# **Landing airports.** Analysing the transformation of airport areas

*Abstract: Airport areas; the place by excellence where economic global forces need local implementation. Reflecting on the impacts of aviation has led to a better understanding of the role of aviation, its regional impact. However, impact tells but part of the story. Current developments in hub airport areas invite to reason along the lines of interaction. To fully grasp its dynamics we need to enquire into the processes that underlie territorial change.*

## Introduction

Airport areas; the place by excellence where economic global forces need local implementation. Reflecting on the impacts of aviation, as we have been doing over the past decades, has led to a better understanding of some fundamental issues concerning the role of aviation. A wide variety of studies is out there ranging from analyses of the aviation regime and network to environmental, economic and urban studies (Cattan & Grasland, 1996; Van De Vijver et al. 2014; InterVISTAS, 2015; IPPR, 2001; York Consulting, 1998 & 2000). Almost all are based on the presumption that the air industry acts as backbone of the global transport structure, generating effects that 'irrigate' the surrounding areas.

The mature European hub-airports, on which I focus here, tell the story of an historic evolution in air traffic growth and, even more important of air connectivity. Air traffic growth rates are a few percent points above GDP growth rate, at least that has been our experience since the 1970s (OECD, 1997). All positive and negative spin-offs effects of this growth consequently need to be accommodated.

In short, we have a simple but wicked challenge. However, it is a challenge that seems to leave us with a false equation: it presumes that the benefits of the globalised aviation industry (bringing mobility, accessibility and economic wealth) trade off versus local hazards and negative spill-overs (such as noise, pollution and the reserves in land necessary to accommodate the infrastructure). It is fair to argue that this view is too simplistic.

Despite the fact that the past decades of reflection on impact provided us with refined economic impact models, planning vistas, business and governance strategies, we fall short in understanding the real life dynamics that underpin the territorial developments. Rather than assuming all change is due to impact, I argue that change is increasingly due to interaction. The airport area is an interface. Exactly here, literally at the place where the global trends and the local context interact, we still have a gap in our knowledge.

At the core of our unease is the undeniable reality that large European airports are not located in empty, available areas (like deserts) where air traffic driven development models simply can be implemented or adapted. This issue is not just a question of finding adequate accommodation of air traffic within an optimum regulatory framework for local land-use.

Are airport areas developing as exogenous industrial complexes, perhaps potentially at risk of becoming the next industrial brown fields? Or are they locally anchored spatial systems, the promising vibrant centres of the future? It seems worthwhile to broaden our perspective and pay more attention to the interface; the changing airport area. Similar infrastructure facilities evolve into varied airport areas, each experiencing and experimenting with the interaction of global aviation and local territories. Tracking the evolution of these interface areas in a comparable manner has the potential to contribute to a better understanding of the territorial dynamics as well as hinting at future development paths.

## Three reasons to think about impact (before tackling interaction)

Thinking about impact has given us valuable insights; I group the acquired knowledge in three sets, providing three reasons not to disregard the insights that these lines of thought have brought us. Firstly

there is the set of studies that focus on the aviation regime itself. Secondly those that enquire into the relation between aviation and economic growth and thirdly the regional planning models, building on the economic potential of airports.

To start with the aviation regime, when in 1909 Louis Blériot flew for the first time across the English Channel, the long debate on the right of aircrafts to access airspace of another state was launched (Budd, 2014). National claims on land and adjoining seas had been common since Roman times, national airspace was a new concept. This culminated in an intricate system of bilateral and multilateral agreements, characterising the civil aviation sector as a series of local monopolies connected by a set of equally protected international routes (Kasper, 1988).

Certainly, civil aviation is going through a phase of deregulation and privatisation, hybridisation of ownership, proliferation of transnational partnership alliances, the transformation of public companies into private enterprises; in short similar processes that other globalised industries are experiencing. However, up to this day, the existence of these regulations creates a major discontinuity in the geographical surface over which air traffic services operate.

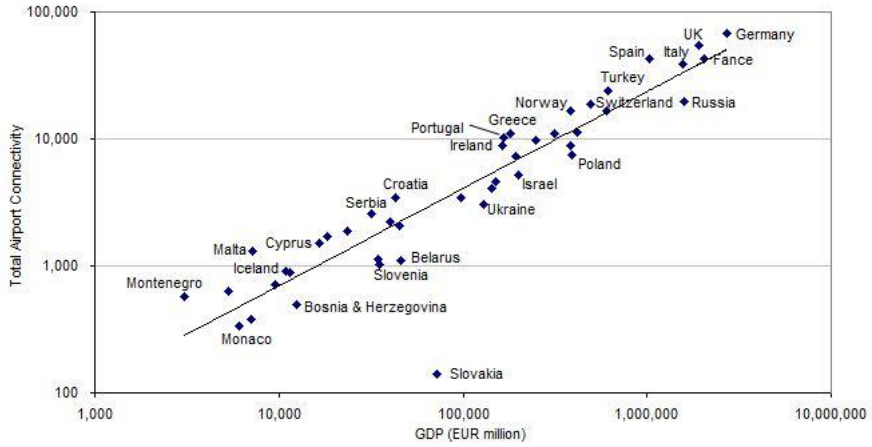
The deregulation process for aviation was initiated in Europe by the introduction of the three regulation packages (1987, 1990, 1992) and formalised by the Open Skies agreement in 1997, applying for the air space within the European Union.[i] This paved the way for the hub-strategies of airlines re-organising their network in feeder flights to hub airports out of which international destinations can be reached. Commonly there is a high degree of dominance by one or two airlines or alliances at all major European airports, reflecting the historical regime driven advantages of the home carriers (de Wit et al. 1999; Frenken et al. 2004).

