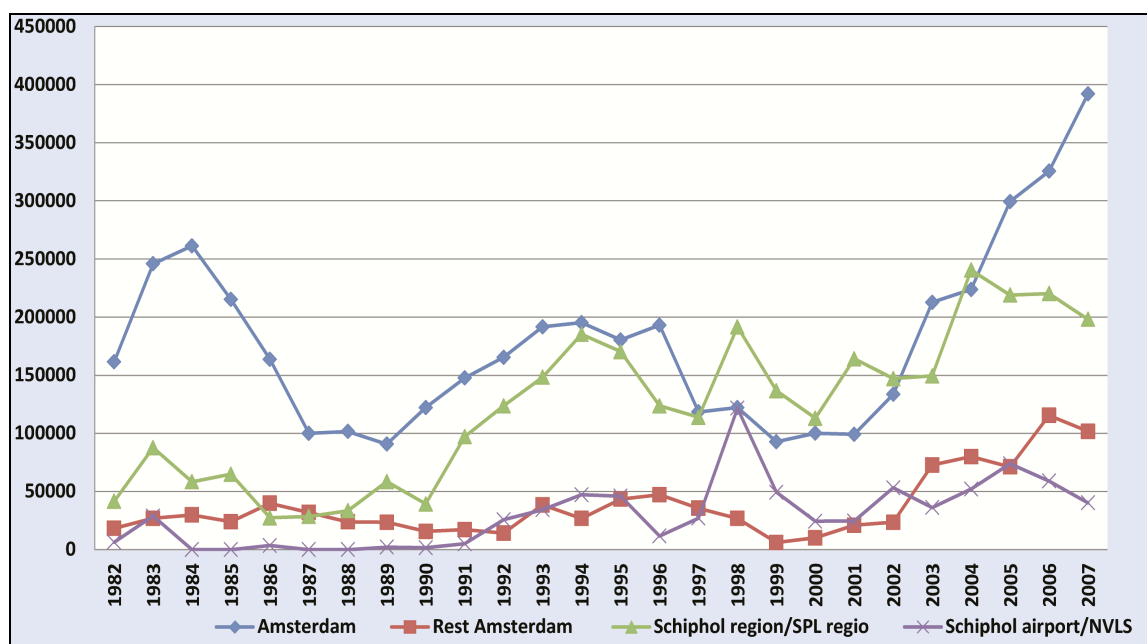
Through this kind of activities in project development and real estate investment, Schiphol succeeded in attracting more and more international companies to the Amsterdam area. The total number of international enterprises with offices in the Randstad increased from over 40 in 1986 to 550 in 1997 and 650 in 2002. Of all foreign companies with offices in the Netherlands at the start of the twenty-first century, one out of five was located in the vicinity of Schiphol, one out of 10 elsewhere in the Haarlemmermeer and a little less than 10 per cent in Amsterdam. Schiphol became a particularly favoured location for European headquarters and distribution centres for businesses in the high-tech and electronics sectors, the pharmaceutical industry, biotechnology, chemical products, machines, fashion and clothing and durable consumer goods. Nearly half of all Japanese companies in the Netherlands were located around Schiphol at that time, nearly a quarter in the rest of the Haarlemmermeer and a little more than 16 per cent in Amsterdam. For companies from other Asian countries, the percentages were 24, 15 and 8 per cent, respectively, and for those from the United States 26, 13

and 11 per cent. Nearly 22 per cent of British companies were located in the Schiphol area and another 11 per cent in Amsterdam.<sup>9</sup>

