

---

# SUSTAINABLE AIRPORT AREAS

GUIDELINES FOR DECISION MAKERS

---

MARCH 2018



metro  
polis ●

**IAU** INSTITUT  
D'AMÉNAGEMENT  
ET D'URBANISME  
\* Ile de France

\* ile de France

Hubstart®  
ACCÉLÉRATEUR DE RÉUSSITE

**ARC** AIRPORT REGIONS CONFERENCE

**ARC** ATLANTA REGIONAL COMMISSION



# **SUSTAINABLE AIRPORT AREAS**

## GUIDELINES FOR DECISION MAKERS

March 2018

**IAU île-de-France - Paris Region Urban Planning and Development Agency**

15 rue Falguière 75740 Paris cedex 15  
Tél. : +33 (1) 77 49 77 49 – Fax: +33 (1) 77 49 76 02  
<http://www.iau-idf.fr>

Executive Director: Fouad Awada  
Urban planning department: Anca Duguet, Director  
Economic department: Vincent Gollain, Director  
Project manager: Teodora Nikolova  
Report carried out by Teodora Nikolova and Martin Hervouët  
With contribution from Vincent Gollain and Nicolas Boichon  
For the Metropolis Initiative on Sustainable Airport Areas (2015-2017)  
ISBN 978 2 7371 2074 9  
*Cover picture: IAU îdF*

**Main partners of the Metropolis initiative on Sustainable airport areas:**

- The Paris Region Council (Conseil Régional d'Ile-de-France)
- Hubstart Paris Region Association
- ARC (Atlanta Regional Commission)
- ARC (Airport Regions Conference)
- GIP Emploi Roissy CDG
- Orly International
- Paris Aéroport
- AMB (Àrea Metropolitana de Barcelona)
- Paris Region Entreprises

**Acknowledgements:** The authors extend special thanks to Elisabeth Le Masson (Paris Aéroport / Hubstart Paris Region®), Sergi Alegre (Metropolitan Councilor of Barcelona Metropolitan Area and President of Airport Regions Conference (ARC)) and Lea Bodossian (ARC Secretary General) for their strong involvement in this project.

The authors also wish to express their deepest gratitude to all the participants in the Sustainable Airport Areas workshops for their invaluable contribution to the success of the initiative. Thanks to their discussions and to the collective intelligence they have deployed throughout the three workshops, many key issues were raised and discussed, and many best practices were identified :

Sergi Alegre, Jean-François Benon, Maÿlis Berthod, Lea Bodossian, Lia Brum, Piotr Brzeski, Haiyan Cai, Lingyu Cai, Frank Cannarozzo, Celia Charlet, Michael Cheyne, Alexandra Covrig, Jacques Cransac, Emmanuel De La Masselière, Eric De La Paillonne, Marc Deman, Hovic Der Sarkissian, Jean-Claude Detilleux, François Dubos, Julien Dufour, Lutz Franzke, Pascal Garreau, Marc Gentilhomme, Vincent Gollain, Jacques Grangé, Stuart Gulley, Pierre-Ludovic Guymar, Nicole Hall, Jae-Hyun Han, Géraldine Henry, Max Hirsh, Minna Honkanen, Istvan Hunyadi, Amel Issa, Katarzyna Jedruszczak, In-kyoung Kim, Marc Knoll, Per Kristersson, Nicolas Laruelle, Solène Le Coz, Hyun-mo Lee, Gaël Leon, Frederic Le Roux, Elisabeth Le Masson, Chris LeTourneur, Istvan Zoltan Levai, Sandra Lignais, Arja Lukin, Gerald MacDowell, Al Nash, Dany Nguyen-Long, Kaly Niang, Guylaine Paillaux, Hannu Penttilä, Suzanne Pierre-Louis, Marvin Pougnet, Olivier Quetard, Fernanda Rizzetto, Maria Ryden, Daraka Satcher, Marion Siegwald, Joachim Solda, Aissatou Thioubou, Jonathan Tuley, Divya Vasudeva, Flor Velarde, Pierre Vidailhet, Baoling Wang, Shawn Williams, Xin Yang, Mireia Zapata, Pauline Zeiger, Carol Zhan.

# CONTENTS

- INTRODUCTION**..... 5
- GOVERNANCE, VISION & STRATEGY** ..... 11
  - I. Manage the complexity and regulate the conflicts..... 11
  - II. Build a shared vision & strategy ..... 17
- URBAN PLANNING AND DEVELOPMENT** ..... 21
  - I. Integrate the airport area development into national and regional strategic planning..... 22
  - II. Dynamic, flexible and adaptable urban planning..... 23
  - III. Sustainable mobility and reliable multi-modal infrastructures ..... 25
  - IV. Spatial coherence and selective economic development of the airport area ..... 27
  - V. Land is a scarce resource..... 28
  - VI. Design of the airport city as a mixed-use city ..... 31
- MOBILITY AND ACCESSIBILITY** ..... 39
  - I. Demand knowledge is crucial, as passenger flow will reach new heights ..... 39
  - II. Airport authorities must be involved in the local environmental and mobility strategies ..... 41
  - III. Emphasize public transportation for national and regional accessibility ..... 43
  - IV. Ensure a high level of performance..... 45
  - V. Envision ground transportation from a passenger’s point of view ..... 47
  - VI. Incorporate the constraints of employees ..... 51
- ENVIRONMENT** ..... 53
  - I. Noise..... 53
  - III. Climate Change ..... 63
  - IV. Water and soil quality ..... 68
  - V. Protection of agricultural land ..... 69
  - VI. Biodiversity ..... 69
- ECONOMIC DEVELOPMENT & COMPETITIVENESS** ..... 71
  - I. Assess and survey economic development in the airport area ..... 71
  - II. Foster a distinctive development strategy that builds on key assets of the airport area..... 73
  - III. Support a balanced and inclusive economic development ..... 75
- SOCIAL INCLUSION & WORKFORCE DEVELOPMENT** ..... 81
  - I. Workforce development is key to linking social inclusion and economic development in airport areas ..... 81
  - II. Foster cooperation among workforce development partners within the airport area ..... 82

III. Survey the local labor market: what are the current and future recruitment needs of employers, and does the local workforce meet these needs? .....	84
IV. Provide high-impact workforce development programs .....	85
V. Connect local workers and job-seekers to training and job opportunities .....	88
<b>MARKETING AND BRANDING</b> .....	<b>91</b>
I. Marketing & Branding: a Review of the Literature .....	91
II. Branding and Marketing Strategy: an overview of the 3 stages .....	94
III. Stage 1: market surveys and definition of the strategic choices .....	94
IV. Stage 2: the definition of the strategic choices .....	95
V. Stage 3: The operational marketing .....	95
<b>REFERENCES</b> .....	<b>109</b>

# INTRODUCTION

In a context of increasing globalization of trade, of rising international flows of goods and people, and the resulting global rise in air traffic, international airports have become strategic assets for the development and attractiveness of nations.

What is true at the national level is also true at the more local scale of the areas surrounding an international airport, and whose own urban, demographic, social, economic and environmental development is closely linked to the presence of such major equipment. They even often become full-fledged economic and urban hubs within their metropolitan area. These territories, whose contours, perimeters and profiles can be very different from one geographical context to another, but which have in common that their destiny is linked to the presence of an international airport, can be referred to as "Airport Areas".

All airport areas are thus engaged in multiple interactions with their airport. Some of these interactions are positive : for instance, the airport activity generates economic benefits for the surrounding areas in terms of jobs, of local taxation, of notoriety, of transport network ... Conversely, airport activity also generates negative externalities on the surrounding environment in terms of air pollution, noise pollution, traffic congestion, agricultural land consumption, urban development, etc.

Airport areas are therefore facing many challenges of their own, which need to be tackled on this territorial scale. In view of all these challenges, more and more airport authorities and local decision-makers around the world feel the need to acquire and share experiences and good practices with their peers from other airport locations, in order to develop their own airport area in a more sustainable way.



Source: IAU

Supported and partially funded by Metropolis (World Association of the Major Metropolises), the “**Sustainable Airport Areas**” initiative was launched in 2015 by the Institute of Planning and Development of the Île-de-France Region (IAU îdF), in order to create a common ground of good practices related to sustainable development of airport areas, to better take into account the issues in these areas and to facilitate the implementation of appropriate policies. This initiative is part of a movement of pioneering projects implemented in various airport locations around the world, such as in Atlanta through the Aerotropolis Atlanta Alliance, or in the territory of Grand Roissy - Le Bourget through the Hubstart Paris Region® Alliance, a pioneering player in developing the concept of sustainable airport area.

As the pilot of the initiative, IAU îdF was responsible for organizing three international workshops that brought together managers of international airport locations and experts on airport issues.

The first workshop was held in Paris in October 2015. Organized jointly with the Hubstart Paris Region® International Seminar dedicated to Sustainable Airport Areas, it hosted more than thirty participants representing eight international airports: Atlanta, Barcelona, Beijing, Paris-CDG, Guarulhos, Incheon, Paris-Orly and Shanghai. The participants identified ten major challenges related to the sustainable development of international airport spaces and discussed them together. These challenges, presented in the graph above, form the backbone of the collective work carried out throughout the initiative.

The workshop also included business tours to the Paris-CDG and Paris-Orly airports.



*First workshop, Paris, October 2015 © IAU*

On September 20, 2016, the Initiative held its **second workshop in Atlanta, USA**. Representatives from six international airports (Atlanta, Paris-CDG, Beijing, Dakar, Vantaa, and Barcelona) participated in the workshop, as well as international experts, consultants and scholars from Paris, Atlanta, Hong-Kong and Vancouver. In total, twenty-five high-level professionals attended the workshop.

Participants identified recommendations and good practices developed by international airport areas on four of the ten main challenges, namely: mobility and accessibility, urban planning, governance and competitiveness. The workshop program also included a visit to the Georgia Resource Center - a world-renowned resource center run by Georgia Power and dedicated to attracting and expanding businesses in the State of Georgia. The workshop was held jointly with the Hubstart Paris Region Sustainable Airport Areas International Seminar, which took place on September 21-22, 2016 in Atlanta.





Second workshop, Atlanta, September 2016 © IAU

The **third workshop** took place on **4 April 2017 in Paris**. It was organized jointly with the Airport Regions Conference (ARC), which held its annual congress in Paris from 4 to 6 April 2017. More than 35 participants coming from 13 metropolises and airport areas (Barcelona, Berlin, Brussels, Budapest, Daegu, Dakar, Dublin, Goteborg, Oslo, Paris-CDG, Paris-Orly, Vantaa and Warsaw) took part in the workshop, as well as international experts and consultants from various organizations (Arcandia, Envisa, Total, UAF). This workshop focused on the following challenges: environment, mobility and accessibility, economic development and urban planning.

A business tour was organized jointly with the ARC in the afternoon. The participants visited several training centers dedicated to various airport-related activities such as aeronautics, tourism and hospitality, customs, ground handling or logistics.



Third workshop, Paris, April 2017 © IAU

The final outcome of this Metropolis Initiative is the publication of the present report. The report is organized in eight thematic chapters. Each chapter deals with one of the major challenges related to sustainable airport areas and proposes recommendations and best practices based on the collective work made by the participants in the three workshops, as well as on further research conducted by the IAU project team members. This report purports to provide practical guidance and recommendations to planners, developers and public decision makers committed to improving the sustainability of airport areas across the globe.

***Nota Bene:*** Given the strong thematic links between “Governance” and “Vision & Strategy”, it was decided to merge these two topics into one same chapter (Chapter I). As for the challenges of Funding and of “The Airport Area within the Metropolitan Region”, it rapidly appeared that these were cross-cutting challenges that were tackled in all other thematic chapters – leading to the decision to not have dedicated chapters on these issues. The reader should therefore not be surprised to find that the present report contains seven thematic chapters instead of ten.



Source: IAU IdF



# GOVERNANCE, VISION & STRATEGY

*“Vision without action is a day-dream. Action without strategic vision is a nightmare. What is needed is both action and cooperative vision from people in- and outside the fence. This all goes back to a generic term called governance” (J.D. Kasarda).*

The spatial and economic impact of airport hubs on their regions has grown in the last decades. As a result, regional planners have started to integrate the governance of airport areas into their core work.

Airport area governance is here understood as the way decision-making processes are organized<sup>1</sup> within an airport area in order to collectively deal with the various issues pertaining to the airport area’s management and development.

Governance covers a large spectrum of issues, from regulating conflict and competition to developing shared strategies, from organizing consultation and debates to steering and implementing policies and projects.

Governing airport areas is a difficult challenge because airport areas rarely constitute specific jurisdictions with clear borders, own institutions and administrative bodies. Instead, they are generally characterized by a complex and fragmented institutional landscape that involves multiple stakeholders, both private and public, with differing and sometimes competing interests, values and policies on many issues and across a variety of geographical scales. This institutional fragmentation can hinder the elaboration and implementation of efficient development strategies for the airport area.

The challenge of governance in airport areas addresses two main issues:

- **Manage the institutional complexity and fragmentation of actors, and regulate the conflicts** between the airport and the surrounding areas (including local governments and local residents) that are positively and/or negatively affected by the airport activities.
- **Build a shared vision** for the long-term development of the airport area and fostering strategic alignment and cooperation (“coalitions” or “alliances”) among the stakeholders involved.

Common to these two issues is the need for governance arrangements that **foster mutual trust and cohesiveness between all the stakeholders**.

## I. Manage the complexity and regulate the conflicts

Institutional complexity lies “in the crossfire of differing ambitions” from numerous players including airport owners and operators, investors and developers, local authorities, infrastructure providers, and regional and national agencies<sup>2</sup>. All these players can have diverging and sometimes competing interests, values and priorities, as well as overlapping competencies and jurisdictional boundaries.

Relatively few airport areas have long-term experience with governance structures, therefore there are not so many available good practices. However, as more and more airport areas around the world are experimenting with this complexity, we see the emergence of governance initiatives and innovations that, rather than reducing complexity, try to adapt to it, to cope with it, even sometimes to bypass it in order to build

<sup>1</sup> Including who is part of the decision-making process, and how decision-making actors relate to one another.

<sup>2</sup> Güller, Mathis, and Michael Güller. From Airport to Airport City. Barcelona: Editorial Gustavo Gill. 2003

new capacities of collective action in airport areas. This is what Australian academic Douglas Baker has called “managing the interfaces”.<sup>3</sup>

## RECOMMENDATIONS AND GOOD PRACTICES

- **Adapt governance forms to the local situation**

*There is no magic formula, no universal model of governance that could be equally applied to all airport areas around the world. Each airport area has to build its own tailor-made government arrangements depending on:*

- *The local and national institutional framework*
- *The local negotiating culture*
- *The role of the central State in airport policy and in urban planning*
- *The airport ownership and governance (partially/fully private or public, for-profit or not...)*
- *The airport area’s urban and rural setting in terms of geography, land use or socio-economic characteristics.*

*All these factors have an influence on the topics that need to be dealt with, the way to deal with them and the actors that should be involved in decision-making processes. (See next page for the examples of Stockholm Arlanda and Amsterdam Schiphol).*

- **Who is part in the process: find the right balance between inclusiveness and efficiency**

*While collaborative governance arrangements are highly inclusive and aim to build consensus amongst actors, they can be slow to deliberate when there are many actors involved, or result in decisions that are not always representative of what they originally set out to achieve, and can even fail to make decisions. Collaborative governance necessarily draws system boundaries, which exclude some actors. Therefore, rather than attempting to be maximally inclusive, the arrangements should determine which actors need to be included to have maximum leverage for change.<sup>4</sup>*

- **Create a level playing field for all the involved stakeholders**

*One of the major objectives of airport area governance is to offer spaces of open dialogue and exchanges where all the stakeholders can feel that they are on a level playing field, allowing them to build mutual trust. This also means that the roles of all participants must be clearly distributed, and that clear rules and transparent processes need to be defined, to provide all stakeholders with a guarantee that the processes are fair, open and equitable.*

- **Who decides: find the right balance between vertical hierarchy and horizontal deliberation**

*In “Governing the Aerotropolis”, Stephen Appold and John Kasarda list three main types of governance structures<sup>5</sup>:*

**Market-based** governance is mostly driven by private firms located near airports to maximize their own economic benefit. Historically it has been the dominant form of governance in many US airport areas. The major downside is spontaneous, often haphazard and opportunistic development in the absence of a common strategic vision or coordinated planning.