The peak of the hubbing strategies was around the turn of the millennium. The September 11 attacks in 2001 and the world-wide economic crises led to a 'rationalisation', a de-hubbing, leaving a select group of airports in the hub-category (Lieshout et al. 2015).[ii] The underlying principle of a hub is to offer more city pair markets than an airline can serve for a given volume of output (Dennis, 2001). In other words, to provide a higher degree of connectivity. According to a 2015 Airport Council International report, total airport connectivity in Europe increased by 39% from 2005 to 2015. Although this relied more on indirect connectivity (up 51%) than on direct connectivity (up 18%). Indirect connectivity through the Gulf and Turkey has been responsible for much of this growth (CAPA 2015).

Van De Vijver et al. (2014) conclude that air passenger connectivity is a much better predictor than population size when it comes down to identifying world cities. Florida et al (2015) conclude that, reasoning the other way around, population size predicts the size of the airport. In addition to a number of general discussions of the role of airline connectivity in world city formation (such as O'Connor 2003; Matsumoto 2004; Grubesic and Matisziw 2012), an analysis that explicitly links cities' airline passenger numbers to their involvement in global service provisioning is that of Taylor, Derudder, and Witlox (2007). In this article, the authors find that the number of airline passengers associated with cities explains up to 53 percent of the observed variance in the world city network connectivity. It is then only logic that Europe's largest airports lie in its economic heartland – London, Paris, Frankfurt and Amsterdam.

A second consequence linked to Blériots maiden voyage was the issue of physical access to a territory via air of both persons and goods – it demanded regulation but also provided new economic opportunities. Aviation is often labelled the real world wide web, the aviation network the physical expression of the global economy (OEF 1999, InterVISTAS 2015). The availability of suitable air services allows the exploitation of the comparative advantages enjoyed by regions, especially for trade and FDI, explaining the relation found in figure 1. Indeed, the driver behind the Open Skies agreements was the need to liberalise civil aviation under the demands of the internationalising economy (Button 1991:1-4).

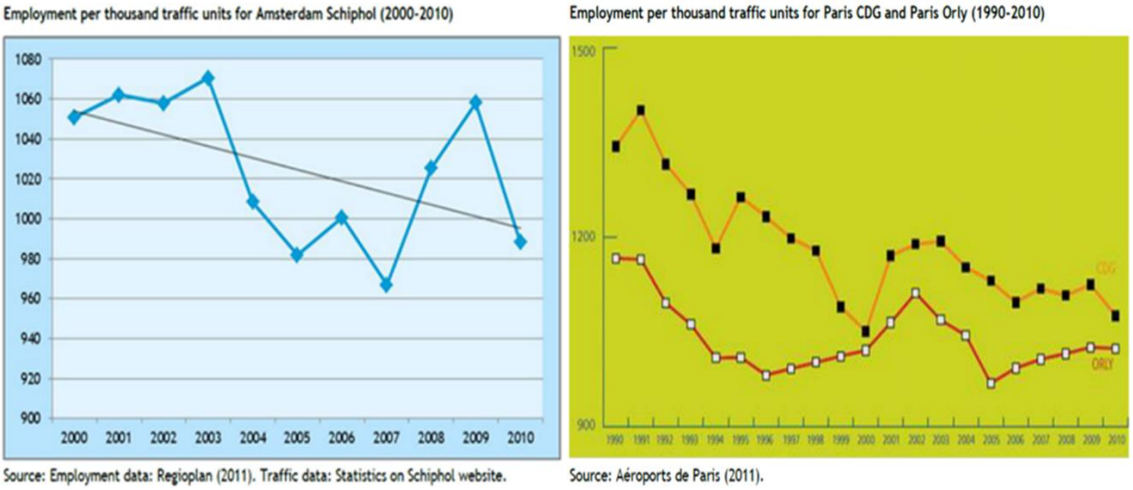
*Figure 1.* **Airport connectivity (2015*) versus GDP (2013)**




*weighted number of direct and one-stop weekly flights, third week of Jun-2015 Note: logarithmic scales
Source: CAPA - Centre for Aviation, ACI Europe Airport Industry Connectivity Report 2015 (with SEO Aviation Economics)

The effects of a hub airport on a regional (intra-national) scale are twofold; there is both the economic impact of the air transport sector itself, as well as the facilitating effect of the presence of air services. Via a straightforward exercise, the economic impact studies, data has become available on economic effects of airports.[iii] According to a 2015 study by InterVISTAS European airports contribute to the employment of 12.3 million people. Overall, the aviation sector, via its direct, indirect and derived effects, accounts for 4.1% of GDP in Europe. The economic potential of a single international hub airport is generally estimated to be in the order of 1.000 jobs per million passengers and 900-1.000 jobs per 0.1 ton cargo (Airport Council International, 2014; York Consulting, 2004**)**.

*Figure 2.* **Examples of airport related job growth in Schiphol and Paris CDG and Orly airport**




Enabled by the increased air connectivity, hub airports became attractive location sites. Airport business strategies, in their turn, changed and actively sought to exploit the non-aviation segment of their business. Since the 1990s airports tend to replace low value per square meter activities, such as parking facilities, by high value per square meter activities; the airport city strategies. The result? "*The defining paradox of an international airport is that is offers all kinds of amenities to people who don't*

*really want to be there, and tries to divert people whose only attention is on when they can get out…you can swim in a rooftop pool in Miami…or explore hiking trails in Kuala Lumpur." (Iyer, 2000 p. 57)*

Schiphol airport, a frontrunner in this strategy, records in the 1990s approximately 1,000 m2 of real estate per 1,000 air traffic movements (Schaafsma, 2001). This also has repercussions on the development in the wider airport area. Already at the turn of the millennium Frankfurt airport has around 500 firms, Amsterdam Schiphol 520 firms and Paris CDG 611 firms (IAURIF-ADP, 2000; Limberg, 2000). The airport area emerged worldwide as a generic postmodern landscape of offices, hotels, warehouses, shopping complexes, and logistics facilities (Güller and Güller 2003).