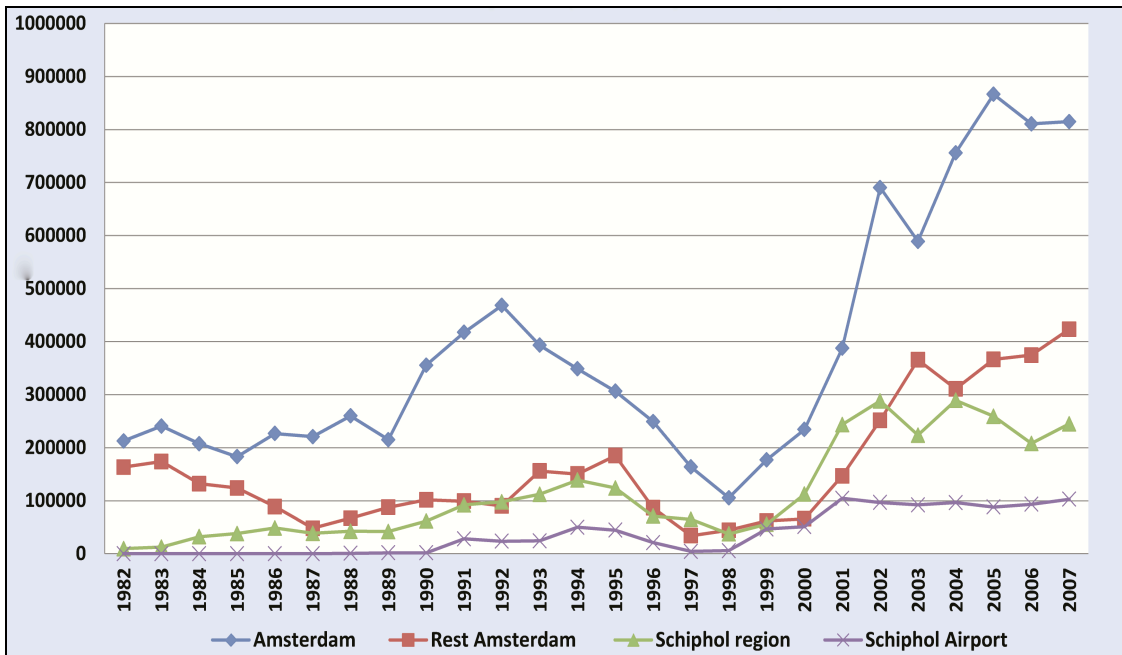
Graph 8 shows how the supply of commercial property and office space developed in this area starting in the 1980s and how attractive Schiphol and its environs became as a business location. Although the supply of commercial estates in and around Schiphol increased significantly after 1990, followed a few years later by a huge growth in the supply of office space, the rental price of space at this location went up nonetheless (with the exception of that of office space after 2002) and remained at a higher level than at other locations in the area. The rise in rental price was partly due to the rise in land prices: land in these areas was after a scarce commodity. But there was more to it. Businesses were apparently willing to pay more to rent a piece of commercial property or a square metre of office space near the airport than to rent an equivalent space in Amsterdam, Hoofddorp, Nieuw-Vennep or Haarlem. Schiphol and its environs, at the beginning of the twenty-first century, enjoyed the status of a ‘top location’ for businesses.

Graph 8. Completion/supply (a, b) and rental prices (c, d) of offices and commercial estates at Amsterdam Airport Schiphol and in the Amsterdam-Schiphol region from 1982 to 2007 (open market; commercial estates >750 m<sup>2</sup> and offices > 500 m<sup>2</sup>).