**Hierarchy-driven** (top-down) governance is common among more recent airports in the Middle-East and in Asia (Hong-Kong, Incheon, Kuala Lumpur), whereby centralized governance by a single public authority allows for stability in decision-making. The main downsides are the lack of inclusiveness of other parties such as local authorities, companies and local residents, as well as slow and difficult adaptation to change. Traditional forms of hierarchical government are often

---

<sup>3</sup> Baker, Douglas. “The Challenge for the Airport City to be a Catalyst for Development: Managing the Interfaces”. In: *Proceedings ACED Conference and Exhibition Airports – Catalyst for Economic Development*, 14-15 Oct 2008, Kuala Lumpur. 2008

<sup>4</sup> Van Buuren, Arwin et al. “Collaborative Problem Solving in a Complex Governance System: Amsterdam Airport Schiphol and the Challenge to Break Path Dependency”, *Systems Research and Behavioral Science*, 29, 116-130, 2012.

<sup>5</sup> Appold, Stephen, Kasarda, John, “Governing the Aerotropolis”, *Global Airport Cities*, 4(1), 12-7. 2009

ill-fitted to cope with the complex interdependencies of scales, actors and topics that develop in airport areas.

**Network governance or collaborative governance** is best suited to address these issues as it is more inclusive and aims to build consensus amongst the various stakeholders. Given the diversity of interests and actors, forms of collective negotiation can be more successful than hierarchical governance and law enforcement. These forms of coordination can enhance trust and therefore the acceptance of projects related to airport development. However they can be slow to deliberate. Collaborative governance has to be worked out carefully in terms of effective implementation and decision-making. “People need to know that time and effort put in will be rewarded in that sense that the negotiated outcome will become a consistent part of the airport-region governance.”<sup>6</sup> Concerns have also been expressed about democratic legitimacy and accountability of network governance as it tends to favor close, blurred and often informal inter-relationships between public, private and non-governmental actors.<sup>7</sup>

In reality, **hybrid forms of governance** are most common: “arrangements to address societal issues mix and borrow elements from a combination of governance modes, drawing on the benefits of one to limit the negative attributes of another. The mixing of governance modes, bringing more and more horizontal actors into decision making arenas, means that decisions are now increasingly negotiated than delivered.”<sup>8</sup>

Governance Mode	Hierarchy	Market	Network
Orientation of actor relationships	Authoritative	Exchange	Interactive
Mechanisms of actor integration	Central and legitimate authority, rules, regulations, codes of practice, procedures, legislation.	Formal, legal contractual arrangements, arms-length transactions, bargaining.	Interpersonal trust, mutuality and reciprocity for actions, negotiating
Focus for managing development	Administrative procedures and accountable outcomes	Contractual delimitation and outcome efficiency	Utilising group resources and providing outcomes that satisfy group concerns

(adapted from Keast & Hampson 2007)

Governance of urban infrastructure decision-making

Source: Donnet, Timothy, *Integrated governance arrangements of airport-region urban infrastructure development*. IRSPM, 2010

### **Governance in Stockholm Arlanda and in Amsterdam Schiphol**

A comparative analysis of governance systems in Stockholm Arlanda airport area and Amsterdam Schiphol airport area show that these two airport areas have made different governance choices according to their specific institutional and urban contexts (see details in opposite page).<sup>9</sup>

<sup>6</sup> Knippenberger, Ute, “Airport-region governance. Conundrums of airports and regional coherence”, in Knippenberger, Ute, Wall, Alex (eds), *Airports in Cities and Regions. Research and Practice*. KIT Scientific Publishing, 2010.

<sup>7</sup> Sørensen, Eva. “Democratic Network Governance?” ECPR joint sessions, 25-30 April 2017

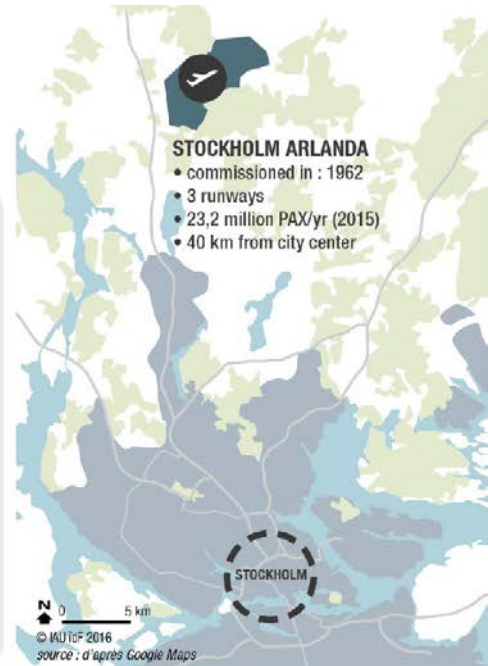
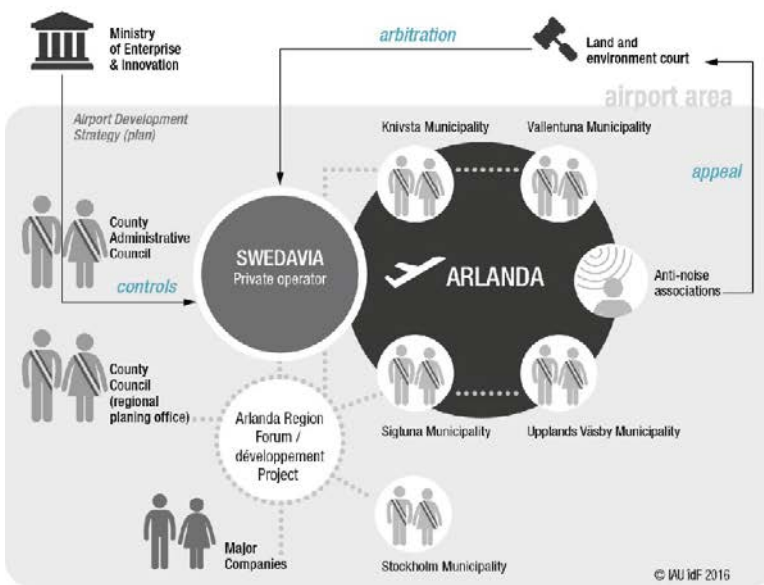
<sup>8</sup> Donnet, Timothy, *Integrated governance arrangements of airport-region urban infrastructure development*. IRSPM, 2010.

<sup>9</sup> Le Goff, Tanguy, Zeiger, Pauline, « Gouvernance des places aéroportuaires : les cas de Stockholm et d’Amsterdam ». *Note Rapide n°736*, IAU îdF, December 2016.

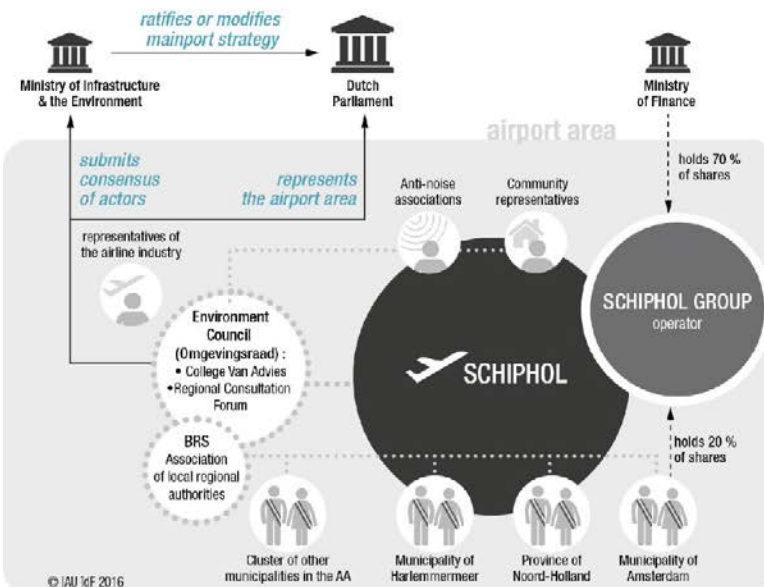
In Schiphol, the governance system is largely shaped by the geographical proximity between airport and city center and by the airport's embeddedness in a densely populated urban setting (inducing scarcity of available land and strong urbanization constraints). Whereas in Arlanda, distance from city center and large land availability lead to emphasizing issues such as ground accessibility (creation of a Stockholm-Uppsala-Arlanda transport corridor) and urbanization potential.

Besides, in Arlanda the State has a dominant role in the airport development strategy with a top-down governance system, while in Schiphol the airport area is managed through a more pluralistic and negotiated governance system so as to deal with the complex institutional landscape: the Amsterdam Schiphol airport is owned and operated by Schiphol Group, a commercial enterprise whose major shareholders are the Dutch State and the city of Amsterdam (plus the city of Rotterdam and Paris Aéroport), but the airport is located on the municipality of Haarlemmermeer.

### GOVERNANCE ARRANGEMENTS IN STOCKHOLM ARLANDA AA



### GOVERNANCE ARRANGEMENTS IN AMSTERDAM SCHIPHOL AA



Source: Le Goff, T., Zeiger, P., « Gouvernance des places aéroportuaires : les cas de Stockholm et d'Amsterdam ». Note Rapide n°736, IAU idF, December 2016.



- **Manage complexity rather than try to reduce it at all costs**

*Inefficiency due to fragmentation and redundancy is often perceived as an issue. In Amsterdam Schiphol airport area for instance, the eight existing long-term governance bodies that discuss airport-metropolitan interfaces (BRS, CROS, Alders Table, BFS, AAA, SRA, AMA, AEB) show some redundancy in the topics they discuss and in the parties that are involved. Some actors therefore press for upscaling and integration of several of these governance bodies. However, other actors argue that the challenges of a complex network environment are best dealt with by governing at multiple scales and that generation of redundancy is actually a good thing. Besides, even though upscaling governance arrangements has several advantages, there is also the risk that a too large governance arrangement becomes a victim of the complexity of its own bureaucratic structure. Thus, the 2013 report on governance in the Schiphol area by the Council for the Environment and Infrastructure proposes an acceptance of the complexity of the current governance structure.*

*Likewise, no universal answer exists on what scale governance should be organized.<sup>10</sup> The relevant geographical scale can vary depending on the issues at stake: the areas and populations affected by noise pollution issues may not be the same as those impacted by a new project of public transportation infrastructure, etc. In order to avoid never-ending discussions about the preferred territorial scope, a more fruitful approach may be “to create a governance solution for each topic as it arises, allowing an adaptive governance to emerge”.<sup>11</sup>*

- **Set up public consultation & dialogue procedures on airport development projects**

*Urban development and airport development tend to give rise to conflicts between many competing and often conflicting interests, such as economic growth versus environmental protection. These current trends increasingly require public consultation and inclusion into decision making processes.*

*Today most international airports have developed consultation processes or structures to discuss with the local communities and the local authorities in the surrounding areas, with various levels of institutionalization and assignments. It can go from one-off public consultation events to specific mediation procedures in relation to new infrastructure or airport expansion projects, to long-lasting structures that are set up either within a national regulatory framework or ad-hoc (oftentimes following a mediation process).*

*Historically, public consultation had been mobilized mainly around issues related to airport-related noise (noise nuisance, complaint management, housing insulation or compensatory measures), but nowadays the topics are much wider, from new “retailtainment” projects such as the Europa City project in Paris Roissy airport area, to new public transport infrastructure or airport expansion (e.g. the Heathrow Northwest Runway, or the Frankfurt Airport expansion project as detailed below).*

*Online public consultation and information through a dedicated website has also become a common practice.*

**Frankfurt Airport: the Forum Flughafen und Region**

*In 1998, a mediation process was engaged to conduct a collective and comprehensive analysis of the options for the Frankfurt Airport expansion project and of potential conflicts. At the time, the process was both innovative and unique in Germany. The mediation process was to clarify the conditions under which the Frankfurt Airport could sustainably improve the performance of the regional economy without increasing the environmental burden. A 21-member mediation group was established with representatives of municipalities, community groups, environmental organizations, industry representatives, Fraport, airline representatives, trade unions, the German Federal Ministry of Transport and the Land of Hesse.*

<sup>10</sup> Fain, Jane, *Towards a Metropolitan Governance in the Schiphol airport region?* MSc Thesis, Delft University of Technology, January 2014.

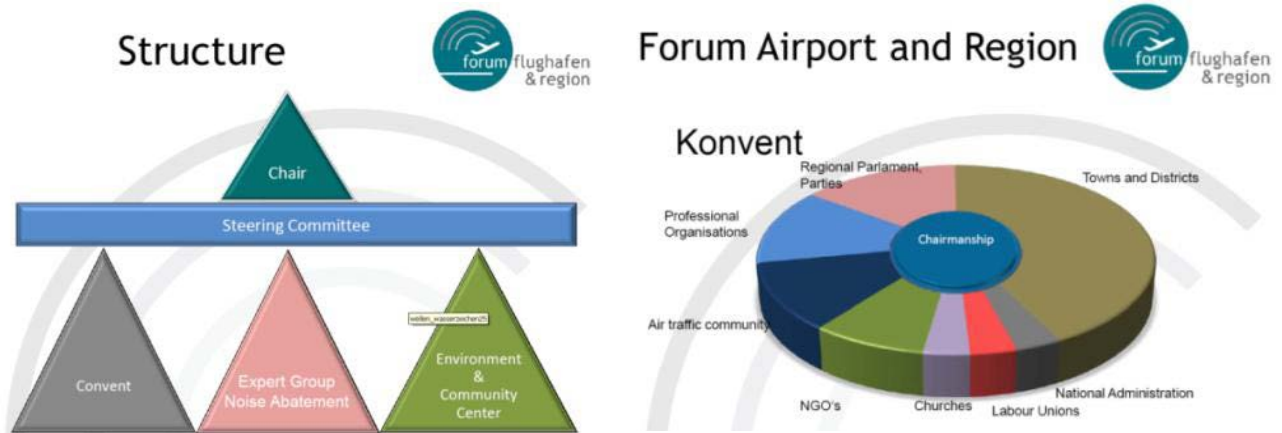
<sup>11</sup> Dutch Council for the Environment and Infrastructure (Rli), *Pulling together. Governance in the Schiphol/Amsterdam metropolitan region*, September 2013

The mediation group produced in 2000 a report on the future of the Frankfurt Airport based on the principle of a sustainable, future-oriented development that brought in line the different ecological, economic and social objectives. This included capacity increase by expansion, a ban on night flights, an anti-noise pact and the establishment of a permanent Regional Dialogue Forum (REF). The report remained controversial, but was successful in shaping the further expansion of air traffic capacities with controllable political risks.<sup>12</sup>

In 2009 the REF evolved into a permanent organizational structure called the Forum Flughafen und Region ("Forum Airport & Region", FFR). The FFR is financed by the Land of Hesse. It is comprised of:

- A triple chairmanship, representing the municipalities, Fraport and an independent personality.
- A Steering Committee of about 10 members for coordination and decision-making.
- A convention (Konvent) of about 60 members, including the Regional Parliament, towns and districts, the federal administration, labor unions, churches, NGOs, the air traffic community, and professional organizations.
- An expert group on noise abatement, as well as commissions.
- An Environment and Community Center (Umwelthaus), in charge of informing and consulting the local communities, monitoring (on environment, air, noise, social indicators), communication, organizing events.