This brings us to the third issue, the regional planning models, developed to harness the economic but also spatial impact of the airport and transform the airport area into a true growth centre. Indeed, the jet aircraft might be the driver of urban development in the 21st century, like waterborne transport (in the 18th century), railroads (19th century) and the automobile (20th century) once were. Many believe that as a consequence airports might fulfil an important role in the spatial structure of urbanised societies like ports, stations and highways have impacted the spatial distribution of functions over territory (Toffler, 1990, Kasarda, 2000).

To go back in time once more, in 1924 Le Corbusier designed the radiant city, *ville radieuse*, where airports are at the centre of everyday life. His office blocks have a railway station and highway intersection below and an airport on the deck above. Frank Lloyd Wright foresaw in 1932 the airplane as a mode of travel that will lead to a more dispersed city, or even no city at all. In his vision of Broadacre City people use small airplanes, autogiros and helicopter taxis next to fast automobiles; large airports would thus not be necessary (Bruegmann, 1996).

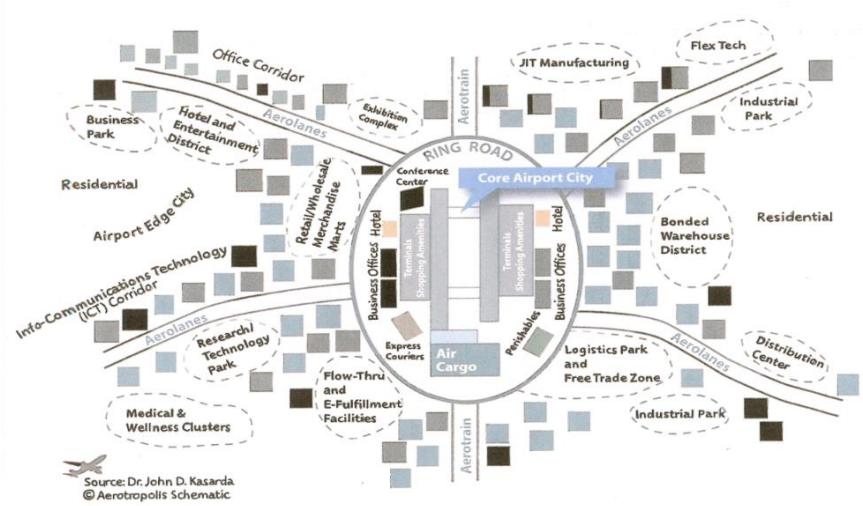
*Figure 3*. **Metropolis 1927**

Source: Fritz Lang, *Metropolis*, 1927

The modern hub airport, changed from a 'simple' infrastructure to some type of urban centrality, continues to generate the same type of ideal airport city models. However it wasn't until the turn of the century, under the influence of changed business strategies of both airlines and airport and largely bypassed by mainstream spatial planning models, that the nature of the emerging airport region has been captured in various ways in more specialist aviation discourse (Freestone and Baker 2011)[iv].

Visions on airport cities, aérovilles, airport corridors and in particular the 'aerotropolis' are promoted (Kasarda, 2000 & 2011). Although none of these popular concepts explain the mechanisms behind the spatial manifestation of the airport as an economic centrality, they are or can be very effective metaphors. The critique heard on the models is that these concepts are definitely industry driven, given the appropriation of the terms by the industry for marketing reasons. Nevertheless airport city or aerotropolis models do lend itself to concepts of transit-oriented development (Curtis et al, 2009). In general however, all these models are ideal-type models rather than context sensitive strategies (Kasioumi, 2015).

*Figure 4*. **Example of an aviation led model: The aerotropolis concept**




Source: Kasarda, J. Aerotropolis, http://www.aerotropolis.com/airportCities/about-the-aerotropolis

If searching for a context sensitive element in these strategies, it has to be sought in the belief that through the airport centred concept planning the accommodation of air traffic might be achieved in a more consensual way. This message comes often with the warning that if the airport strategies cannot be rolled out the position of the airport might be compromised – therefore not providing the necessary connectivity to achieve economic growth.

The lack of genuine coordination concerning airport development plans, land use planning, and related policies (land-side infrastructure provision, or wider environmental, economic, urban and social policies) is generally assumed to underpin many of the conflicts encountered today. Governance arrangements are considered imperfectly equipped to handle land use development challenges in airport regions. Calls for a broader conceptualization of planning at the airport–city interface are increasingly heard (Güller and Güller 2003; Jarvis 2007, Freestone and Baker 2010, Schlaack 2010).

A better merging of different planning cultures is considered required; airport master planning has to mesh into a more comprehensive airport area planning process (Jarvis 2007, Burghouwt 2005, Knippenberger 2010). The European perspective is that this is the shared responsibility of both airport operators and public authorities (Güller and Güller, 2003). However also in the USA it is concluded that the main problem among key agencies with a stake in airport area development is that they *'see themselves as separate institutions with their own unique structure, mission and view of the world'* (Blanton, 2004).