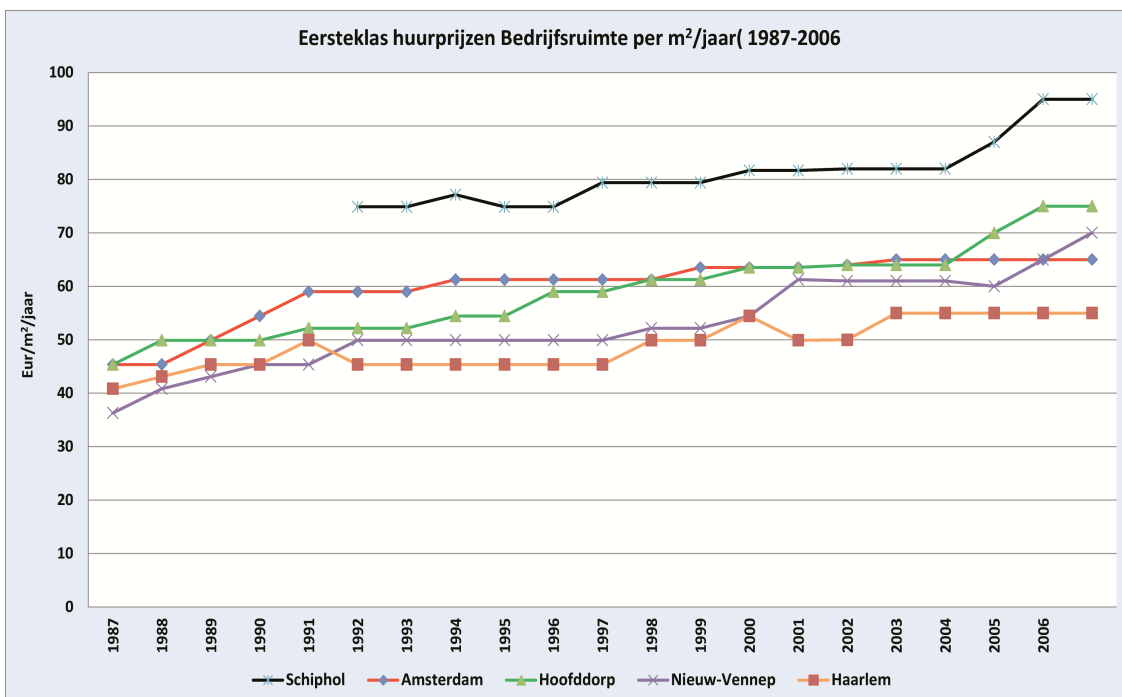
(8a)



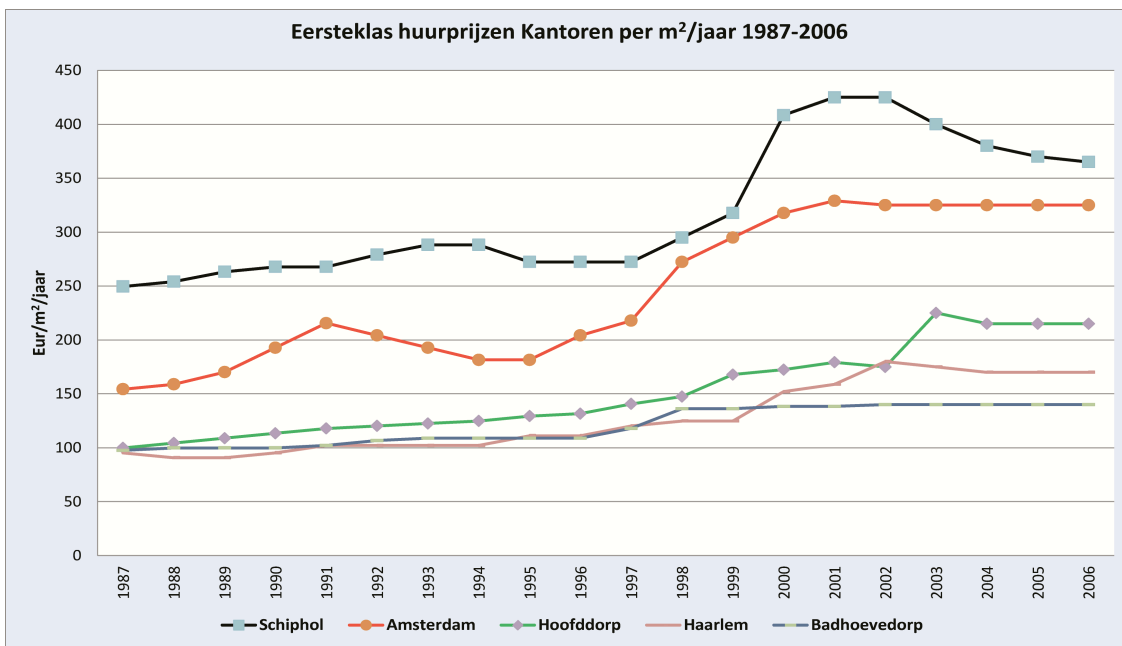
(8b)



(8c)



(8d)



Source: DTZ Zadelhoff Research 2008

The impact of Schiphol on space in the greater surrounding area increased on another level as well. The enterprise's shadow expanded not only across the land, but in the air, too. In addition to the airport's surface and the growth of project development and real estate activities, changes in air traffic also made the airport an increasingly determining factor in the region's development.