Overall, the mediation process relating to the development of the airport is seen to represent an innovative and effective paradigm for multi-actor cooperation and citizen's involvement.



The organizational chart of Forum Flughafen und Region  
Source: <https://www.forum-flughafen-region.de/>

<sup>12</sup> OCDE (2015), *Governing the City*, Éditions OCDE, Paris.

## II. Build a shared vision & strategy

As detailed in the previous section, an airport area is often made up of several jurisdictions (local governments, airport authorities) that may have competing interests in attracting businesses. A key challenge is therefore to **create cohesiveness among actors** and to get the various jurisdictions to acknowledge the benefits of working together instead of competing with one another. Particularly important is to make sure that the airport's interests are aligned with public interests.

### RECOMMENDATIONS AND GOOD PRACTICES

- **Motivate collaboration by identifying concrete projects**

*In the initial phase, creating mutual trust among the partners is key. Kick-starting collaborative initiative around tangible projects can help rally forces. Flagship events such as sports events, cultural events or professional fairs are potential occasions to gather momentum. Once mutual trust and collective work habits are established among the partners, the scope of work can then be widened and progressively lead to setting a “bigger picture”.*

- **Create an alliance of key public and private partners**

*Whether the governance structure should be informal or formal is open to discussion. Above all, it must be adapted to the local situation.*

*Key principles of this governance process include:*

- Involving public and private stakeholders,*
- Being agile/flexible*
- Adopting methods and tools of project management that will help collective work on various topics such as adopting a budget, setting up an operational and dedicated team, agreeing on the respective responsibilities and the decision-making process, etc.*

*Good practices include:*

- *the Aerotropolis Atlanta Alliance for the Atlanta airport area (see details below),*
- *the Memphis Aero City Alliance,*
- *Hubstart Paris Region® for the Paris-CDG airport area.*

*These alliances bring together businesses, local governments, nonprofits and other interested parties in order to push forward the development of their airport area around a shared vision.*

#### **The Aerotropolis Atlanta Alliance**

*The Aerotropolis Atlanta Alliance (AAA) is a public-private partnership led by the Atlanta Regional Commission (ARC). It was formed in 2014 as a non-profit membership organization and a coalition of local governments, Fortune 500 corporations, local businesses, non-profits, and other interested parties located within Aerotropolis Atlanta (the area surrounding Hartsfield Jackson Atlanta International Airport). It is governed by a 26-member board of the district's top private sector leaders, local Mayors, County Commissioners, and Chambers of Commerce. Its mission is to transform the Hartsfield Jackson Atlanta International Airport vicinity into a world-class airport area.*



*Another key issue was to get public and/or private partners to invest in airport areas. In Atlanta, the challenge has been to convince partners at the State level (the State of Georgia) that the airport is as much a major economic engine for the region as is the port of Savannah on the coast of Georgia, whose development the State has massively funded. “Over the next several years, Atlanta will be hosting some large national sporting events. Many people will be flying into the region, riding trains or driving cars up the interstate through the airport area that right now does not look great, it does not look invested in, roads need to be paved, the landscaping needs*

*improving... So we have been spending a lot of time trying to convince the State to get the airport on their priority list and to take funding that was dedicated to the port of Savannah over to the airport.” (Jon Tuley, senior principal planner, Atlanta Regional Commission).*

*Members of the Alliance can now speak with one voice to State partners and can therefore leverage the impact of their messaging. The same is true with private funders. The State of Georgia is home to a large philanthropic, non-profit community that funds projects in low-income inner-city neighborhoods related to topics such as education or quality of life. These organizations could also be interested in funding projects within the airport area, such as workforce skills training programs. However, they do not want to disperse their funding to several different beneficiaries. They wish to direct it to where it can have the most impact. In this regard, the Alliance can have a positive impact because it creates a well-identified, single platform that can ask for those funds, receive them and implement projects thanks to these funds.*

- **Draw a joint vision of the airport area’s long-term development**

*The collective work will then be dedicated to drawing a shared vision of how the airport area should develop in the mid-to-long term, as well as setting up the strategy and identifying the main objectives that have to be reached in order to implement this vision. Issues related to economic development and to social inclusion are generally easiest to deal with in the first phase. Conversely, it may be more difficult to reach a collective agreement on environmental issues (such as noise or air pollution), but also on a long-term vision because of the pressure that the market often exerts on airlines and on companies. It is therefore important that the partners take all the time needed to build the vision, as well as to share it with the local communities.*

**The Aerotropolis Atlanta Blueprint**

*In 2015, The Aerotropolis Atlanta Alliance (AAA) and the Atlanta Regional Commission (ARC) partnered to develop the Aerotropolis Atlanta Blueprint.*

*The Blueprint is a community-derived development plan that embodies the public-private vision for advancing the partnership priorities in the Atlanta airport area: “To leverage the airport as a major asset to drive economic investment, job growth, and quality of life in the area.”*

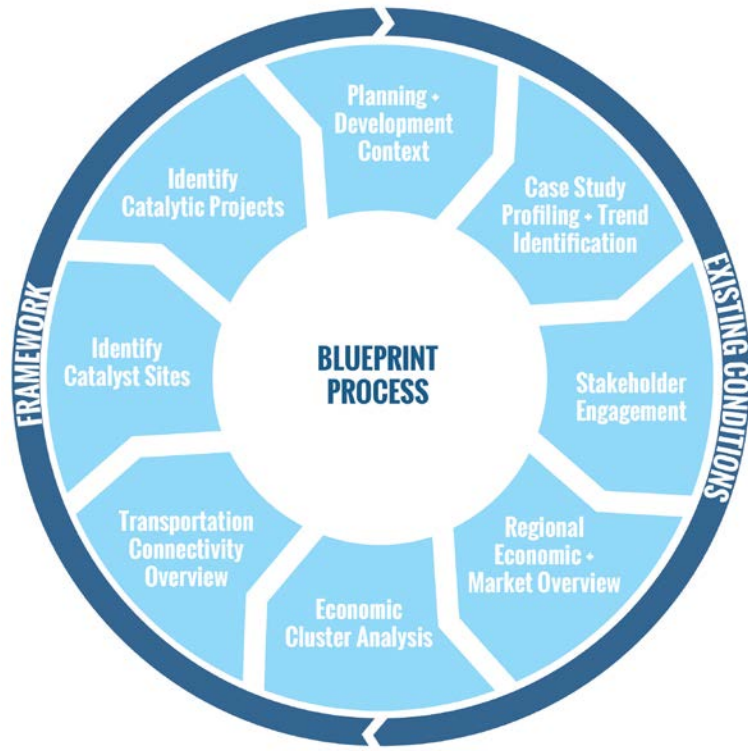
*The Blueprint also provides:*

- *A strategic framework to guide growth and development of the airport area for the next 5 years.*
- *An action plan that identifies existing and proposed initiatives individual partners should pursue to help further the coalition’s efforts and to move that vision forward in a 1-5 year period.*

*The six month process of elaboration of the Blueprint included:*

- *Visioning with a subset of AAA members dedicated to the Blueprint.*
- *Interviews with AAA members and key area stakeholders over a two day time period.*
- *Existing conditions analysis.*
- *Week-long workshop to bring together interested stakeholders and the AAA under a joint strategy.*
- *Consensus around an action plan.*

*The resulting document includes a set of four strategic priorities along with a draft vision statement, guiding principles, and goals to help direct initiatives and actions moving forward.*



*The Aerotropolis Atlanta Blueprint Process*  
© Aerotropolis Atlanta Alliance, 2016



*Stakeholder interviewees during the process*  
© Aerotropolis Atlanta Alliance, 2016



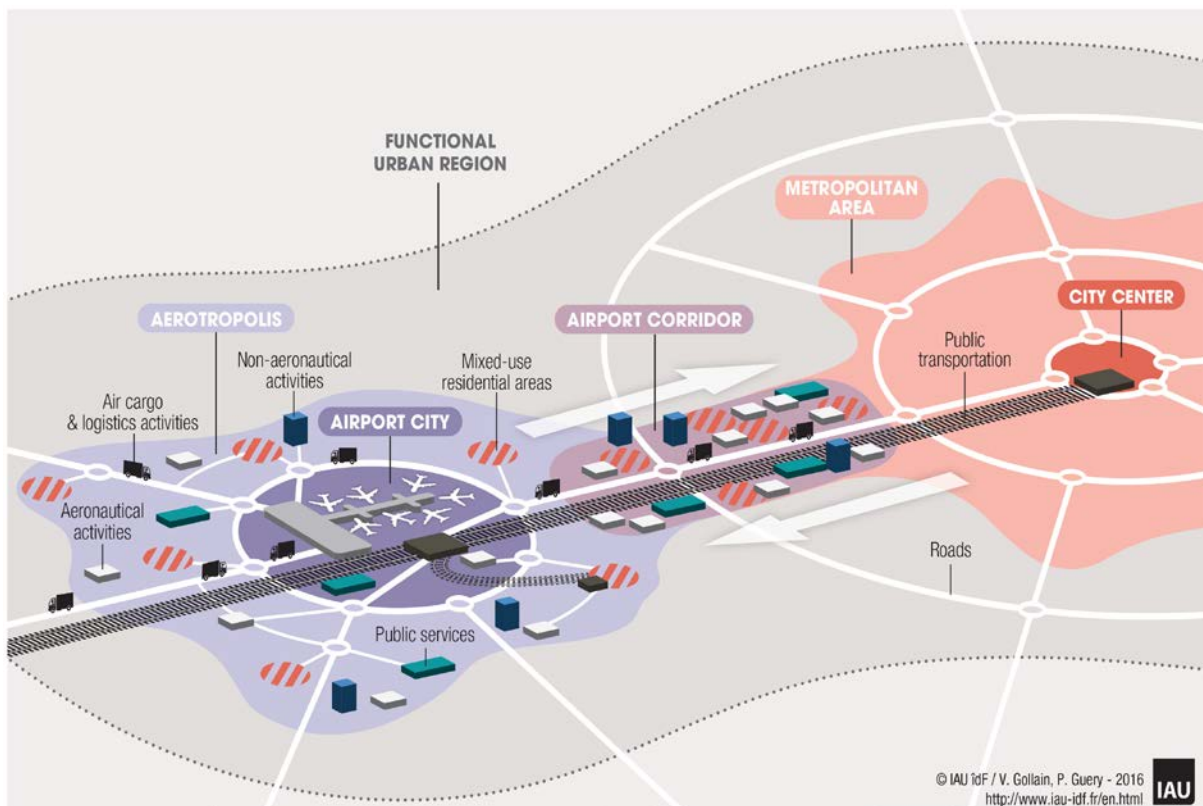
# URBAN PLANNING AND DEVELOPMENT

Although many cities have faced economic crises over the past decades, a tendency of continuous growth producing huge urban output can be observed in the airport areas. However, these urban developments often appear without any planning concept and with little participation of local stakeholders. Those areas become faceless and unaesthetic business parks spread alongside heavy traffic corridors and unstructured poor suburban residential territories. Airport areas, are also territories of special dimension because they have to combine local and national issues, long term economic issues together with quality of everyday life in the area as well as issues of connectivity to the main city and the surrounding territories.

Urban planning is a major tool providing the framework for the coherent development of territories allowing to take into account the scale, the choice of urban design and the possible impacts while associating different stakeholders including the inhabitants. It is a transversal mechanism for sustainable land development connecting quality of life for living and working, mobility, attractiveness, environmental protection as well as actions against negative externalities. In the airport areas, all these urban planning elements gain a special dimension.

Even if urban planning may not solve all the negative externalities provoked by the airport activities, it can help find a balance and determine the means for the realization of specific urban projects. A monitoring-evaluation process is indispensable in order to be constantly on alert for the efficacy of the policies and their adaptation.

Airport-centered urban development assumes different spatial forms, according to geographical position, economic development or business approach of the different airport operators. The main models or concepts of airport related growth are: Airport City, Aerotropolis, Airport corridor and Airport Region.



*Airport-centered urban development spatial forms*  
Source: IAU

## I. Integrate the airport area development into national and regional strategic planning

In order to avoid possible programmatic redundancies or useless competition between territories, the position of the airport area is to be defined according to the development of the other metropolitan centers in the region. Urban development strategies of the airport area are to be brought into line with the regional transport policy to increase the attractiveness of the whole region. It is important to take into account the different layers of interaction between the different territorial scales and to use different tools.

### RECOMMENDATIONS AND GOOD PRACTICES

- **Take into account the interaction between different elements, on different scale.**

#### ***SDRIF (Paris Region's Development Master Plan), Paris Airports, France***

*The Paris Region's development master plan for 2030 (SDRIF 2030), approved in 2013, was drawn up by the Paris Region in conjunction with the French state, involving numerous planning stakeholders of the region. It sets out the conditions for creating a pleasant, attractive, socially integrated and robust region. In order to improve the Paris Region functions as a metropolitan area, the SDRIF sets out plans to boost the economic dynamism of the region, to support a transport system, to develop attractive amenities, to ensure sustainable management of the natural ecosystem as well as to ensure the monitoring of its implementation.*

*The SDRIF is also providing the framework for the long term sustainable development of the two major airport areas in the region (CDG and Orly). It consists in:*

- *Reducing the negative externalities*
- *Preserving actual functions and ensuring growing traffic capacity of the two airports*
- *Restructuring of the CGD and Orly airfields in order to optimize their functioning*
- *Controlling the creation/spread of residential areas and the increase of the population in the areas of strong nuisance*
- *Improving the earth transportation in the airport areas*
- *Improving the quality of life the surrounding population etc.*

- **Co-ordinate urban development strategies with regional transportation plans**

#### ***Denver International Airport (DEN), Colorado, USA and RTD Rail Transit Line***

*The recent delivery of RTD (Regional Transportation District) Rail Transit Line, a rail corridor connecting Denver International Airport to Denver CBD, has created a real "Corridor of opportunity" for the development of the whole airport area. Four new stations were created on the territory of DEN in order to connect the different parts of the airport area:*

- *DEN South terminal and Westin hotel*
- *Tower road / Marriott Gaylord hotel and Conference Resort*
- *National Panasonic HQ offices, Smart city and housing*
- *High-way I-70 / Peña boulevard gateway*

*The construction of the stations stimulates redevelopment around them. It also provides access to/from airport, suburbs and CBD for employees of all different types.*

#### ***Blaise Diagne International Airport, Dakar, Senegal***

*The new Dakar Airport Blaise Diagne is situated in Diass, at 47 km South-East of the Senegalese capital. Train access is being built simultaneously with the construction of the airport. It is important to anticipate the need: not just reacting but being proactive.*





New regional express line from Dakar to Blaise Diagne International Airport  
Source: APIX S.A.

- **Switch from fragmentation to integration of the airport area**

#### ***Paris-Charles de Gaulle International Airport (CDG), France***

*A systemic and holistic approach is applied for the elaboration of a global strategic plan for the development of the airport area. Different stakeholders are involved in the project-level governance. The goal is to mix local public policy issues on different scales and create strategic plans, programs and projects.*

*This approach won the European Urban and Regional Planning Award in July 2016.*

## **II. Dynamic, flexible and adaptable urban planning**

Contemporary airports operate in a context of perpetual changes like liberalization and privatization of airlines and airports, low cost carriers, fuel price developments etc. The airport have to adopt a flexible dynamic approach allowing fast adaptation to the changing situation. Traditionally airport urban development plans were focused on a short-term and singular objective, but a new strategic planning is now being adopted worldwide. This forward-thinking strategic planning is dynamic, flexible and adaptable offering a range of options for future development as well as strict in order to limit the unreasonable irreversible urbanization at the same time. Governance involving the participation of local stakeholders is a key element for finding a sustainable urban development balance in the airport area.

Dynamic strategic planning can be easily adjusted and modified over the time to the actual conditions, in order to avoid negative situations or seized the opportunities arisen. It defines flexible development over multiple levels but commits only the first stage, suggesting different options in the subsequent development stages. The plan has to be adaptable to a range of possible futures (de Neufville and Odoni, 2013).