**The airport as a wicked problem – a problem of organised complexity**

Consequently we can state that airports and airport areas are a typical example of wicked problems – changing in nature and character while dealing with them. See for example Peter Hall's book on planning disasters which contains a chapter on 'Why can't we build London's third airport?'(Hall, 1982). Indeed, a famous phrase on wicked problems is the exclamation: *'How is that we can get to the moon when we can't get to the airport?'* (Webber, 1973). Why is this and what have we tried so far? We can discern at least four phases in planning approaches; the early days of aviation, the development of aviation as a mass transport mode in the 1970s, the deregulation and implementation of hub strategies since the 1990s and the shift to landside development in airport city and airport area strategies.

Planning in the early days started out with more or less 'insular' infrastructure plans. This technical (airport)planning is still done according to ICAO planning guidelines. Nowadays, ICAO does underline the importance of a longer term perspective and an eye for the regional setting of the airport. Airport planning manuals stress the importance of political co-ordination with all planning levels in a larger airport area (De Neufville & Odoni 2003, Wells & Young 1986).

Since the 1970s, when facing fast growth, different types of airport lay-outs are tried out and in some cases, like in Paris, whole new airports are build. The way the airport is dealt with is typically as a semi-open system incorporating feed-back mechanisms (scenario planning). Airport extension plans start to published with accompanying cost-benefit analyses. This continues to be mainstream ever since.

At or around the 1990s, when the airport expansion plans met with resistance, due to increased environmental impacts and awareness, the noise and economic impact studies become an important part of the planning process. Hub-airports are increasingly dealt with as an open network system, the relational approach and analysis of actor network constellations become preferred planning tools. This is in line with the need for a more explicit embrace of collaborative planning, advocated by planning theorists since the late 1990s (Healey 1997).

An openness to participation in regional and national planning and environmental decision making was recognized as a desideratum, a shift towards sustainable airport planning (Longhurst et al. 1996).[v] It is reflected in the stakeholder fora at airports such as the Alders Table in the Netherlands or the Umlandverband in Frankfurt. There has been an increased scientific interest for institutional and stakeholder analyses of these type of stakeholder fora in airport regions (Van Wijk, 2007, Huijs, 2011, De Jong and Boelens, 2006). Galvin (2010) qualifies these structures as an attempt to mobilise the increased number of public and private stakeholders in the airport area.

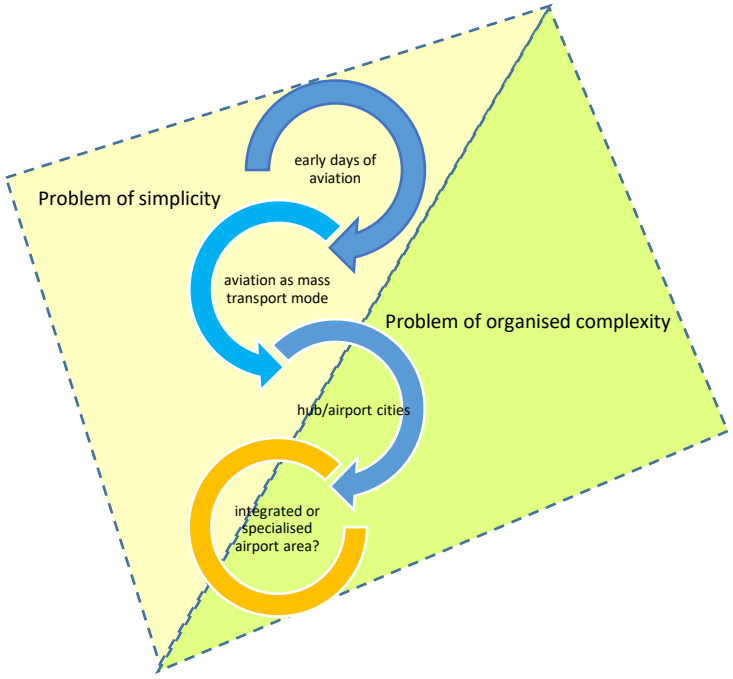
This multitude of stakeholders, incorporating 'new' players such as the local governments which in most countries traditionally did not take a pro-active role in airport planning, equally led to alternative co-operative structures and collaborations. These alternative structures, increasingly also between public and private actors, emerge often outside the realm of formal planning. The main issues around which these initiatives revolve are (Berthon & Prins, COFAR 2001, ARUP/ICE 2009):

a) management of the airport, not only in terms of strategy and commercial interests of air transport players, but also for the service of users and economic interests in the region,
b) optimisation of economic spin-offs from airport activities, on different scales and
c) integration at a local level on a social, economic, environmental, economic, spatial or even political level.

The past decades of airport development and air traffic growth have thus brought us an expertise in dealing with airport related impacts. To speak in the terms of Weaver (1948, p. 536), we have become quite good specialist dealing with airports as problems of simplicity (few variables, clear outcomes), for example when needing to decide on an extra runway. We have built up a vast experience with airport related issues of disorganised complexity (many variables, statistical approach, averages) such as noise zones. Although this has proven to be already a much more complicated problem.

However when it comes to understanding the interface, a frontier area between the off and on-airport dynamics – a space where the global and local interact, we are in the realm of organised complexity. Weavers third category of problems, problems of organised complexity, have a sizeable number of factors which are interrelated. There are strong and non-linear interactions amongst these variables. These interactions lead to complex structures that have their own drivers and characteristics and thus render a problem truly wicked. As said before, similar infrastructure facilities turn into varied airport areas, each experiencing and experimenting with the interaction of global air traffic and local territories.