The years 1956-1958 marked a watershed in this regard as well, for then the national airport adopted not only a new form of management but also an ambitious expansion plan for an airport on a new location, designed by a commission led by Schiphol director Jan Dellaert. The basic idea of this 'Dellaert Plan' was the of tangential plan, the advantage of which would be that the airport would not only be able to operate in all kinds of weather conditions but would also be able to respond to future developments in air travel. When aircraft numbers increased, or when different types of aircraft were introduced, another runway could simply be built in a different direction, or with a different length. The safety risks involved in such a tangential pattern were considered par for the course.<sup>10</sup> The adoption of the Dellaert Plan laid the framework for Schiphol's spatial expansion for many years. Although the original plan was partly revised in the 1960s, the core elements of the design were retained by planners and Schiphol management. The decision to adopt the tangential plan as the basis for the future expansion of Schiphol proved to have a



path-dependent effect, in the sense that once the choice was made the actors involved continued to think and act, consciously or not, within the parameters of the design.

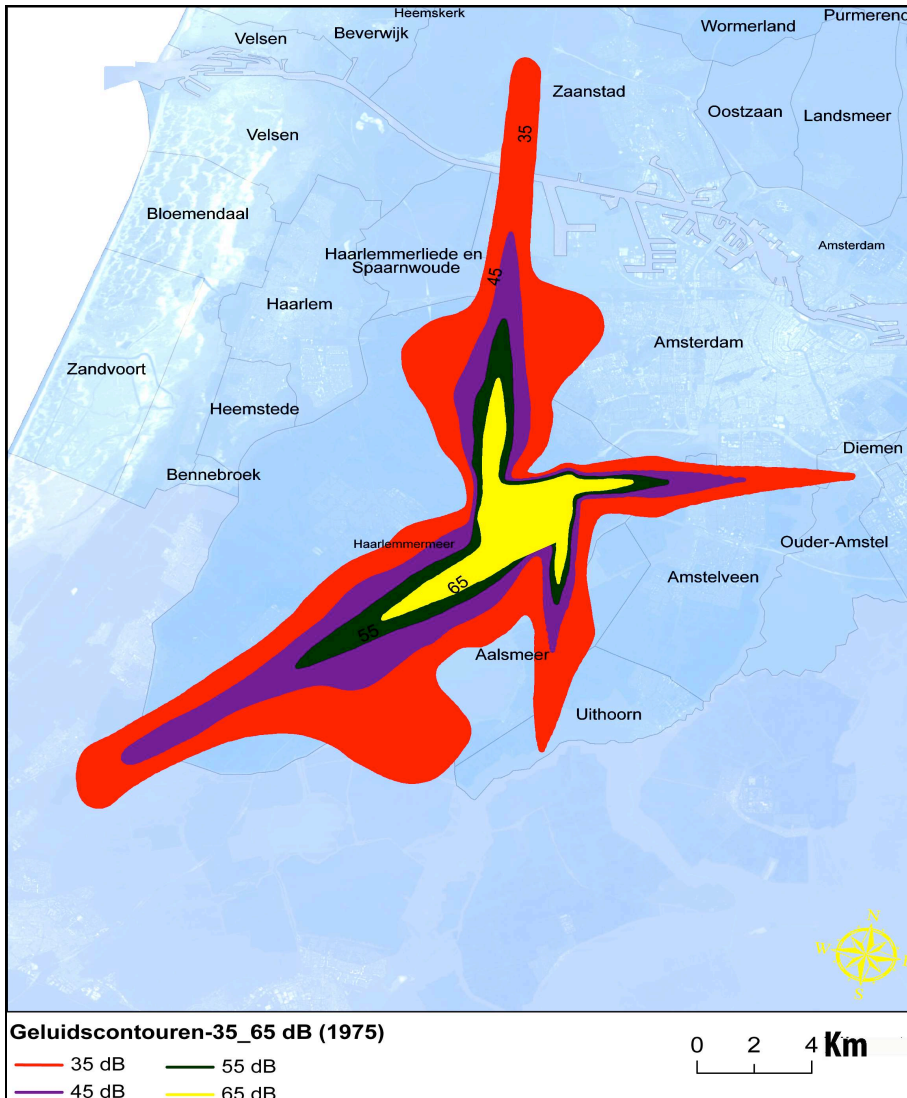
They also continued to do so when noise pollution became an urgent problem. Airplanes make a lot of noise – many of the people involved, experts or not, were aware of this in the 1950s too. Yet in the spatial planning of the time by the municipalities around Schiphol, the potential rise of noise nuisance and air pollution of Schiphol was either more or less ignored or dismissed as an unimportant issue. Amsterdam, the municipalities of Amstelveen and the Haarlemmermeer had planned new residential areas without taking Schiphol's growth and the airport spatial expansion plans into account. As results, conflicts between airport and its surrounding municipalities began to rise. Long discussions between airport authorities and local and regional government parties took place to take concrete measure to limit the growth of Schiphol and to take into account the possibility to delocalise the airport activities elsewhere. When the regional and local authorities did not succeed to agree about the issue of the spatial expansion and growth of Schiphol airport, the Dutch government decided –as compromise- then to apply new rules that regulate the levels of noise nuisance around the airport and its surrounding areas.