Adaptive Policymaking is an approach treating the uncertainty. It is based on the concept that in a rapidly changing situation, fixed static policies are likely to fail (Kwakkel et al., 2010).

### **RECOMMENDATIONS AND GOOD PRACTICES**

- **Support urban dynamics, provide for reactivity**

#### ***Hartfield-Jackson Atlanta International Airport, USA***

*The importance of being open to new opportunities arising: The arrival of Porsche in the airport area of Hartfield-Jackson Atlanta International Airport is an “accident of history” made possible thanks to the flexibility of the urban planning. The 27-acre complex located at the Northeast corner of the airport is the largest investment of the sports car manufacturer outside Germany. The industry-first facility is complete with a driver development track, classic car gallery,*

restoration center, human performance center, driving simulator lab and a fine dining restaurant as well as 13,000 square feet of conference and event space. The experience center has been specifically designed as a destination for the public, including automotive enthusiasts and Porsche customers.

### **Edmonton International Airport, Alberta, Canada**

The Edmonton International Leduc (EIA) Partnership was created in order to develop the Leduc Alberta Aerotropolis. It includes the airport operators as well as the city of Leduc and the Leduc County (government together with airport operators). An airport connected development approach was embraced to define target end user economic sectors and their land use, building and employment requirements. Economic market-driven land use and development spatial framework (zoning) was determined. It responds to flexible land and building requirements of target economic sectors, called Flexible Form-Based Code (FFBC). A compatible and complementary land use framework was defined. The results were:

- Collective synergy and cooperation to fund major roads and transportation infrastructures, including Aerotropolis boulevard, which will open up access to the major Port Alberta Logistics Park. The partnership is benefic to the airport, the city of Leduc and the County of Leduc.
- Collective strength to lobby provincial, regional and federal governments to fund major transport and transit improvements such as new interchange with the Queen Elizabeth Highway (aka CavaxMax trade corridor connecting Canada, USA and Mexico), as well as to accelerate the construction and the delivery of Mass Transit (potentially with light rail) from the Edmonton CBD to the Airport area.
- Necessary framework provided to attract and to market private and government investments for specific target compatible and complementary economic sectors including energy, aerospace, logistics, agri-business, perishables...

**Example:** Agrivalue Processing Business Incubator (APBI) was created near the Edmonton International Airport to assist the future of agriculture in the airport area. It is a multi-tenant facility providing infrastructure and services to support and enhance the establishment and growth of new companies and new business ventures in Alberta. The APBI is a federally registered establishment enabling resident companies to market their products nationally and internationally.



Agrivalue Processing Business Incubator (APBI) near the Edmonton International Airport  
©Alberta Agriculture and Rural Development

- **Monitor the situation**

***Economic development Plan of Paris – CDG Airport, France***

*An economic development plan was created to assess the expansion possibilities and to identify the potential development projects in different sectors as well as their time-schedules. Flexible regulations were proposed to allow permanent modification and adaptation of the plan according to the evolution of the market.*

*The specification of each zone is defined in the economic development plan. Several locations are suggested for the development of different projects but some may be identified as having a stronger potential than others.*

- **Exchange and cooperate with all the stakeholders:** The flexibility stems from discussion and cooperation between all the concerned parties: **Aviapolis in Vantaa, Finland** is a good example for successful cooperation.

### III. Sustainable mobility and reliable multi-modal infrastructures

Mobility and transportation access are some of the main urban planning issues encountered in any airport areas around the world. Transport infrastructure is the necessary condition allowing the development of the area. Extensive urban planning based entirely on road access as well as recent massive passenger growth, have led to congested roads in many international airport areas. Compact urban planning combined with well-dimensioned land use program are key elements allowing the development of public transportation in the airport area. A balance between metropolitan and local issues has to be achieved as well.

The global transportation offer in the airport area has to take into account the specificities of the existing network, including all types of passenger groups: from air-passengers to workers on staggered hours.

After establishing a coherent transportation network, it is also important to develop a policy to discourage the use and the parking of personal-use vehicles at the airport.

#### RECOMMENDATIONS AND GOOD PRACTICES

- **Work on different scales: national, metropolitan and local**

***Stockholm Arlanda Airport, Sweden***

*Arlanda station is the 4<sup>th</sup> busiest national train station in Sweden ensuring long distance services as well as direct connections to Stockholm. Arlanda Express was built in 1999 as a high-speed point-to-point connection to the capital. All national and international trains bound to North Sweden call at Arlanda station. The local buses integrate the airport in the regional transport network. Three underground stations were built to optimize the accessibility to the airport area: two for Arlanda Express and one for the international/national/regional trains.*

- **Ensure dense multimodal transportation network which will bring attractive urban intensity as well as economic development.**

***Fuimicino Airport, Rome, Italy***

*With a strong tourist appeal and an important role in the global industry and service sector, Fuimicino airport expects 50 million passengers in 2020 and about 90 million by 2040. This amount of traffic made it the perfect contender for a new, fully integrated intermodal hub.*

The study was launched in 2009. The area's three main transport operators, Aeroporti di Roma, Rete Ferroviaria Italiana and the National Autonomous Roads Corporation (ANAS), signed a memorandum of understanding to carry out the study and to define the preliminary design of the multi-modal transport system.

In February 2015, the airport announced a €12bn investment in transformation of Fuimicino, after ADR and Italy's state-owned train operator Trenitalia struck a deal to build the country's first integrated air and rail transport system (E. Grey, 2015<sup>13</sup>).

### **Charlotte Douglas International Airport (CLT), North Carolina, USA**

The city, the county and the airport are involved and working together on the Airport area development strategy plan (on a 50 square mile area). Major road improvements are key to unlock economic and real estate opportunities as well as social enhancement of the community. The main issues in terms of mobility for Charlotte Douglas airport area are:

1. Enabling mobility and transportation improvements. The mobility streams split into 4 main flows:

- Passenger traffic on the airport terminal
- Commercial goods traffic (logistics)
- Access to work/jobs traffic
- Local/regional commuter traffic

2. Re-assignment of roads using City of Charlotte, State of North Carolina and Federal FAA funds to create a Road framework to achieve mobility improvements and to open-up real estate access for economic development including Norfolk Southern Railroad, intermodal logistics expansion of FTZ #57(Foreign Trade Zone, situated in the airport area).

3. Accelerating the need for mass transit light rail corridor

- **Ensure mobility and local connectivity for non-passengers**

#### **Hong Kong International Airport (HKG), Chek Lap Kok, China**

Government subsidized a bus network (E-bus) to ensure citywide access to the airport for airport employees (fare, around 2\$, regardless of the distance). Direct connections to PTB (passenger terminal building), Cargo facilities, etc. are thus ensured. Limited night bus network operates for shift workers.

#### **Paris-Charles de Gaulle International Airport (CDG), France**

Local public transport plan: Twelve priority connections were identified to connect the residential areas to the offices where people work, as well as to the Paris Region public transport and to the future Great Paris underground network.

- **Concentrate the freight in multimodal centers**

Intermodal transportation via sea ports, roads and railways is already well-developed within the freight market. About 30% to 40%<sup>14</sup> of all freight in any region is transported with the help of intermodal transportation. As airports and railways were historically developed independently, the idea of constructing mixed rail-to-air hubs has emerged recently.

The freight development in the airport areas is mainly based on road accessibility and affordable land market. It is thus spread incoherently through the territory. The freight offer should be structured and grouped, depending on its type, its transportation specificities and the proximity of a multimodal transportation centers.

#### **Trans-European Transport Network (TEN-T) program**

Over the past eight years, the European Union has been funding hundreds of co-modality projects under the TEN-T program aiming to ensure the cohesion, interconnection and interoperability of the trans-European transport network through next-generation transport infrastructure. A number of these projects focus specifically on building links between railway corridors and local airports for both freight and passenger transportation.

---

<sup>13</sup> According to the Global Intermodal Freight Transportation Market 2015-2019 report by research company Technavio

<sup>14</sup> <http://www.railway-technology.com/features/feature/rail-air-freight-can-it-work-4593678/>

#### IV. Spatial coherence and selective economic development of the airport area

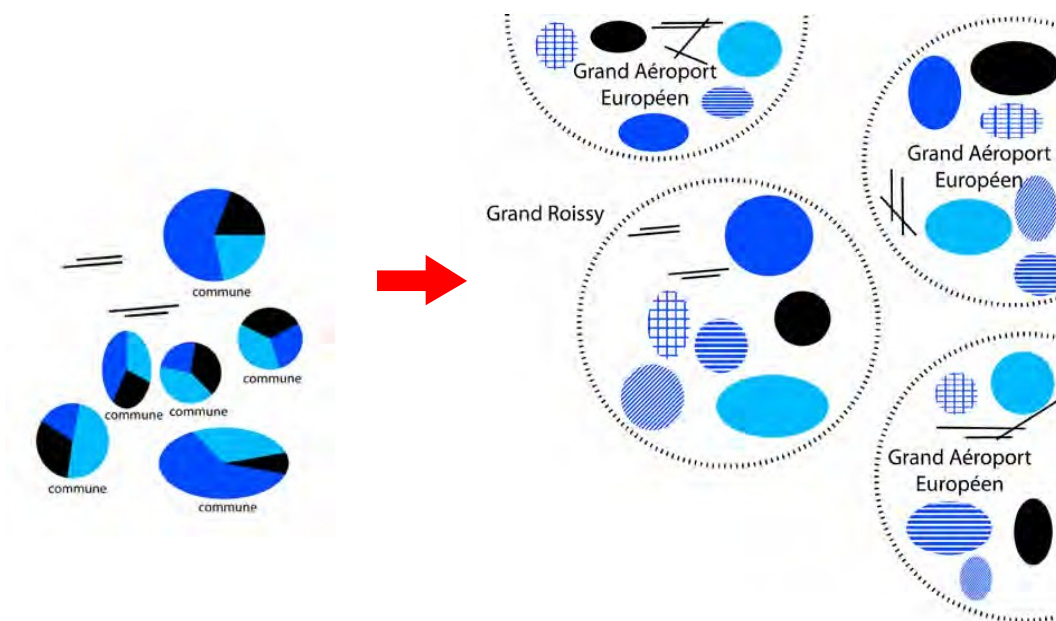
Airport areas are often territories of eclectic urban development and strong territorial competition. Organizing the space coherence and diversifying the activities is crucial for the visibility and competitiveness of the entire airport area. Choosing selective growth on a high level is a key action allowing further development as well as reduction of the environmental impact.

Many factors have to be considered when applying selective methods on the scale of the airport area: the analysis of the type of the activity to be located, the proximity to the airport platform and the neighbor city as well as the public transport services and the risk of traffic jams. It is also important to limit the offer of similar activities: being too disseminated, they do not allow the achievement of qualitative economic performance.

The selective development would allow the move upmarket of the airport area activities. The fret offer and the fret location have to be structured according to the multimodality, the infrastructure specificities of the different possible sites as well as the type of the fret activity.

#### RECOMMENDATIONS AND GOOD PRACTICES

- Join and coordinate airside operations and real estate development in the airport area
- Switch from eclectic development to selective one.



*Paris-CDG actual development where neighbor communities are hosting a variety of functions (left) and Paris-CDG possible future development where selective principals are applied and communities are specialized in different functions (right)*<sup>15</sup>.

© Groupement Acadie, Atelier Ch. De Portzamparc, Agence Güller Güller

#### **Schiphol Airport, Amsterdam, Netherlands**

*Schiphol Airport has the crucial position of Mainport in the Netherlands. To strengthen Schiphol's economic function and to meet the noise mitigation agreements, the parties in the Alders*

<sup>15</sup> Rapport final: Etude d'orientations et schéma d'aménagement durable du grand territoire de Roissy, DRIEA

Platform<sup>16</sup> agreed to allow Schiphol scope for continued, selective growth. To accommodate such selective growth at Schiphol, Eindhoven Airport and Lelystad Airport are undergoing development as alternative airports for non-Mainport-related air traffic. Furthermore Rotterdam The Hague Airport and Eindhoven Airport have their own networks to serve the business and non-business (leisure) markets in their respective regions.

## V. Land is a scarce resource

Airport areas are very attractive territories for economic development. However, air transport is the main function of an airport and this function do not have to be corrupted through unreasonable land use. The fast growth of the airport areas has to be carefully framed to avoid the irreversible and unsustainable occupation of precious land. Natural and agricultural land are real richness and has to be considered an important heritage to preserve.

The control of the land consumption can be achieved through reversible urban development allowing mutability of different zones: activities, transport infrastructures, wasteland, residential... The extensive urban development cannot be a sustainable model. The future model should not only integrate the creation of new activity zones but also the transformation of the existing ones and their requalification and clustering<sup>17</sup> all together.

### RECOMMENDATIONS AND GOOD PRACTICES

- Increase density rather than using new land
- Be very strict on planning strategic land reserves for future aviation

#### **Schiphol Airport, Netherlands**

Netherlands has one of the highest population density in Europe (409 persons/km<sup>2</sup>). Dutch have looked through different solutions to increase the land surface. Land has even been reclaimed from the sea by poldering. Nevertheless, huge areas around Schiphol airport remain free of constructions. The built-up areas are extremely dense, allowing the remaining land to be placed in reserve in order to be used for aviation purposes and future development of the airport.

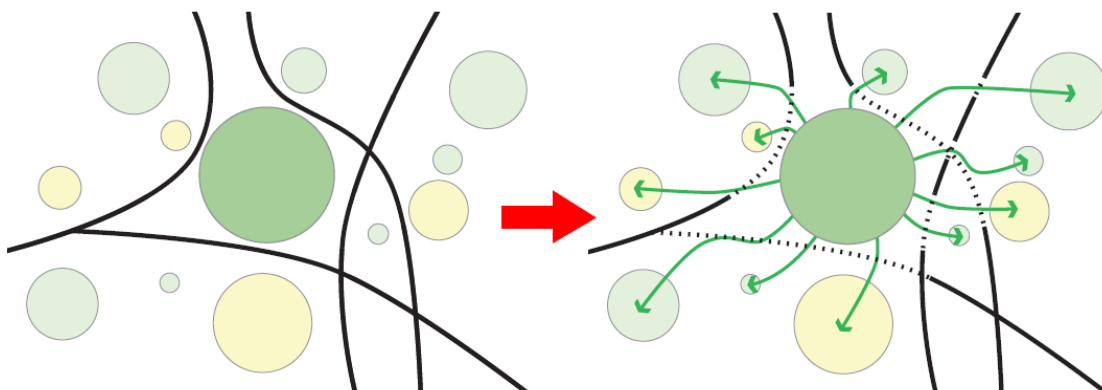


Schiphol airport area © Google Earth, 2011

<sup>16</sup> Consultative forum created to advise the Government on balancing the requirements of aviation growth at Amsterdam Airport Schiphol, disturbance reduction and local environmental quality.

<sup>17</sup> Etude d'orientations et schéma d'aménagement durable du territoire de Roissy, Groupement Acadie, Atelier C. de Portzamparc, Agence Güller Güller.