*Figure 5.* **From airport to airport area – from a problem of simplicity to a problem of complexity**




Still, I believe that the dynamics at interface level and the way these are addressed in real life strategic management and planning policies give hints to both the organisational quality and future potential development paths of the area. The current debate on airport development takes the perspective that hub-airports are archetypes with a body of evidence and a set of criteria that 'automatically' will lead to a certain territorial development. Instead of hinging on the usual assumption that capacity is the result of the sum 'technical capacity minus environmental constraints', the missing link, changes in the territorial context and the responses to these changes are, in my opinion undervalued as a central factor.

Taken the territorial context as a core factor to future developments is a radically different perspective than, and here I oversimplify, calculating the potential socio-economic impact as a function of jobs to number of flight movements. As an alternative we could consider airport areas as c*omplex adaptive systems (CAS).* CAS are thought to have recognisable robust key features, but flexible enough to evolve through time and hence able to adapt to changing conditions (De Roo, Hillier & Van Wezemael, 2012). Crises and adaptations over time are likely to trigger changes within the system itself and in its interaction with other systems (Bertolini 2007). It is a territory undergoing changes, an area that is a 'possibility space', an interface between the international world of aviation and the local territorial context with its own characteristics and potential.

Adopting this perspective shifts the focus from (quantitative) impact analyses to enquiries into their specific regional dynamism and resilience. The regional dynamism and resilience of an airport area both condition the interface and consequently determine the potentiality for change. The main underlying objective is thus not to assess the (maximum) potential for the accommodation of air traffic, but to enquire into potential of the airport area, the organizational capacity to respond and incorporate change.

**Capturing interaction: exploring change and potential**

In short, the above underlines thus that an airport area is not merely a receptacle of air traffic, but that there are local features and local capabilities that influence and define its development path. The factors central to the 'impact approach', aviation growth figures and regulatory regime changes obviously remain important drivers for change in airport areas. However although they enable change, these factors are not explaining how the transformation of airport areas pans out. This transformation thus cannot, in my view, be explained solely by global drivers, there is a set of processes that are not scaling at a global level and take place in the interface.

Besides the fact that we give recognition of the changes that these areas have gone through over the past decades, focusing on the airport areas themselves has two advantages. Firstly it shifts the focus from quantitative and network analyses to the analysis of the node (airport area) itself. Secondly it underlines the need to let go of the idea that there is one unified vision or strategy for the future development of area. We should turn our attention to detecting innovation and agility rather than starting out drafting an ideal development plan, model or policy.

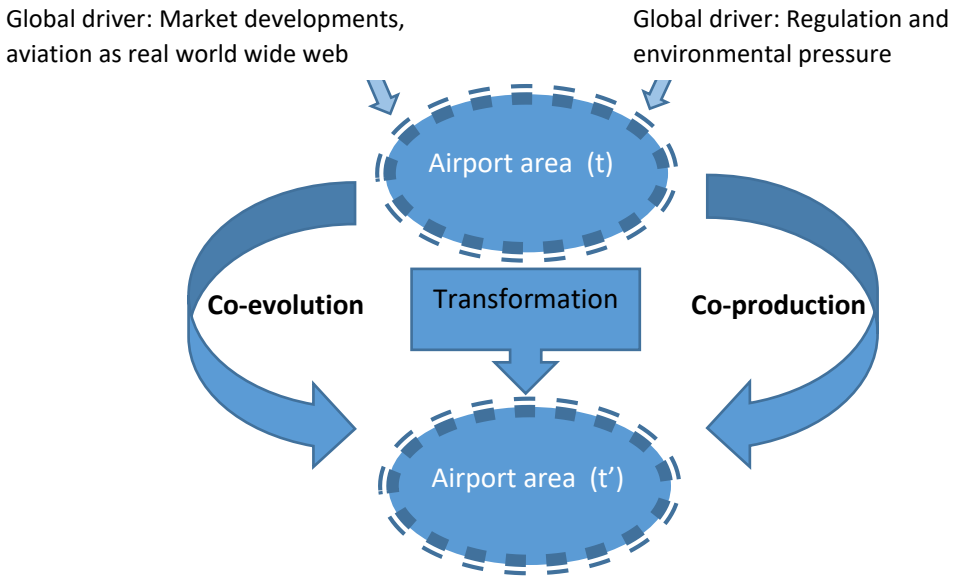
This implies we focus on the local capabilities of airport areas. Boschma (2015, p.1-3) refers to Maskell and Malmbergs (1999) definition of local capabilities as a combination of the region's infrastructure and built environment, natural resources, institutional endowment, and knowledge and skills. Local capabilities are seen as capabilities of the longue durée, hard to copy by other regions. The reasons why it is hard to copy varies, it can be due to a variety of factors such as the myopic behaviour of local agents, the tacitness of the local knowledge base (Gertler 2003) or untraded interdependencies (Storper 1995). In other words this is a plea for the importance of a regional locale as explanatory factor. Two types of capabilities seems of particular importance;

- economic features – the transformation of the hub airport into an airport city/airport area impacting on the evolution of economic uses in the airport area,
- institutional/organisational, entrepreneurial capabilities - changes and adaptations in the territorial strategies dealing with the transformed interface and formulating future development paths.