In addition, the Dutch government integrated the airport's spatial planning into national spatial planning – the idea being that this would make it possible to keep the negative effects of growth under control and simultaneously provide Schiphol the opportunity to expand within certain limits. On the one hand, aircrafts would have to be made 'quieter' and on the other hand construction would have to be planned so that as few people as possible would be inconvenienced by air traffic. In order to define the margins of liveability around Schiphol, 'noise contours' were introduced as an instrument: lines on the map indicating the (calculated) aircraft 'noise exposure' for a given area (see Map 1).<sup>11</sup>

Noise contours and regulations on 'acceptable' noise and liveability were revised more than once in keeping with the evolution of aviation technology. In 1990, for example, Schiphol and the Netherlands Aviation Authority set up a new system for measuring aircraft noise around the airport (NOMOS). The state then issued a new guideline indicating the zones in which no large-scale construction would be allowed to take place, due to excessive noise nuisance. In 2004, within the

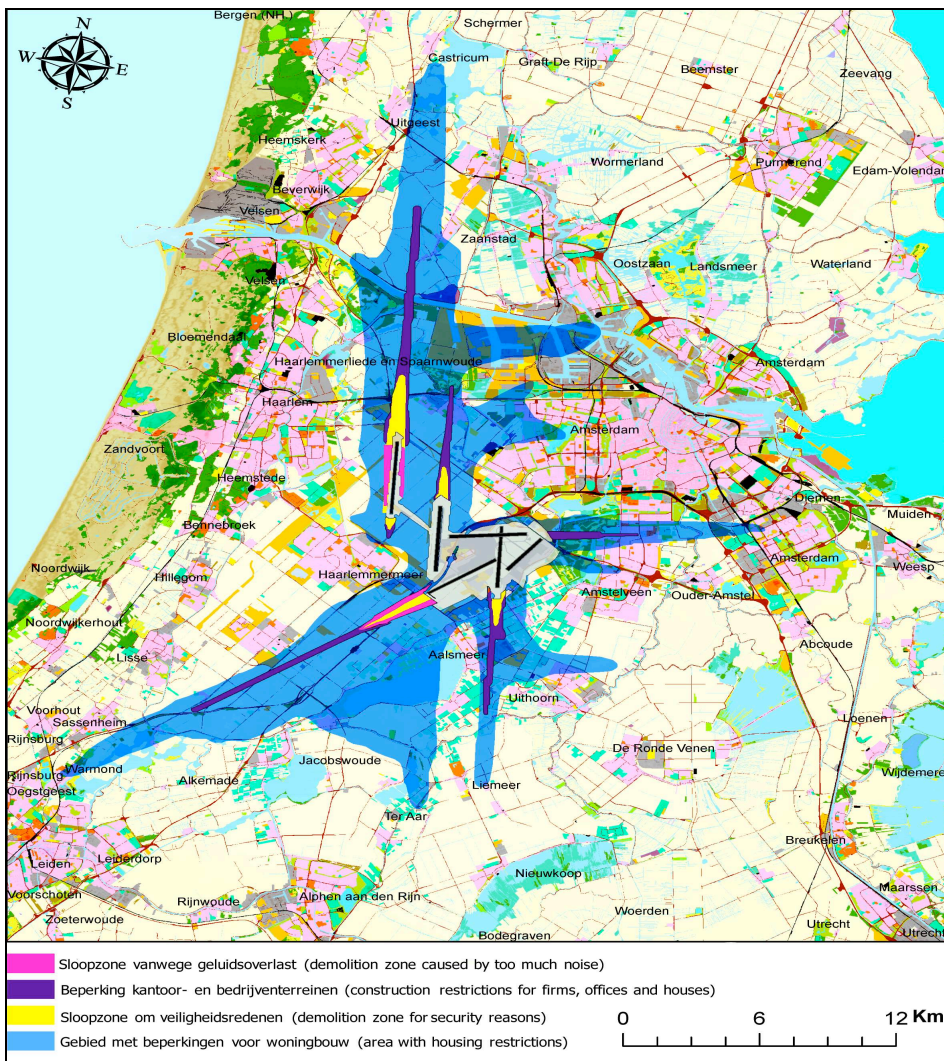
framework of a new Aviation Act, decisions were again enacted setting maximum limits for noise and air pollution in and above Schiphol, codified the use of land around the airport and defined in which areas construction was prohibited due to noise nuisance and/or other environmental considerations.<sup>12</sup>

Map 1. Noise contours (35 decibels, 45 dB, 55 dB and 65 dB) around Schiphol, 1975.



Source: El Makhoulfi 2009 (computation based on Schiphol Group Annual Reports)

Map 2. Noise contours and restrictions on construction around Schiphol, 2004.



Source: El Makhloufi 2009 (computation based on ‘Schiphol en u: de regels’ (‘Schiphol and You: The Rules’)), Dutch Ministry of Transport, Public Works and Water Management).

So at the end of the twentieth century, Schiphol was creating more and more employment; at the same time, it was creating obstacles to housing construction in many locations. Available space for housing in the region decreased as a result of increased regulation related to the airport’s nuisance levels (Map 2). The ‘sky’ provided a direction for developments on the ‘ground’. And on the ground, starting in the 1980s, the airport was steadily transforming into an independent, dynamic factor in spatial planning. Because of its function as a hub in national and international transport networks, Schiphol became an economic centre, an ‘airport city’ in itself, which generated its own agglomeration effects and competed with established urban centres on a regional level. Schiphol increasingly resembled a

typical downtown centre: uninhabited, but bustling with activities. Economically and morphologically, the weight of the airport in relation to urban centres in the area, Amsterdam included, was constantly increasing.