- Enhance quality of open areas, improve connections between them



© Groupement Acadie, Atelier Ch. De Portzamparc, Agence Güller Güller<sup>18</sup>

*Airport areas are often fragmented territories because of the heavy infrastructures they host. Links between the open spaces are essential for enhancing the urban quality.*

- Make business locations sustainable through appropriate ownership land policy
- Optimize land use

#### **Copenhagen Airport, Denmark**

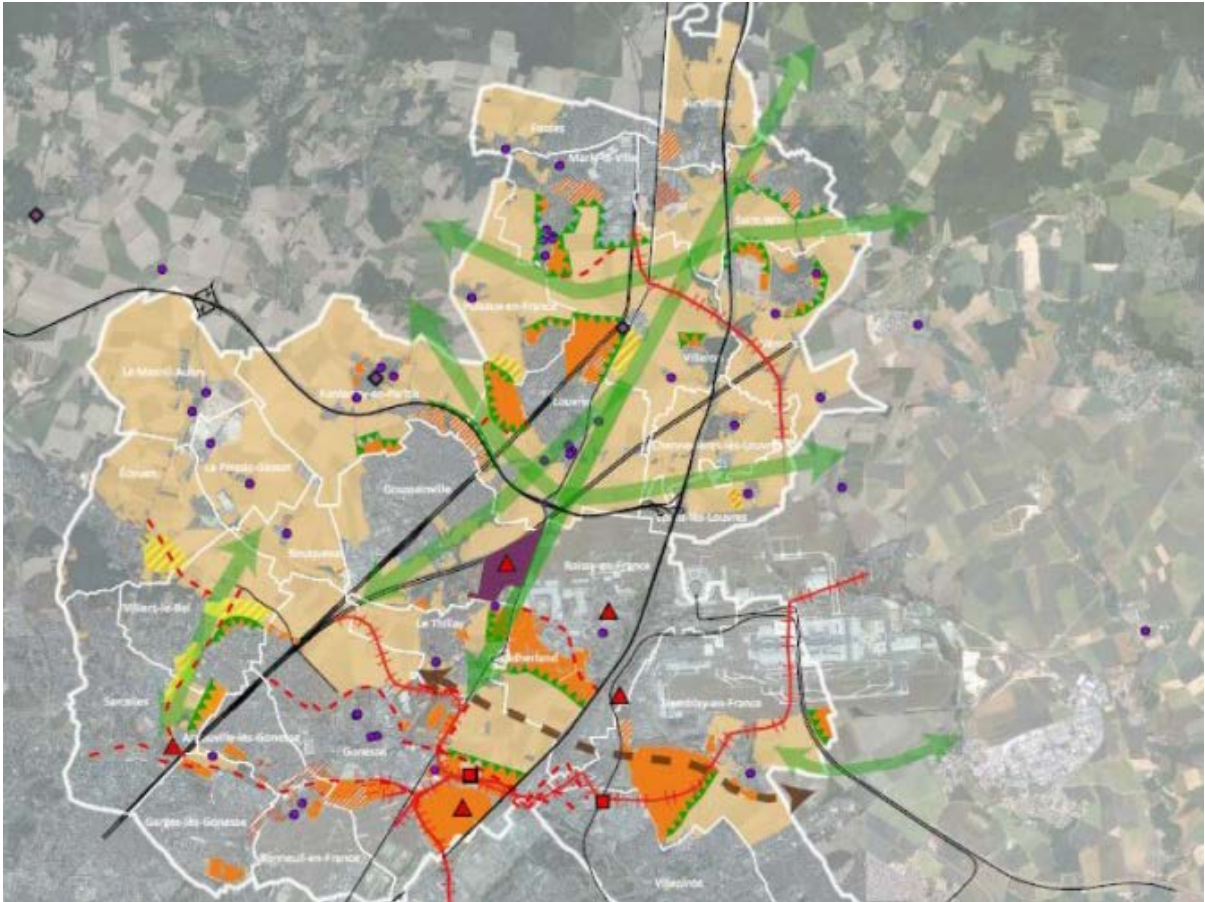
*Copenhagen Airport is expanding in order to handle up to 40 million passengers annually, almost twice the current number. Unlike other expanding airports, Copenhagen Airport is not planning to build a new, separate terminal. On the contrary, the plan is to increase the capacity of the existing terminal complex in a phased process. The airport authorities wish the Copenhagen airport to remain compact and manageable. Terminals 2 and 3 will be merged, and Terminal 1 is expected to close as a domestic terminal. The compact structure will offer good conditions for transfers, boosting airlines' business and enhancing the passenger experience. Expansion of the terminal structure will allow the accommodation of 50-70% more aircraft stands which is achievable by shortening the crossing runway. Originally built by the Germans during World War II, when the aircraft were more wind-sensitive and needed longer runways to land, today this runway is only used for about 0.2% of the take-offs and landings. Thus there will not be any new land consumption while doubling the size of the existing terminal complex. The works have started in the beginning of 2017.*

- Preserve agricultural land

#### **Paris CDG Airport Agricultural plan**

*The Paris-CDG Airport Agricultural Plan has been created in 2013. It was followed by the establishment of the Agricultural Charter for the protection of 8000 ha of agricultural land in the Greater Roissy area which has been signed by 25 communities in September 2016. Huge areas with surfaces of more than 1000ha are forbidden for construction on a long term while smaller ones, which are less interesting from agricultural point of view, will host new development. The purpose is to boost the economic development and the construction of dwellings in the area while preserving agriculture and farmers at the same time.*

<sup>18</sup> Rapport final: Etude d'orientations et schéma d'aménagement durable du grand territoire de Roissy, DRIEA



Agricultural plan of Grand Roissy Airport Area  
© EPA PdF & DDT95

- **Compensation for land expropriation / room for growth**

Compensation for land expropriation is an important issue in Asian countries where certain airports are in full expansion. The villages situated near the airport are demolished to allow the construction/extension of the airport. The main question is how to fairly compensate the residents.

#### **Beijing New Airport Area, China**

*A relocating house program providing framework for accompanying the residents in the expropriation process was created. It includes different compensation standards, environment actions, employment promotion, such as:*

*Better design and construction are provided to local residents whose homes were demolished such as Green star II labelled houses.*

- *The residents are involved in the design and the construction of the new relocation housing.*
- *Standard social security services are provided for local residents such as pensions, medical care, education etc.*
- *Higher standard community service facilities are provided, such as kinder gardens, primary schools, nursing and commercial facilities...*
- *Trees and other landmarks from the original homes are preserved and replanted in the gardens of the replacement housing*
- *Vocational training for local residents is provided for free so that the rural population can make professional adjustment and find jobs in the service sector or industrial economy.*
- *Certain policies are applied to companies hiring local inhabitants.*



## VI. Design of the airport city as a mixed-use city

Urban planning and design of airport cities have to be sound and flexible. Often perceived as “no-man’s land”, airport areas are unattractive territories for living. There is a lack of urban amenities and services in these areas. Attractive housing would bring real inhabitants into the area. These sensitive territories require that specific attention should be paid to the design of the common space, since it is one of the main contributors for the generation of urban value.

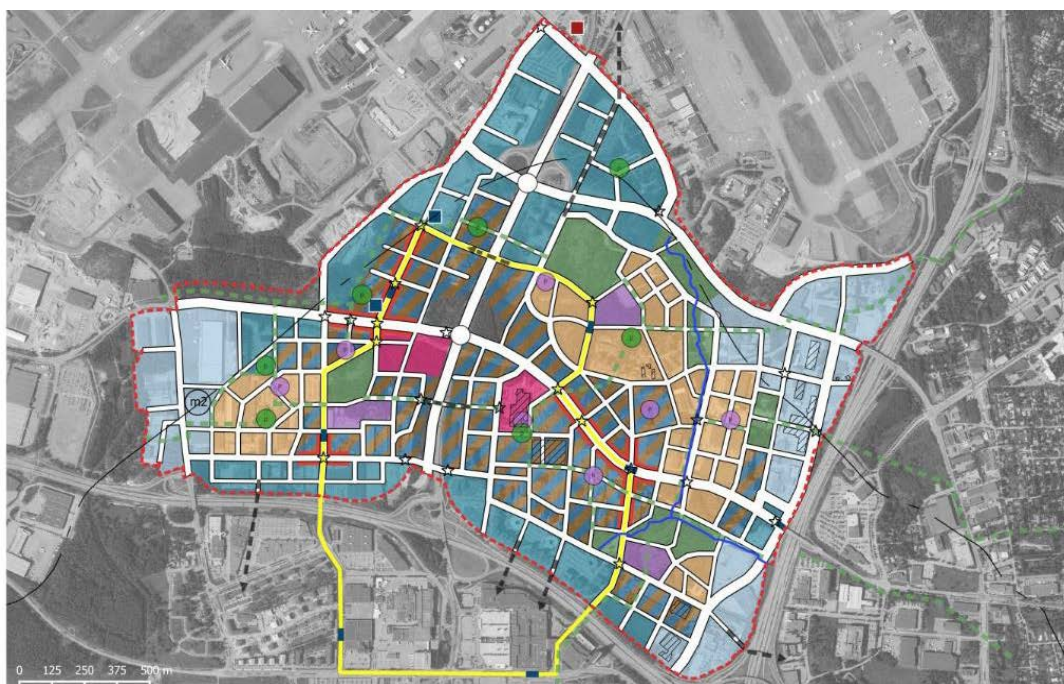
The provision of appropriate street patterns and connectivity and the allocation of open spaces are main elements for succeeding in the transformation of the airport city in a real city. Equally important is the simplicity in the layout of the constructible blocks and plots, combining appropriate compactness and economic mixed use of the built area, in order to reduce mobility needs. Finally, the airport area large scale design should facilitate the strengthening of the social mix and interaction and the cultural aspects of the territory.

### RECOMMENDATIONS AND GOOD PRACTICES

- **Balance density according to transport offer**
- **Create a mixed-use development**

#### ***Aviapolis, Vantaa, Finland***

*Aviapolis is the fastest growing international business area of Helsinki region, which City of Vantaa has committed to develop. Centre of Aviapolis will be built in the coming decades next to the Airport connected to the new Aviapolis Train Station and the center of Pakkala. From monotonous business area to diverse neighborhood of housing, businesses and services, the change of city structure requires a new urban model. Housing requires pairing with recreational areas, which were not needed in the current business area. It is possible to utilize the starting points of the landscape structure for creation of new recreational network. Such are streams and wetlands, major topographic features and the border zone of the ridge that should be combined to form the skeleton of the landscape network.*

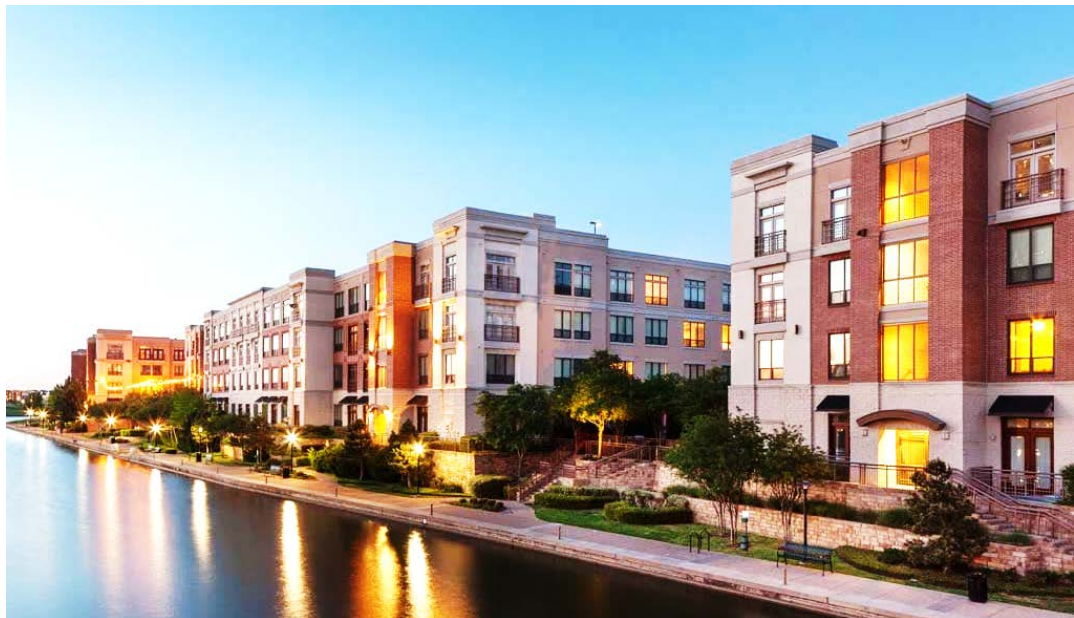


*Aviapolis New Masterplan, Vantaa, Finland*  
© Vantaa, Aviapolis, 2016

- **Find a balance between economic activities and housing, build housing for all socioeconomic levels of employees**, not only for the modest workers but also for the high qualified employees. Always pay attention to the noise zones.

***Dallas Fort Worth International Airport (DFW), Texas, USA***

*Dallas Fort Worth International Airport is situated at the intersection of five different municipalities including the cities of Dallas and Fort Worth. DFW's excellent connectivity has attracted many Fortune 500 headquarter offices (Exxon, ADP Marshal, Sabre etc.). Their high-qualified employees live in some of the highest income housing in the USA situated within the DFW airport area (Irving, Grapevine, Southlake...). Exxon and ADP are located in Las Colinas "edge city" in Irving. Las Colinas was a suburban business park until the recent construction of Dallas Area Regional Transit (DART) light rail which connected the DFW international airport to the CBD of Dallas as well as to Las Colinas, stimulating the urban development in the area. The whole area was planned in 1972 to benefit from its proximity to Dallas-Fort Worth, and has grown to become a successful example of an upscale, mixed-use development. This TOD (transit oriented development) brought more affordable, multi-family residential projects near the train station areas, appealing to young people, families and employees without cars.*



*Las Colinas, Irving, USA*  
© AMLI

***Liege Airport Area, Belgium***

*SOWAER housing policies in the Walloon region (Liege Airport Area) – very strong real estate policies. The region has a real estate agency charged to buy the houses and to put them on the renting market. Considering noise issues, people are less inclined to complain and make problems if they are renting than if they were owners.*

- **Aim for urbanity and hospitality, create qualitative space on human scale**

Urban aesthetic is a result of the assemblage of structures that form an interdependent whole, the city. The role of the architecture is to mix art and space in order to construct "timeless" building complexes. To achieve such a level of urban aesthetic, the urban space should consist in associating urban structures in a harmonious morphological coherence.

Airport areas are often territories where aesthetic and urbanity have not been looked for. They have been thought to be functional and affordable: huge building blocks, without façades and with scarce landscape effort of their surroundings. Urban and architectural projects should break with this barbaric and introvert

development to give way to new urban forms well meshed, less space consuming and much more attractive for the inhabitants.

**Schiphol airport, Amsterdam, Netherlands**

New development project has been undertaken at Schiphol airport in 2013 in order to bring urbanity to this "no man's land". The aim was to make the area more welcoming and attractive for the CBD employees and the residents of the neighboring municipalities, as well as to develop a prosperous and sustainable airport area. As a result, the central area of the CBD has undergone significant changes. Several initiatives have been undertaken to promote conviviality and hospitality of the area. During the last 5 years the exterior and interior public space has been entirely refurbished..

"The Base" complex was inaugurated in the center of the CBD in 2015 : a car park surrounded by three office buildings was covered by a glass roof and converted into an atrium that became an attractive public space. It actually houses a public library, a nursery open 24/7, a fitness center, a leisure area, two cafes and a restaurant<sup>19</sup>. In addition, the ground-floor of the office buildings have been reconstructed to make it more user-friendly and convivial.



Construction of « The Base », Schiphol Airport  
© buitlingstaalbouw.nl



Atrium, « The Base », Schiphol Airport  
©iadvisegroep.eu



Public library, « The Base », Schiphol Airport  
© S.Logreco, K.Fritz, C.Malandrino



"The Base Breakout" – Leisure space, Schiphol Airport  
© S.Logreco, K.Fritz, C.Malandrino

In parallel, a community in the workplace (SPOT) was created in order to bring animation and promote events for employees. An online platform informs them about the events organized by the SPOT (exhibitions, afterworks, guided tours, food trucks, ice rink at Christmas etc ...). Following the example of Schiphol, to avoid a monofunctional urban development and create a prosperous and sustainable airport area, it would be necessary<sup>20</sup> to :

- Create density and diversity
- Plan and develop on human scale
- Open and make more lively the ground floor of the buildings, in order to make visible their occupation and show the human presence
- Create meeting spaces, exterior and interior, attractive and well identifiable
- Organize events

<sup>19</sup> Les places aéroportuaires – de la fonctionnalité à l'urbanisté - K.Fritz , S.Logreco, C.Malandrino, juin 2017

<sup>20</sup> Pieter van der Horst at Sustainable airport areas international seminar, Hubstart Paris Region, October 2017

- Use long-term business development models focusing on the needs of the customers and their employees.