Just observing the transformations of specific areas, even in case of spectacular changes in land use, still does not tell us much about the dynamics of change. We need to analyse the feedback loops, the processes that underlie change, a challenging task. The objective is twofold; reviewing both the historical development path as well as the organisational changes that influence future development;

- it aims to review *co-evolution*, enquiring into the interaction between the institutional/organisational context and the economic diversification of the airport area, illustrating its development path
- it aims to review *co-production*, the spatial strategies and policies that accommodate and respond to the transformations taking place in the area and potentially steer its future direction.[vi]

*Figure 6.* **Schematised framework**




Next to the transformation and the global drivers, we have thus the two elements of co-evolution and co-production. To start with co-evolution, a term coined by evolutionary economic theory (Boschma, 2015). Evolutionary economy posits that in a region economic development can be triggered by a collective learning process (that is fostered by intensive intra-regional interaction patterns) and a strengthening of the regional, institutional infrastructure. In other words an institutional infrastructure must be present, i.e., research and higher education institutes, technology transfer agencies, vocational training organisations, business associations, finance institutions etc., which hold important competence to support regional innovation.

Solvell (2015, pp. 1) seems to have a similar concept in mind when introducing his idea of the cluster commons. In his words these commons, which is not a natural but an economic commons, is: *…really a meeting place accessible through paths and bridges, where new institutions emerge that, under the right circumstances, will lead to mobility of resources and individual capabilities (e.g., leading to new firm formation; see Sorenson and Audia 2000; Stuart and Sorenson 2003; Sorenson and Sorenson 2003) and knowledge spillovers.*

Central to co-evolution is the on-airport/off-airport interface itself. In other words: Has the implementation of airport city strategies favoured the local anchorage of the airport and therewith strengthened the interface as territorial cohesive entity with an own (socio-economic) dynamic and territorial strategy and therewith an increased potential for change? Does the airport area as a whole become, despite its accrued economic diversity, more and more a specialised economic zone – an area where all development is closely linked to the internationally regulated and global air industry? Or, on the contrary, does the enhanced diversity of economic activities at interface level tend to favour a diverse, more urban economy– integrating the airport area in the metropolitan armature as more than just an infrastructure facility and transportation cluster?

Here we find a first niche in our knowledge, as Storper (2016) observed: are metropolitan regions 'ripping' into a set of specialised areas, or on the contrary do metropolitan regions tend to have more integrated economies? Hypothetically a co-evolution of the economic and the organisational networks can create windows of locational opportunity, localised change and therewith opportunities for future economic growth and development.

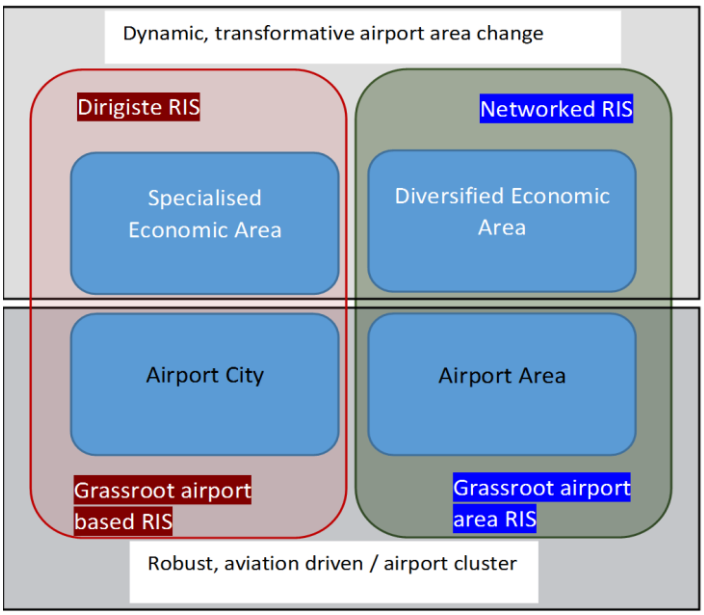
This notion of localised change, triggered by co-evolution, can be analysed through the regional innovation systems (RIS). Asheim & Isaksen (2002, pp 83-84) distinguish three main groups of RIS. The first type is the 'grassroots RIS' and described as territorially embedded regional innovation network. Firms base their innovation activity mainly on localised learning processes stimulated by geographical, social and cultural proximity without much interactions with knowledge organisations. A second type of RIS is the 'network RIS' that is further developed into regional networked innovation systems.

Both the grassroots and networked types of RIS are firmly anchored in their local territory. However, the third type of RIS, labelled the 'dirigiste RIS', is not endogenous but rather exogenous by nature. Asheim & Isaksen (2002) describe this RIS as predominantly nationally, or internationally oriented. Its activity takes place to a large extent in cooperation with actors outside the region. The local community is less involved in its development, or rather just a specific part of the population with similar educational backgrounds (p.e. engineers) is likely to be included. The air industry, characterised by its global economic ties and international regulation regime could very well fit the bill. The regional impact is in this case of a specific nature. To what extent are airports anchored in the local territory?

On paper we can imagine four different paths leading to a variety of airport areas:

a. A grassroots airport city path – airport city strategies are implemented on-site with little consideration for the territorial context.
b. A dirigiste RIS in the form of a specialised airport area – the agenda for territorial strategies in the area is firmly aimed at enhancing the functioning of the airport and largely set by/following the airport authority's agenda.
c. A grassroots airport area path – the territorial strategy is 'mimicking' the airport on-site strategy and/or aimed at serving the airport platform.
d. A networked RIS – the off-site territorial strategies describe the area as a growth pole, obviously with an airport at its core, but the objective is to enhance diversified economic growth rather than a maximum accommodation of air traffic.