This change in the relationship of the Schiphol airport city with other urban centres in the area corresponded with a shift in the regional spatial pattern from a monocentric, hierarchical urban system to a more polynuclear urban system – in other words, a system of urban networks. Over time, Schiphol acquired an increasingly central position, in economic and spatial terms, in the new, emerging urban system, in which qualities such as proximity, accessibility and connectivity became the leading forces stimulating economic growth and employment. The importance of Schiphol for the Dutch economy as a whole and that of the region around Amsterdam in particular increased substantially. And the more attractive Schiphol became, thanks to its hub function and as location for national and international companies, the more demand for office space and commercial estates also increased, as well as housing space for the tens of thousands of people who found work at or around the airport.<sup>13</sup> No single actor – not the national nor the regional government – was able to influence (directly or indirectly) the dynamics of the spatial development of the airport Schiphol. This is because the introduction of the new organization form of the international airport of the Netherlands, provided Schiphol with the needed instruments to become a powerful actor in the region and at the national level. Consequently, spatial urban sprawl was not taking place only from the agglomeration of Amsterdam towards its surrounding areas, but also from the airport Schiphol regions towards these surrounding areas of the agglomeration of Amsterdam. The sub-urban areas between the agglomeration of Amsterdam and the Schiphol region were filled by an increasing number of industrial parks, office locations and residential areas. So, the airport Schiphol has played an important role in the emergence of the so-called ‘nebula city’ during the 20<sup>th</sup> century development of the metropolitan region Amsterdam.

## Literature

- 1 Marc Dierikx and Bram Bouwens, *Building Castles of the Air: Schiphol Amsterdam and the Development of Airport Infrastructure in Europe, 1916–1996*, The Hague 1997, pp. 177-190; Schiphol Group Annual Report, 1957.
- 2 Amsterdam City Archives (ACA), access no. 1323, and ACA, access no. 5183, nos. 1482-1493; nos. 1514-1548; nos. 1482-1492; nos. 2913; nos. 2163, 2164, 2165.
3. Koos Bosma and Abdel El Makhoulfi, 'De ruimtelijke metamorfose van Schiphol. Van polderdorp naar nevelstad', in: Ed Taverne e.a. (eds.), *Nederland stedenland. Continuïteit en vernieuwing*, Rotterdam 2012, pp. 124-137.
- 3 Dierikx and Bouwens (1957), op. cit., pp. 114-124.
- 4 Dierikx and Bouwens (1957), op. cit., pp. 228-231.
- 5 [Guillaume Burghouwt, \*Airline Network Development in Europe and Its Implications for Airport Planning\*, dissertation, University of Amsterdam 2005;](#)  
[Alistair Gordon, \*Naked Airport: A Cultural History of the World's Most Revolutionary Structure\*, Chicago 2004.](#)
- 6 <http://www.schiphol.nl/SchipholGroup/Company1/Strategy/AirportCityConcept.htm>  
(English text retrieved 25 January 2012)
- 7 Peter Louter, 'Maatschappelijke waarde analyse Mainport Schiphol, Bureau Louter', report no. 04026, Delft 2005;  
[Jacco Hakfoort, Tom Poot and Piet Rietveld, 'The Regional Economic Impact of an Airport: The Case of Amsterdam Schiphol Airport', \*Regional Studies\*, Vol. 35.7 \(2001\), pp. 595-604;](#)  
Nyfer, *Hub, of spokestad? Regionaal-economische effecten van luchthavens*, Breukelen 2000, <http://www.nyfer.nl>.
- 8 Dierikx and Bouwens (1957), op. cit., pp. 401, 410.
- 9 [Abdel El Makhoulfi, \*Spatial-Economic Metamorphosis of a Nebula City: Schiphol and Schiphol Region during the 20th Century\*, Routledge, December 2012;](#)  
NDL/BCI, *Van EDC naar ELC*, The Hague 2001, p. 19;  
[Pim Warffemius, 'Modeling the Clustering of Distribution Centers around Amsterdam Airport Schiphol: Location endowments, economies of agglomeration, locked-in logistics and policy implications', \*TRAIL Thesis Series\*, 2007, T2007/9.](#)
- 10 Dierikx and Bouwens (1957), op. cit., pp. 159/163, 174.
- 11 El Makhoulfi, op. cit., Chapter 6.

12 El Makhloufi, op. cit., Chapter 6 and Chapter 8.

13 El Makhloufi, op. cit., Chapters 6, 7 and 8.