"The Cabin", an innovative pop-up, used for a meeting room  
© S.Logreco, K.Fritz, C.Malandrino



Schiphol Plaza – Public space  
© S.Logreco, K.Fritz, C.Malandrino

- Introduce compact urban shapes, create infrastructure for walking and cycling

### **Aviapolis, Vantaa, Finland**

The center of Aviapolis is in the district of Veromies, situated on the South of Helsinki airport. The Veromies district includes small-scale industry, office buildings and several hotels. The Aviapolis Frame Plan aims the transformation of this area into a versatile and vibrant urban development with 20 000 residents and 40 000 jobs.

Main objectives for the planning of the area:

- Turn the motorized city into a walkable city neighborhood.
- Build ecologically and culturally sustainable city.
- Make sustainable transport choices competitive and create innovative travel solutions.
- Enable settlement of 60 000 jobs in the area.
- Build a city district of living and housing for 20 000 residents.
- Make Aviapolis an airport city where people come from near and far.

The first main objective of the frame plan is to transform the motorized business area into walkable city neighborhood. The urban model of the area is rethought and reshaped in order to become more "human". The actual building blocks are too big (300mX300m). The frame plan offers different urban structures for the new development of the area. It is estimated that the new median block street side dimensions will be between 100m and 150m with a walking path or street separating the blocks. Pedestrians and cyclists would thus be encouraged to occupy the public space.



Kartanonkoski residential area, Aviapolis, Finland © Pertti Raami/City of Vanta

- **Innovate, be unique, create your own identity.**

*It is important to take examples and inspiration from other airport areas but without blindly duplicating their models. There is a risk of losing competitiveness while copying the others. Urban and architectural models reflecting the local heritage bring originality and real identity to an airport area development. The construction of the roof of **Denver International Airport** evokes the snow-capped peaks of the neighbour Rocky Mountains, while the old **Jakarta Airport** terminal building is inspired by typical Indonesian architecture.*



© Denver International Airport



Soekarno-Hatta Airport, Jakarta, Indonesia © JakartaAirportOnline.com

- **Use qualitative architecture to create attractive exteriors and interiors**

#### **Bilbao Airport, Spain**

*The new terminal, designed by the architect Santiago Calatrava covers an area of 25,000m<sup>2</sup>. Aesthetics are very important because the airport is the gateway to the Basque capital. White and very expressive, the Bilbao International Airport is a gigantic three-story block of steel and glass with a sharp silhouette. The steel and concrete structure, called La Paloma (the Dove) because of its resemblance to a giant bird about to take flight, is integrated into the hilly green landscape of the surroundings of Bilbao. The aluminum skin of the Central Terminal sweeps across the 140 meter long terminal entry, providing cover for multiple levels of arrival and departure. The layout of the airport has been designed to limit the impact of ancillary buildings on the view of the main building. The four-story car park is tucked into a grassy embankment, out of sight once the vehicle has been parked.*

#### **Madrid Barajas International Airport**

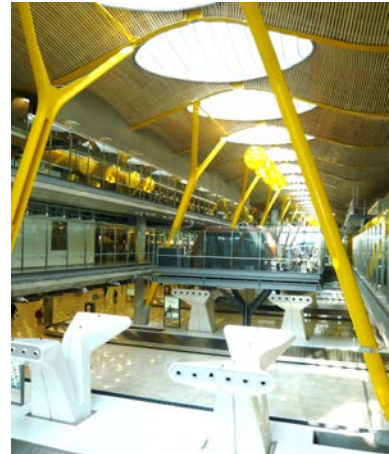
*Madrid's new Barajas International Airport terminal, featuring vast, light-filled halls, was honored with the Royal Institute of British Architects Stirling Prize — Britain's most prestigious architecture award. The building's designer, the Richard Rogers Partnership, beat challenges from five other contenders with its colorful airport terminal, which is three-quarters of a mile long.*

**Marrakech-Menara Airport, Morocco**

The new extension of Marrakech-Menara Airport is most notable for its unique and functional façade. The light is filtered by arabesques that cover the windows, a structure that is reminiscent of typical wire mesh combined with modern touches. The facade comprises 24 rhombuses and 3 triangles. They are clad in white aluminium panels and filled in with glazing.



Bilbao airport / © Bilbao airport



Madrid airport / © P. Lecroart, IAU



Marrakech Menara Airport, Morocco / © Getyourguide



Carrasco Int Airport, Uruguay / © archityperreview.com

- **Use vegetation and greening**

Greening plays an important role in building environmentally friendly spaces. It beautifies our environment, especially in no mans' territories like airport areas. It provides freshness, beauty, comfort and elegance as well as reduces heat islands. It thus improves our environment and enhances the quality of the urban space.



Schiphol Airport © Schiphol group



Green roof at Chicago airport © tcooper1960

### **O'Hare International Airport, Chicago, USA**

The FedEx Cargo Relocation Facility now includes the largest green roof in the City of Chicago and the second internationally, behind the green roof at the Frankfurt, Germany airport. The 3.9 acre structure is the size of three football fields. Green roofs are not only aesthetically attractive because visible from planes, they also act like thermal insulation, reducing the urban heat island effect and help with storm water management. In addition, they reduce noise, air pollution and lower energy costs.

### **Land Art Park Buitenshot, Schiphol Airport, Netherlands**

The Land Art Park Buitenshot was created not only to reduce ground noise from the aircrafts but also to add aesthetic and recreational values to the area. Its design is a unique integration of landscape architecture, land art and innovative technology (for more details, please refer to Chapter "Environment").



Land Art Park Buitenshot, Schiphol Airport, Netherlands  
© Paul de Kort

- **Be sustainable, integrate sustainability into the earliest possible stage of a project.**

### **Chattanooga airport, USA**

The Chattanooga Airport's new energy-efficient 9,000 square foot corporate flight center (FBO) terminal facility is awarded platinum certification from the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) green building certification program. The FBO terminal, is the only aviation terminal in the world to receive platinum certification representing the highest possible level of energy and environmental performance.

### **Honk Kong International Airport green architecture**

HKIA's terminals use modern glass façades and building envelopes to reflect heat and reduce cooling loads. Roof skylights optimize natural light during the daytime, and light sensors automatically reduce indoor lighting when there is sufficient daylight. Innovative cooling systems are in place in Terminal 1 to cool only the bottom three meters of the large indoor spaces to effectively provide comfort for airport staff and passengers, while leaving the air above at ambient temperatures. In 2014 when the Midfield Concourse was opened, a Green Airport Design Strategy was applied to every major building and facility at HKIA. In 2017, the Midfield Concourse achieved the BEAM Plus Gold Standard, featuring 35 green initiatives.



Hong Kong International Airport, China  
© Hong Kong International Airport

- **Preserve the cultural and natural heritage**

***Warszawa-Modlin Airport, Poland***

*Integrate existing and/or heritage buildings and find new functions for them: Because the most sustainable projects are the ones that are never built, the project team is searching to meet identified facility needs by using existing buildings instead of resorting to new construction. The existing and/or heritage buildings are thus restored and integrated in the master plan of the airport area and are actually hosting new functions. When new construction is deemed necessary, policies are put in place to ensure projects to be built in a sustainable way.*

*The question arising: how to integrate the fortress situated near the airport in the airport city planning?*

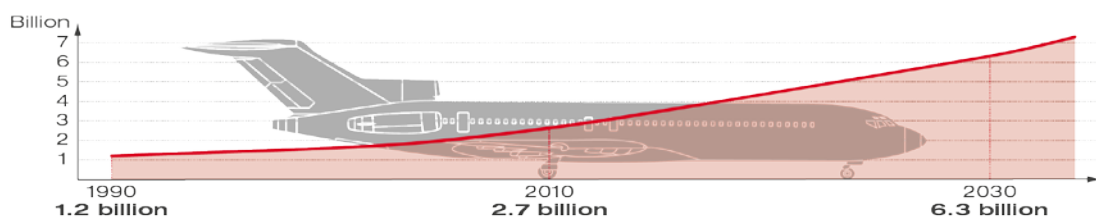


# MOBILITY AND ACCESSIBILITY

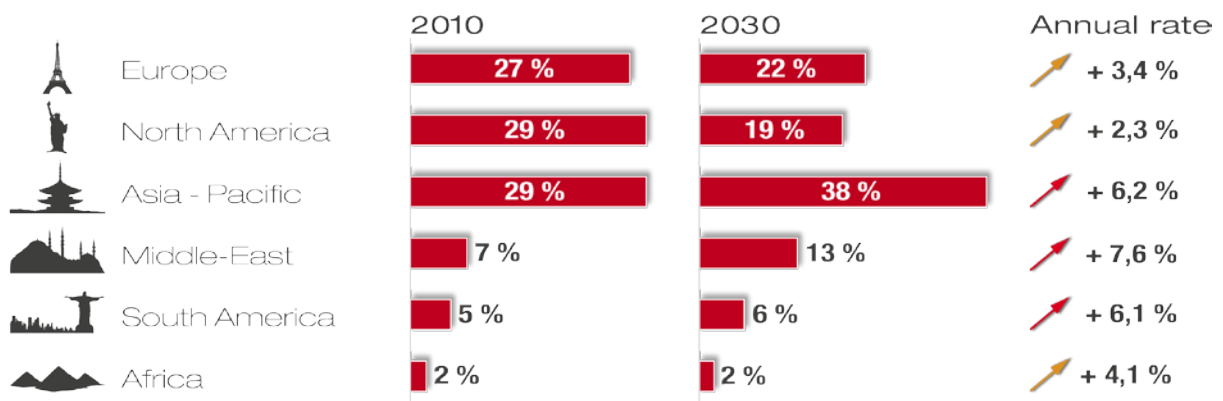
## I. Demand knowledge is crucial, as passenger flow will reach new heights

International tourism is growing fast: from 940 million of tourists in 2010 to 1,800 million in 2030 according to the World Tourism Organization. As far as transport is concerned, the International Civil Aviation Organization forecasts a growth of air passengers from 3.1 billion in 2013 to 6.3 billion in 2030. These trends question our airports' ability to welcome smoothly and efficiently such a high number of passengers.

Passenger growth



World share in passengers-kilometers



Source: ICAO, Cir 333 Global Air Transport Outlook to 2030 – © IAU idF, 2015

The airport authorities deal with the challenge of flow growth through their development strategy. But they can sometimes overlook its impacts on the different geographic scales of ground transportation. It shouldn't be only focused on enhancing mass transit between the airport and the city center but should also deal with connections to nearby cities, secondary business centers or within the airport city and its urban developments.

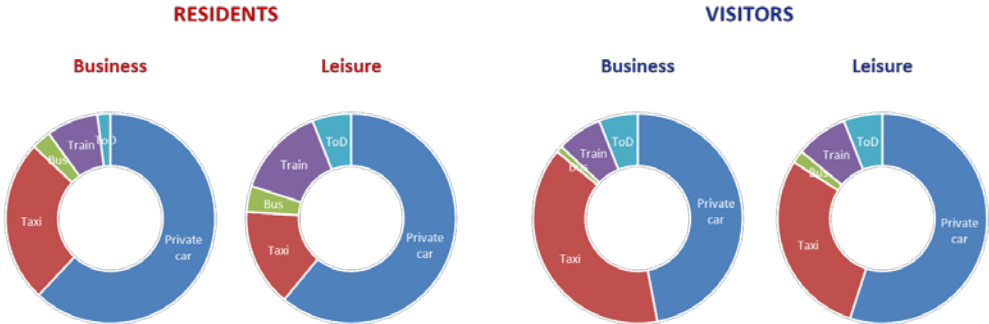
In a budget-constrained era, it has become necessary to invest with care in public transportation (PT). Each market segment calls for a specific approach considering its needs, priorities and constraints: employees or air passengers, business or leisure trip purpose, coming from high or low urban density areas, etc. For instance, it is important to separately analyze the residents, who are familiar with the local transportation networks, and the visitors, who don't have the same knowledge or access to a private car. Previous studies have demonstrated that there isn't one single approach that can ensure a high PT mode share for everybody. Knowledge of the market is the key.

**RECOMMENDATIONS AND GOOD PRACTICES**

- **Undertake scheduled airport ground access surveys**

**San Francisco International Airport**

The Metropolitan Transportation Commission sponsors regular ground access surveys for Oakland and San Francisco International Airports since 2001. Those surveys allow for a better understanding of the passengers’ habits and transportation modes. The results can be analyzed according to their status (residents or visitors), their trip purpose, the hour of their trip, etc.



SFO Airline Passenger Survey 2006  
 Source: Metropolitan Transportation Commission, JD Franz Research, Inc.

- **Interpret the market and identify the segments with specific needs**

**Multiple services in Tokyo Narita International Airport**

Two operators, with seven different train services, answer to various market segments: express (no stop), fast (7 stops) or local (up to 23 stops), depending on the fare the traveler is willing to pay, his time sensitivity and his destination. In addition, bus services are in charge of the catchment area closest to the airport.

**Kuala Lumpur VIP service**

In order to improve the PT ridership and attract more business travelers, the Kuala Lumpur International Airport provides a specific “top of the range” package which combines an “express” train journey with personal luggage handlers and a limousine service to reach the final destination from the “express” train station.

**Hong Kong downtown terminal**

The airport being far from Hong Kong, a downtown terminal welcomes passengers in the city center. Check-in and baggage drop-off can be done before getting on a train to the airport. This kind of terminal is nevertheless complex to organize as it requires partnerships with airlines and security measures for luggage handling. A downtown terminal is also available in Abu Dhabi, Delhi, Kuala Lumpur, Shanghai, Seoul, Vancouver or Vienna but this service has been withdrawn from Bangkok, London, Madrid, Rome and Tokyo.

- **Monitor the adequacy of the system with the development of demand**

**English airports**

In the UK, the Government’s “Aviation Policy Framework”, published in 2013, set out a clear method for the development of airports. It incited 27 British airports to elaborate a specific surface access strategy in order to increase mode share for public transport, for passengers as well as employees. Each airport should engage in an “Airport Transport Forum” bringing all the transport

stakeholders to the table. The main output is a clear framework for each action that ought to be implemented and how it should be monitored. Today, the British Government take these strategic documents into account before granting any air capacity increase.

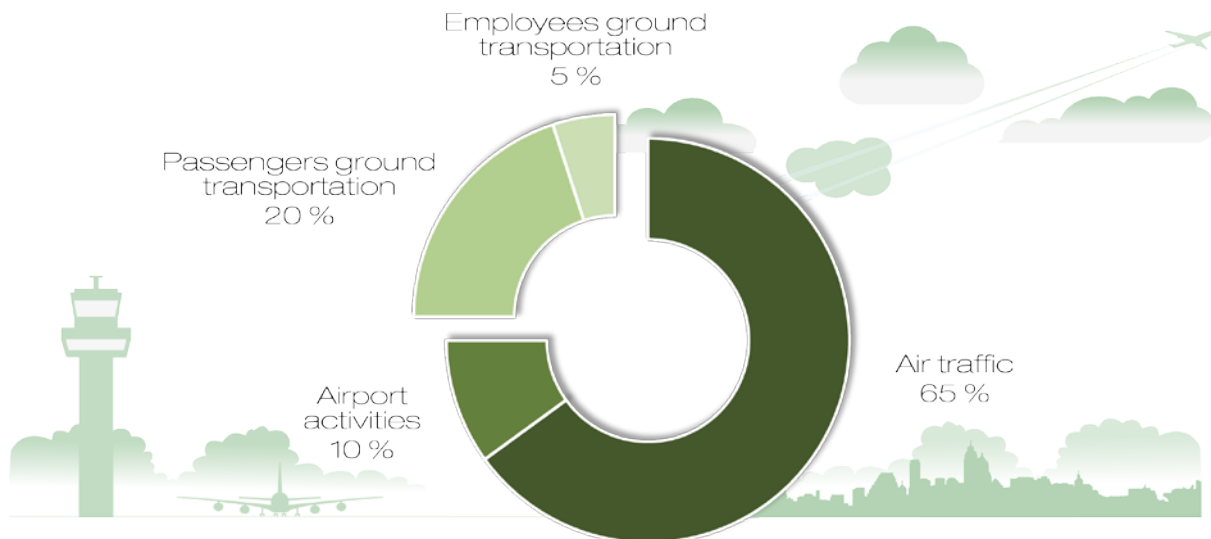
**Washington airports**

The Washington metropolis is supervising a “Continuous Airport System Planning” program for the whole regional airport system (three main airports) since 1978. This program regularly surveys passengers’ mobility patterns (every two year) and their evolutions in order to forecast any necessary adjustment to the public transportation service.