*Figure 7.* **A typology of airport areas**




Our second process, co-production, is all about the reaction of the actors in the local territorial context to the transforming interface, the airport city/airport area? Within the fields of social sciences much

attention has been given to the tension between global economic trends and local contexts. Friedmann (1995) speaks of : *"A growing social schizophrenia resulting from the double covering of, on the one hand, regional societies and local institutions, and, on the other hand, the rules and operations of the economic system at the international level."* Sassen points at the importance of the localised struggles by actors who are not globally mobile and nonetheless critical for the organisational infrastructure of globally networked politics. She calls this '*lumpiness*' (Sassen, 2006, pp.13 & 381-383).

This brings us to the essence of co-production, the possibility to create something together. These partnerships and networks can be seen as symptomatic for the broad shift towards an emerging co-production of space; especially in those fractures between the public and private sector (Albrechts, 2015). It is possible to analyse the idea of co-production in terms of institutional arrangements – considering co-production more as the creative entrepreneurship of public and private parties to come to collaborative innovative solutions. Collective action is in the end a form of self-organization, a basic mechanism by which complex urban systems organize themselves (Partanen, 2015).

Co-production is seen as a process where diverse actors have the incentive to formulate a strategy and undertake collective action. This process thus starts with an incentive, but it thought to undergo two phases: a phase of creative agility, testing and developing new ideas, and a phase of creative resolution, actually implementing new strategies (Hill 2014) . What is needed to spark co-production? When it comes down to thinking of institutional arrangements that capitalise on co-production several factors need to coincide. Ostrom (1996, pp. 1080-1082) considers five factors of critical importance. These five factors are:

- The aforementioned incentive,
- A minimal trust, credibility and willingness to co-operate of the actors involved,
- A certain level of creative entrepreneurship (of both public and private parties),
- Having legal options to collaborate,
- A common interest or need.

Friedmann's observation on the tensions due to the double covering of the rules and regulations of the global economic system on the one, and the regional institutional context on the other side, affects some of Ostrom's factors. Consider the potential obstacles in legal options, trust or a clear view on a common interest in the light of airport areas. With which goals, to what extent, by whom and on which base can spatial planning in these cases be done, and which opportunities for sustainable economic development can be created? All this renders organisational aspect even more interesting; the 'thickening' of the frontier zone is reflected in a myriad of private and public initiatives that rely on a collaboration of actors that have not necessarily been cooperating in the early stages of airport development.

Is there since the 1990s, evidence of a heightened co-operation between on-site and off-site actors resulting in a dynamic common territorial strategy? Is there an increase or decrease in the alignment between on-site strategic management objectives and the objectives formulated in the planning policies in the wider airport area – between the globally oriented air industry and the local institutions? The airport planning and the public planning system? Is there evidence of innovative co-operational structures between on- and offsite actors? Did this result in newly set up innovative and more or less formalised organisational structures in airport areas influencing planning policies and investment allocation? Do European hub airport areas differ in this respect?

With regards to co-production we can formulate potential sources of relevant evidence at different levels of analysis. Firstly, at the airport level, the global drivers, and in particular the environmental driver, impact business strategies. The way each airport authority has incorporated this in its business strategy and the spin-off effects resulting from this, might differ per region. The resulting levels of creative agility and resolution equally might differ and therewith impact the developmental trajectory per region in a different way.

Secondly, off airport site the focus of local and regional institutions and actors is thought to have shifted over time: seen the major regional economic impact and the risen awareness of the potential for airport related economic development. A reactive attitude to airport development (concerned with noise zones, height restrictions and land reserves) is presumably supplemented or replaced with a more pro-active attitude towards potential economic development as well as potential synergies with strategic investments in more sustainable airport management made at airport level.

Finally, collaborative cross-over networks are the visible 'co-production of space', that was mentioned earlier. An analysis of the scale and scope of the common innovative projects and collaborations that are evolving in the 'grey zone', at the frontier of on/off airport territory is a third method to differentiate between the airport areas.

*Figure 8.* **Searching for evidence: co-production**

| **Co-production:** | level of analysis | Evidence |
|---|---|---|
| Analysis of creative agility and creative resolution | On-airport | Airport environmental and spatial strategies, airport as laboratory |
| | Off-airport | Innovative plans/projects in the airport area and/or changes to formal planning policy |
| | Cross-over, joined | Initiatives by cross-over networks linked to environmental (Carbon Initiative, COP21) or spatial strategies (joint representations) considering the airport area as laboratory/spatial entity. |

**Where does this leave us? Limitations and potential contributions**

Concluding we can state that the European hub airport areas post 1990 should be considered as diverse and vastly changed areas compared to their previous development stages. The airport area is an interface, not an empty desert upon which future airport cities are build. It is a socio-economic and spatial complex that has its own characteristics and drivers. Traditionally airports, being highly specialized transportation facilities regulated by national or independent authorities, have long been 'black holes' in metropolitan planning strategies. Airport areas remain a new reality, often still overlooked by planners and policy makers (Schaafsma 2008). More often than not, impact, instead of interaction, is the baseline in airport debates.

We have built up quite an expertise on impact but seem to have a blind spot for interaction. Thus the search seems to remain on for generic solutions, mostly with the aim to accommodate current and future air traffic growth. Practically this often boils down to tweaking and adjusting the existing regulatory frameworks to locally implement and operate the airport while maximising the local spin-off and benefits. (Indeed the industry claims a license to operate under clear and uniform standards.) The risk with tweaking existing systems in place is obviously that one might end up in a path dependent lock-in, a gradual step-by-step approach to a dead end solution.

Developing alternatives is not a luxury; recent market changes start to challenge the position of the European hubs. In spite of the historic cumulative advantage of a large urbanised home base, air traffic market forces and regulatory regimes will affect the growth pace at these first generation hub-airports. In the vocabulary of Piketty (2015:97); air traffic at the large European airports has profited of a catch up phase but is at a global technological frontier.