**II. Airport authorities must be involved in the local environmental and mobility strategies**

The environmental impact of the air industry became a worldwide concern. Air companies already provide substantial efforts to reduce their fuel consumption (mainly for economic reasons) and the improvement of their carbon footprint is now dependent on the development of greener energies. In the near future, it is likely that the main measures for reducing air traffic emissions will be based on the market: carbon pricing, emissions trading system, etc. In the meantime, reducing greenhouse gas emissions will focus on the environmental footprint of the airports themselves and especially their landside emissions.

25% of CO2 emissions from airports come from ground access [ARC, 2010] which is the main field for local action. This key-issue emphasizes the need to provide more eco-friendly means to access the platforms, especially through public transportation considering the importance of the flows mentioned in the previous chapter.



CO2 emissions from airports  
 Source: Airport Regions Conference, 2010 – © IAU idF 2015

But ground access is a tricky matter, as it is often out of the airport authorities’ jurisdiction. The regional or national authorities can fail to include the specific needs of airport customers or employees in their mobility strategies. Moreover, ground access is one of the most complicated topic to deal with as the greener transportation modes are often the ones with the highest investment and operating costs. Considering the scope of matters at hand, a great deal of negotiation and diplomacy are needed between the various stakeholders involved: airport authorities, national and local governments, local authorities, transport authorities, operators, companies, associations, land owners, etc.

## RECOMMENDATIONS AND GOOD PRACTICES

- **Define the stakeholders and get them to the table**

### ***Mediation process in Vienna***

*The Vienna airport needed to expand (new runway and new terminal) but the airport authority faced a strong local opposition. In order to have a global agreement for the airport extension, a mediation process started with the establishment of a preparatory group. The first result was a mediation agreement signed by all participants that opened the way for further dialogue. In 2001, the biggest mediation procedure ever undertaken in Europe started with more than 60 representatives of 50 different groups participating (local governments, airport authority, NGOs, airlines, political parties, etc.). The work was done in different groups: a process steering group, the mediation forum and work groups. More than 75 meetings took place in the last years. The whole process was documented on a website to guarantee transfer of information and knowledge. In 2003 a partial contract was concluded. In 2005 a final general declaration was signed by more than 50 partners. Finally, a dialogue forum was established for future conflicts management.*

### ***Boston Logan Airport***

*Since 2009, the main stakeholders for airport access strategy in Boston are cooperating through the MassDoT (Massachusetts Department of Transportation): highways, mass transit, aeronautics and registry of motor vehicles. MassDoT is recognized for its innovative approach of flow management, especially through its coordinated program for infrastructure improvement. In terms of passenger information, MassDoT created the Mass511.com website which collects real-time data on traffic conditions.*

- **Designate a leader**

### ***Mobility Plan for Barcelona El Prat airport***

*The extension of Barcelona airport had been approved without a clear strategy on how to handle the mobility of more than 60 million passengers in the future. The local government of El Prat was worried about the foreseeable impact on traffic and air quality in the area (already polluted over the limits fixed by the EU). Therefore the municipality engaged in the Mobility Master Plan for the Barcelona airport and was the leader of the procedure. The local government had meetings with all public transport authorities, the airport (owned by the State) and trade unions in order to convince them of the necessity to develop a Mobility Master Plan and a permanent Mobility Commission afterwards. Goals were set for public and private mobility of passengers and employees and what the actions and investments by all stakeholders needed to be. The first meeting was in 2002 and the Mobility Master Plan was approved in 2006. From then on, the Mobility Commission of the airport is operating.*

- **Coordinate with the regional and national strategies**

### ***The green strategy of Stockholm Arlanda Airport***

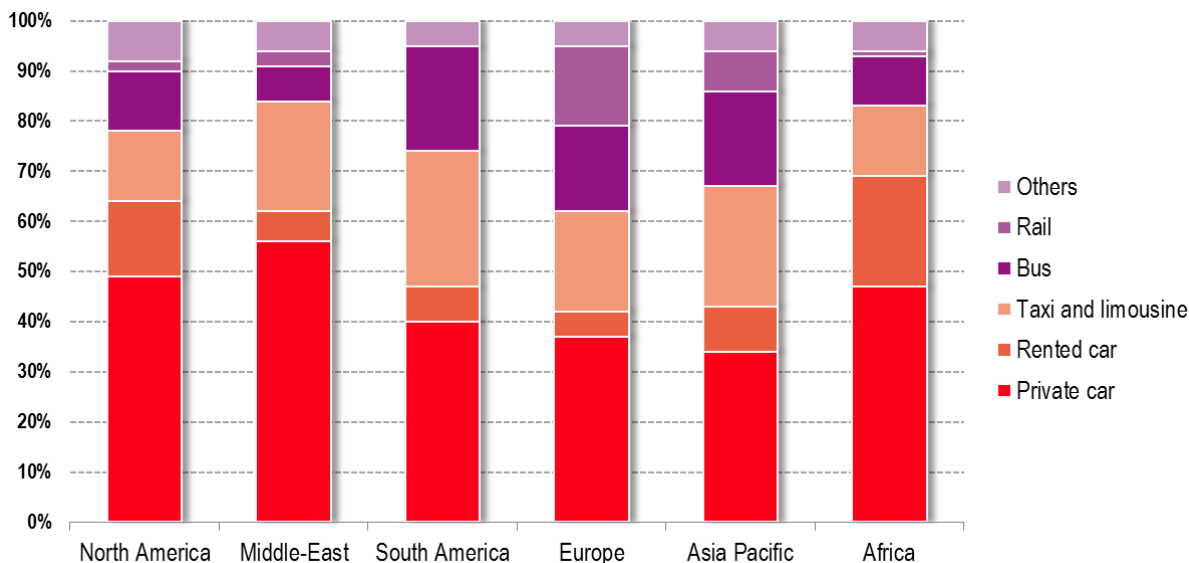
*Due to carbon dioxide emissions cap in Stockholm, Arlanda airport's environmental permit doesn't allow for current emissions to exceed the level produced in 1990. As a symbol of environmental commitment, Arlanda needed to create incentives for taxi companies to progressively replace their conventional fuel vehicles with hybrid or taxis powered by renewable fuels. Therefore, the "eco-taxi" project started in 2005 introducing separate lanes outside the terminals depending on the type of vehicle (eco- or ordinary) and priority was given to the eco-taxi lane. The inauguration of a biogas filling station at the airport in September 2010 made the use of green-fuel taxis easier. Now, all taxis picking up passengers are eco-taxis. Non eco-taxis are still allowed to drop passengers off, but since they are not allowed to pick up any new ones,*

*this is not a profitable route any more. Now there are currently eight lanes and priority is set according to the CO2 efficiency of the vehicles, the fastest lane being reserved to electric cars. The program was extended to Gothenburg, Malmo and Bormma airports in 2012.*

### III. Emphasize public transportation for national and regional accessibility

On worldwide average, 71% of air passengers use a private mode to access airports. Only 5% of 118 airports surveyed by the Airports Council International in 2012 had a private car share of less than 40%. Other recent studies on airport ground transportation have identified the following criteria affecting mode share:

- **Distance between airport and city center:** a long distance can be advantageous for public transport (high taxi fares)
- **Demand structure:** a condensed catchment area can make mass transit easier to implement, with frequent services
- **Airport size:** large airports, with high passenger flows, are more likely to invest in public transportation and develop numerous mobility services
- **Local mode share:** each world region has its specific approach to transportation modes. Private car usage is more likely in the Middle-East (56%) and in North America (49%), taxis have a high share in South America (27%) and Europe is especially keen on public transport (33%)



Mode share for airport ground access  
 Source: Airports Council International, « Airport Quality Survey », 2012

Public transport ridership is highly dependent on the local context and the airport size. Large airports (>15 million passengers per year) are more likely to have a high PT share: Oslo (68%) and Tokyo-Narita (59%) have some of the highest PT share as they are far from the city center (50-70 km) and take advantage of a well-developed transport system. Island airports, such as Hong Kong (63%) are also good examples<sup>21</sup>.

But local context doesn't explain everything. A thorough analysis shows that world airports have implemented various strategies in order to influence the mode share of their passengers: upgrade and diversification of services, stress on a high quality of service, ticketing and pricing strategies, etc. An efficient and attractive access can't rely on a single quality, whether it be speed, directness, transfer possibilities, etc. It seems obvious that a successful ground access must combine them all, which often means the association of mass

<sup>21</sup> Source : Avinor, 2010 (Oslo), TRB, 2000 (Narita) and MTRC, 2005 (Hong Kong)

transit towards main city centers, express buses towards secondary city centers, shared cabs or transport on demand for areas where the demand is scarce or scattered.

A focus on the world major airports shows that they are often served by many different options to reach out to a wide market, whether it be express, regional or national trains, metro, express or local buses, etc. The Hong Kong international airport even provides a ferry service connecting the Pearl River Delta economic zone.



**RECOMMENDATIONS AND GOOD PRACTICES**

- Find the appropriate mix of services and infrastructures for your situation

**Seoul Incheon International Airport**

Thanks to a carefully designed airport with a main station at its core, Seoul Incheon combines national high speed trains, regional train services and the express train "A'REX". Its catchment area expands far beyond the limits of Seoul city and reaches out to the whole Korean country, contributing to make it one of the best airports worldwide.

**Kuala Lumpur International Airport**

KLIA offers two main train services: the nonstop KLIA Ekspres and the 3-stops KLIA Transit. The latter also serves a major federal administration center. The two services share the same tracks and fares but they have different station platforms and visual identities. Thanks to this particularly legible service, 46% of trips are work-related and 24% of passengers are regular users.

- Provide specific services to the different geographic scales

**Denver International Airport**

*“SkyRide” scheduled coach services connect the Denver airport to twelve Park & Rides, distributed in the whole urban area. Special parking fees are available for residents within the Regional Transportation District. Many other American airports resort to express buses and Park & Ride facilities to adapt to a scattered catchment area (Boston, Los Angeles, San Francisco...).*

- **Facilitate national accessibility**

**Zurich Airport**

*With 350 daily train connections, Zurich airport has an influence over all Switzerland. Some cities are connected twice an hour, including major economic and administrative centers such as Geneva, Basel or Lausanne. The airport website offers a rail “travel planner” in order to illustrate the many opportunities at hand for passengers.*

**Frankfurt Airport**

*A combined flight / train check-in procedure is available for Lufthansa / ICE travelers, thanks to a partnership between the airline and the DB train company. Nevertheless, this kind of procedure has important consequences on the development of logistics and software programs in order to ensure a smooth journey for passengers and their luggage.*

**Copenhagen train station**

*Copenhagen airport provides excellent rail connections with a metro station and a national / international train station (for Denmark and Sweden). Both stations were inaugurated in 2007 as a single intermodal hub.*

## IV. Ensure a high level of performance

The first modern airports have been built with freeways as the main access and the city center as the main destination. Today, cities are expanding, freeways are jammed with traffic and airports often serve several urban areas. Environmental awareness implies that ground access to airports can't rely on cabs and private cars anymore. Nevertheless, it is hard for public transportation to provide an answer as attractive as car mobility and to reach out to all the different market segments. A high level of performance is expected in order to ensure a smooth, reliable and pleasant journey for each passenger, whether it be on the road or on tracks.

“Express” train services are often highlighted for their level of performance. In fact, the Airports Council International noticed that 19% of world airports chose to offer an “express” train service to their main city center<sup>22</sup>. Beyond their controversial nature, what these “expresses” often imply is a reliable way to connect the airport: priority access to the tracks, specific stations, scheduled timetables, fixed travel time. They are costly but can deliver the highest level of performance for some markets.

Other modes can learn from the “express” train services feedback: limit interference with other services, coordinate the various stakeholders, ensure good maintenance of rolling stock, tracks and stations, plan ahead evolutions of demand, etc. Building a new infrastructure, offering a new service isn't the end of the road. Holding a reliable and performant service over the long haul is the hard part, especially for airports which have a tremendous impact on the country's or city's image. First impressions often come from a taxi window or a waiting time in a station.

<sup>22</sup> Source Airports Council International, DKMA, “Airport Service Quality, Best Practice Report, Ground Transportation”, 2012

## RECOMMENDATIONS AND GOOD PRACTICES

- **Public transportation should be the top priority**

### **Oslo Gardermoen Airport**

When Gardermoen was chosen in 1992 to be the new airport site for Oslo, authorities knew it was far from the city center (around 50 km) but decided that public transportation would be the main ground access mode to the new airport. The airport layout was based on a single terminal, whose heart would be the train station. In this station, the outer tracks would accommodate national train services, whereas inner tracks would accommodate “express” train services to the city center. Today, Oslo airport has the highest PT share in the world (68% in 2010 including 40% for the Flytoget express train). With an excellent punctuality rate (96%), Flytoget always takes precedence over any other train on the tracks. Its frequency is one of the highest for express train services with those of Hong Kong and Beijing (10 min). In addition to this, a national train leaves the airport station every 20 minutes, reaching out to all of Norway.

- **Define what the target of your performance should be and monitor it**

### **Delhi Indira Gandhi International Airport**

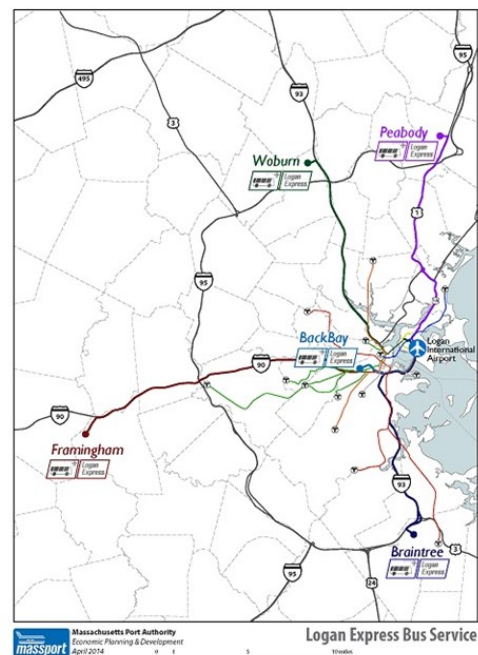
The Delhi metro line serving the airport was built thanks to a public-private partnership. As ridership was insufficient, the fares were lowered by 40% in order to bring them closer to the ones of buses and other public lines. The frequency of trains and their speed were increased as well. Specific subscriptions for airport employees were created, connections improved and the first train schedule moved earlier. Today, as ridership increased, the Delhi Metro considers to extend the line.