Recently built airports, such as Istanbul, might tip the balance; just as the port of Rotterdam is no longer the largest port in the world but ceded this position to Asian harbours. This does not imply that the largest airports will simply relocate – the strength of the urban economies in which they are located will guarantee their role of importance. Just as the location of the port of Rotterdam in the Rijn Delta guarantees a throughput to the European economies. It merely points at the potential different stage of development, an alternative route – one where the territorial context and cohesion/interaction will be certainly important, if not defining elements in the development path of airport areas.

There are obviously some limitations to the width and depth of the outlined approach. First of all the choice to focus on co-evolution and co-production, as processes at the root of change, has the risk that we grossly underestimate structural change, especially stemming from the global drivers. However, I hopefully made it clear that this approach is developed to complement existing impact approaches and models based on these impacts.

Linked to this there is risk of overestimating the contributions of collaborative efforts. It is theoretically very well possible that an airport area with an exogenous RIS character, and therefore a dirigiste attitude to airport area development, still functions as a stable CAS. This all depends the level of creative abrasion; there might be no felt need to change. However, the global drivers are influencing all major European airport areas in a substantial manner and leads to debates on the way forward.

Thirdly there is the selection of airports. Although it is a deliberate choice to take European hub airports as a starting point, it is very well possible that other key features are driving change in airports with a highly different profile or territorial setting. Further, the economic impact of hub airports is not comparable to the potential impact of smaller airports. This approach needs adaptations for non-hub airports.

Finally, in applying this approach to specific cases, there is a risk, inherent to any comparative case analysis, to over- or underestimating the role of initial conditions. When explanation and/or prediction are based on case analysis, we risk to interpret rather than proof. Even more of a concern is the possibility to fail to recognise change, either because of its progressive nature or the ways labels are used to describe phenomena. The same word might not necessarily have the same meaning in the various airport areas.

Nonetheless, this is a particularly interesting timeframe to observe both the territorial dynamics and the arguments in the discourse. I think we are at a point that we need to acknowledge that even with stakeholder fora in place we might simply not be able to truly come to a unified vision on the longer term development. Moreover, this approach might give us a better insight in the real life practice. The co-evolution and co-production processes, whether initiated on a particular theme or project or developing in full-fledged joint undertakings on airport area level, are worthwhile studying in more detail.

Change will continue to happen in this frontier zone of globalised production systems and localised context. Understanding change in the territorial context of the airport should be seen as an asset, not as a limitation, backdrop or scenic setting. There is an advantage in getting acquainted with the innovative co-evolution that shapes the interface; and the co-production process influencing its transformation.

In contrast to the global drivers which are in themselves ‘non-actionables’ in the regional context, both processes, co-evolution and co-production, are ‘actionables’. The way business is done, innovative strategies implemented and formal planning systems challenged is in the end very much an intra-regional affair. Understanding interaction can give us a better insight in the developments at European hub airport areas, assessing our own level of agility and resolution in addressing this wicked planning issue.

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[i] An open sky policy is a major reform of the regime that regulates air services; the regime that sets the rules that enable airlines of one country to provide air service to an airport in the partner-country and vice versa (Allen et al. 1997).

[ii] Obviously it is herewith not said that this situation will remain the same in the future. Emirates and Etihad airlines are expanding their network of feeder flights from Europe to the hubs of Dubai and Abu Dhabi. Other hubs, such as Istanbul, are showing growth figures that exceed the figures of the 'traditional' European hubs. In the industry a major debate is going on over the possibility to 'roll back' open sky agreements to protect the European market. Simultaneously Ryanair, offering low-cost direct flights from secondary airports now schedules operations from major airports. An indication to a change in use of airport infrastructure? Whether these changes will lead in the long term to a different constellation of hubs and therewith a changed distribution of access to air services is hardly a question.

[iii] These studies have been carried out on a wide range of airports and with a wide range of objectives. Concerning European airports, showing the feasibility of extra infrastructure, or the economic contribution in terms of jobs so as to influence the debates on airport developments have been the two most common reasons to conduct impact studies. Impact studies may be used for planning purposes to assess whether there is enough land for new commercial projects in the vicinity of the airport or whether there is a sufficient supply of labour and associated housing to support such developments (Graham, 2001). Economic impact studies can simply have a public relations role underlining the economic value to the public, policy makers or airport users (Mason, 2003).

[iv] For an overview of the different models; Freestone and Baker (2011: 267) provide a comprehensive overview of the different models of airport-centred development.

[v] This is further promoted by Eurocontrol via the CEM-initiative. The collaborative environmental management (CEM) sets out a high level, generic protocol that aims to support core operational stakeholders in their continued efforts to deal with environmental impacts at and around airports. See also:
http://www.eurocontrol.int/articles/collaborative-environmental-management-cem-specification
The transition from a techno-rational approach to more communicative planning models is, by the way, not at all exclusive for the case of airport planning. It fits neatly with the developments in planning theory since World War II (see amongst others Allmendinger, 2002, Campbell and Fainstein 1996 and Verhees 2017).

[vi] Co-production has been coined as a term to describe a process through which inputs from individuals who are not "in" the same organization are transformed into goods and services (Ostrom, 1996). A perhaps more

standard approach in planning research would focus on analysing and interpreting the story of the stakeholder fora or the evolution of the formal planning system. Instead I propose to review the process as a process that is taking place in a 'grey zone', the potential for co-production between the corporatist, internationally oriented business strategies and the local and regional public institutions.