- **Promote bus and HOV lanes**

### **Boston Logan Airport bus services**

Since June 2012, the Silver Bus Line is free for passengers boarding at the airport (normal fare is \$2.65). Massport, the government agency managing the airport, funded part of the rolling stock and reimburses the operator for uncollected tickets sales (nearly \$100 000 each month). Between 2012 and 2013, the Silver Line ridership rose by 18%, while the metro ridership remained stable. Boarding times were also reduced (hence travel time), as well as traffic pressure next to the terminals.

Moreover the Logan Express Bus Lines are non-stop services connecting the airport with four Park & Ride facilities, 15 to 30 km away from the airport. Those bus lines are free for subscribers to the MBTA (Boston metropolitan network).



Express Bus Lines and Park & Ride facilities for Boston Logan Airport

Credits: Massport

- **Performance is connected to maintenance (roads, tracks, rolling stock, stations)**

### **Improving the Malpensa Express service in Milan**

When Alitalia left the Malpensa airport in 2008, the Malpensa Express train service needed to attract new customers. Services were offered to the Central Milan train station thanks to a new infrastructure (the Malpensa Express used to serve only the Cadorna station) and services with



*intermediate stops were also created. This meant an increase in stations and tracks quality in order to maintain the image of a “premium” service. As a moving image of the far away airport (>40 km from the city center), rolling stock was also renewed.*

**The Dulles Access Road in Washington**

*The Dulles Access Road connects Washington Dulles International Airport to the city center. It is a free and direct highway, built exclusively for the airport in 1962. It is owned and operated by the airport authority since 2006. The airport authority has total control on this strategic link which is a spotless image of the Dulles airport. This highway should accommodate for a railway line, a project that is partially financed by the airport authority.*

**V. Envision ground transportation from a passenger’s point of view**

The mobility patterns of air passengers are peculiar: their trip is necessarily multimodal (as it includes air and ground travel), they are highly sensitive to the reliability of their travel time, their freedom of movement can be limited by luggage or travel partners and they are likely to be unaware of the airport layout. Therefore, if public transportation is to be attractive compared to the freedom of car mobility, it should be designed for their needs.



**Hosts at CDG airport train station**  
Credits: IAU idF

The passenger’s point of view should prevail over any other point of view. All effort should be put into ensuring a smooth experience for the passengers as soon as they enter the ground transportation area. The anxiety of an air journey should never be overlooked: “will I arrive on time?”, “where can I put my luggage and is it safe?”, “where should I land or board?”, “how expensive is the trip?”...

These issues can become overwhelming if the passenger is in an airport, a city or a country he doesn’t know or if he doesn’t master the local language. This is not only the case for public transport: taxis or car rentals are also affected.

Information and human care should be at the center of the process. Every air passenger goes through an air terminal. They are focal points for the whole transportation system. The quality of information the passengers receives there is essential. Welcome centers, posters, leaflets, legible and comprehensible signage are some of the tools that can be used in the terminals and can lead the passengers to the most appropriate transportation option. But information should also be remotely accessible: websites and apps have become key-translators of an airport complexity. Their update and legibility can be part of a successful information process and help the passenger make his choice, without having to look up for each operator’s website.

Finally, airports are not equal: some of them have a layout made for an easy understanding, some of them are a bit of a headache. Some are relatively new but others have to deal with their heritage. For instance, most of the major American and European airports still operate terminals that were inaugurated before the 1970s. Even refurbished or extended, they still impact the whole airport layout. Dealing with this heritage from a time when car access was the rule brings another dimension to an already complex matter. In those cases, the passenger’s point of view is even more crucial: airport and transport authorities should put a huge stress on human presence, information, signage, shuttles, landmarks... but keep it simple and understandable for everyone.



**Smiling servants**



**Information Inquiry**



**Care for the old**



**Airport Ambassador**

*Human care in Shanghai Pudong airport*  
Credits: Shanghai Airport Authority

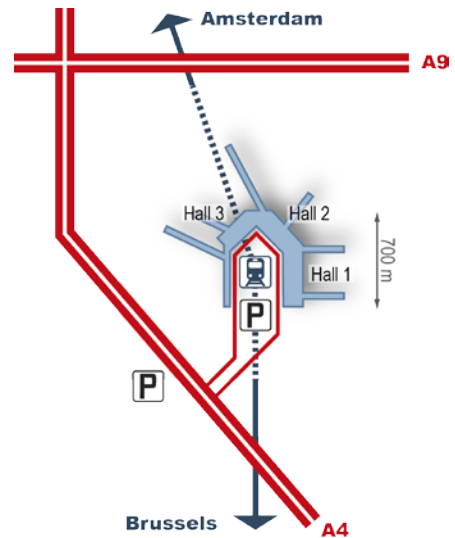
## RECOMMENDATIONS AND GOOD PRACTICES

- **Integrated Ground Transportation Centers make journeys easier**

### **Schiphol Plaza in Amsterdam Airport**

The Schiphol Plaza is the main hall for the airport. It houses a shopping center, a cultural center (museum, library, etc.) and the Ground Transportation Center. National and international train services are located downstairs and bus services are right outside Schiphol Plaza. As a unique focal point, its design helps to concentrate relevant information. Its signage is clear and comprehensible. Its location takes into account the specific paths of passengers, as boarders or landers sometimes travel on different routes.

Schiphol Plaza isn't a unique case. Copenhagen, Munich or Kansai airports are also well-known for the efficiency of their Ground Transportation Centers which offer a wide range of train or bus options to all passengers and employees.



Ground Transportation at the center of Amsterdam Airport  
Credits: IAU IdF

### **Miami Intermodal Center**

In Miami, the airport station was moved in order to better answer to passengers' demand and make the different services more efficient and reachable. This project was identified by the Federal Government as of national importance. The brand new "Miami Intermodal Center" includes the rental car center, a taxi stand, bus station, subway station and train station for Amtrak and Tri-Rail services. The new station could also welcome high speed train services in the future. It is connected to the terminals thanks to the automatic "MIA Mover" shuttle.



MIA Mover in Miami Int'l Airport  
Credits: © Steven Brooke Studio

- **Human presence is essential**

### **Singapore Changi Airport**

Changi airport is known for being one of the best airports worldwide. As the local transport authority is competent regarding train services, bus services and taxis, the major access modes to Changi airport benefit from the same strategy. As it is close to the city center (low taxi fares) and without a direct metro line (connections with nearby territories were preferred for airport employees), the airport chose to emphasize human support. In each air terminal, specialized agents advise passengers 24/7 regarding the best transportation option according to their individual needs.

### **New York JFK Airport**

In each air terminal, the Port Authority manages a welcome center where passengers can get advice for ground transportation. The signage is common to all New York airports with simple

colors: yellow for air-related devices, green for ground transportation and black for other services.

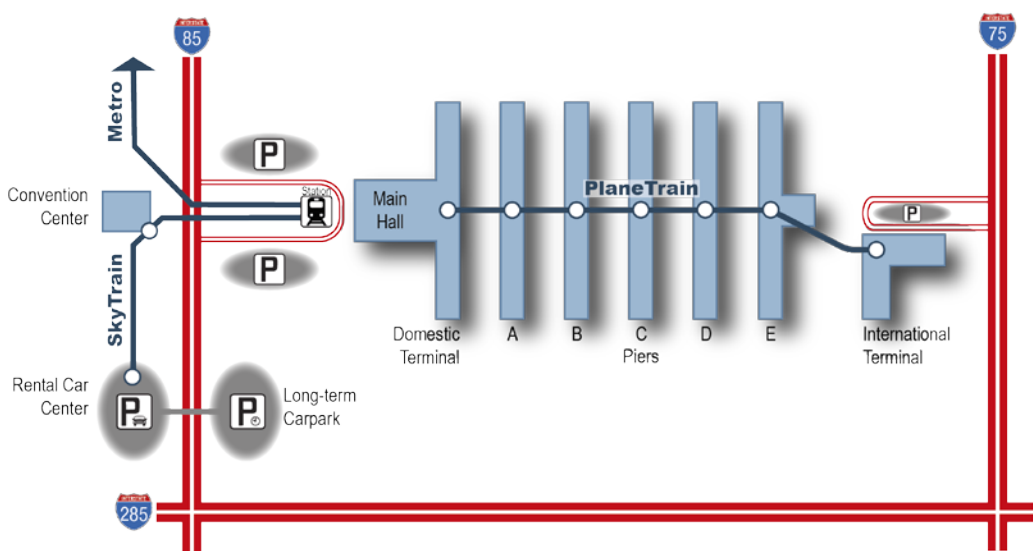
**Vancouver International Airport**

The Vancouver airport is an international reference for dealing with all kinds of disabilities. Its support for impaired people implies strong human presence as well as specifically designed devices. Since 1989, specialized volunteers are deployed all over the airport to provide special care for disabled people.

- **Make the best of your airport layout**

**Hartsfield-Jackson Atlanta International Airport**

The airport of Atlanta is well-known for having the largest passenger flow in the world (> 100 000 000 per year). Its layout relies on a single main hall where most of the transportation options are gathered. An internal “PlaneTrain” shuttle connects this focus point to the piers and an external “SkyTrain” shuttle connects it to other resources (convention center, rental car center and long-term car park) reducing the traffic pressure on the roads closest to the terminals and making the whole airport system easily understandable for all users.



Layout of Hartsfield-Jackson Airport in Atlanta  
Credits: IAU idF

**Traffic relief: drop-off areas and cell phone waiting lots**

Dealing with traffic is a major concern for American airports. For instance, away from the air terminals of the Chicago O’Hare airport, “O’Hare Kiss & Fly” is an area where passengers can be dropped off without clogging the terminals access roads. It is close to the bus station, to bike parking spaces, to the long-term carpark and is connected to the air terminals thanks to an automatic shuttle. In other American airports, “Cell phone waiting lots” allow car drivers to wait in an area far from the air terminals for their passengers to land and call them when they can be picked up.



Cell phone waiting lot in Tampa  
Credits: Tampa International Airport

- **Fixed fares are one less trouble the passengers have to think about**

**Fixed fares for taxis**

Fixed fares for taxis are pretty common in the United States, in Canada or in Japan. In Europe, fixed fares are available in Madrid-Barajas (€30), Roma-Fiumicino (€48), Stockholm-Arlanda (€72) or Milan-Malpensa (€90). The average rate is around 1.66€/km in Europe and America. In Chicago, shared taxis are also promoted as a less expensive option: \$24 for each passenger instead of \$40 for a traditional taxi fare to the city center (both fares are fixed).



Taxi stand at CDG airport  
Credits: IAU idF

**Fixed fares for public transport**

Some airports have a fixed fare for trips to the city center, whatever the PT option. For instance, in Kuala Lumpur, fares are the same for the non-stop train service and the 3-stop train service (around €8). In Frankfurt, the train and bus options also share the same fare (€4.55). Similar cases can be found in Copenhagen (subway or train for €4.82), Milan (express or regular train services for €12) or Zurich (S-Bahn, train or tramway for €6.32).

- **Take care of your online communication**

**A comprehensible, centralized and updated website**

Some easily understandable examples for airport websites are available in Copenhagen, Dallas / Fort Worth, Hong Kong, Madrid, etc. In Boston or Chicago, a comparative table makes it easier to compare transport options, including taxis. In Oakland or Atlanta, explanatory YouTube videos bring the passenger inside the airport station to show how suitable PT could be for his needs. In Miami, a “Train tracker” function shows the position of the various trains in real time. Journey planners are especially useful on the websites of Amsterdam, Copenhagen, Kuala Lumpur or Tokyo Narita airports.

Mode	Cost: O’Hare to downtown	Travel time: O’Hare to downtown	Cost: Midway to downtown	Travel time: Midway to downtown
CTA trains	\$5 or less*	45 min	\$2.25 or less*	25 min
Taxi	around \$40	25-90 min	around \$25	15-40 min
Shuttle Van Services	over \$25	25-90 min	over \$15	15-40 min

Helping passengers ponder the pros and cons of public transport in Chicago  
Credits: CTA

**Online reservation for ground transportation**

Online reservations are a way to make public transportation more easily accessible and to secure the passengers’ choice (once their ticket is bought in advance, they won’t change their mind at the airport after their flight). Kuala Lumpur, San Francisco, Seoul or Paris (“Bus direct”) provide such a service. Online reservations are pretty common for car drivers as well: parking reservation, real-time parking occupancy rates, interactive road maps with traffic information, etc.

## VI. Incorporate the constraints of employees

Airport employees are potentially an important market for public transportation, with an average of 40,000 people for a major platform. Nevertheless, their demand is peculiar, scattered, sometimes in areas with different transport authorities. Airports are moreover operating 24/7 and many job hours are staggered or unsociable and do not match with the usual peak time. Finally, their employers are numerous, with different obligations and human resources management: working hours, duration, overtime management, parking policy, etc.

A good strategy starts with knowing which needs are not currently covered and comparing the PT network and its load factors with the geographic layout of employees. High car ownership areas must be identified, in order to know which sectors are less prone to public transport. It would be inefficient to try and solve the matter as a whole. The best approach is to appreciate specific deficiencies and optimize the current system.

Metro or regional services are likely to provide a suitable answer for employees living in dense areas, as long as their fares exclude airport taxes. Buses (express and local), transport on demand and car-sharing platforms can provide an answer to a scarce demand, as long as the journey is secure each step of the way, especially during nighttime. Never forget that some of those services can also appeal to air passengers coming from low-density areas and help improve ridership.

Finally, airports are flat areas by definition, which means they are especially suitable for cycling. Airport authorities should aim at reducing cycling obstacles, building secure cycle lanes and providing parking spaces. This is not for commuters only: some employees travel a lot inside the airport city during their working day and could benefit from those developments instead of relying on company cars.

### RECOMMENDATIONS AND GOOD PRACTICES

- **Make public transportation attractive to airport employees**

#### ***Improve bus services***

*In Toronto, Hong Kong or London, numerous bus services are offered: express buses for the major local hubs, regular lines, minibuses, transport-on-demand, etc. In London-Heathrow, 32% of employees are commuting on public transport, including 18% by bus. In Amsterdam, the “Sternet” bus network, operating since 2000, was jointly designed by the region and the airport authority for airport employees who can ride for free. Today, 28% of Schiphol employees are commuting by bus (55% by car).*



*Transport on demand at CDG airport  
Credits: IAU idF*

#### ***Limitation of parking resources in Washington National Airport***

*Due to its closeness to the city center and its reliable metro access, Washington National airport chose to limit the number of parking spaces for employees. Limited parking licenses are valid for a year only and their fare is pretty high (around \$295).*

- **Take into account late hours**

***Make the most of car-sharing services***

*In Stockholm-Arlanda, the airport authority supports the “Car2go” and “Sunfleet” car-sharing services. In Vienna, “Car2go” and “DriveNow” take advantage of specific spots in the VIP car park.*

***“Guaranteed Ride Home” Program in Washington***

*The Washington transport authority created the “Guaranteed Ride Home” program. If an employee rides Metrobus or Metrorail to come to work in the morning, he qualifies for a free replacement service (taxi, rental car, etc.) if PT can’t allow him to go back home (personal emergency, unscheduled overtime). This service can also be used by commuters who carpool, bike or walk.*

- **Bring the companies around the table for a shared strategy**

***Paris Charles-de-Gaulle Airport***

*Airport companies and institutional actors have joined their efforts in order to have a better understanding of the employees’ needs through surveys or common actions (“AirProMobility” program). They contributed in defining specific services, such as the “Fileo Roissy” transport on demand service, “Planet’AIRport” mobility services or the low fare car-renting device “Papa Charlie”.*

- **Cycling shouldn’t be overlooked**

***Sydney Airport Ground Transportation Master Plan***

*Sydney Airport suffers from congested highways and from low ridership on the private subway line serving the airport. High station access fees levied by the operator (around €8.40) make the airport stations too expensive for employees who choose to walk from the nearby stations instead of using the airport ones. As the airport authority doesn’t have enough leverage on the private subway operator, its Ground Transportation Master Plan focused on cycle access too, especially for employees, with dedicated cycle paths, parking spaces, specific signage, etc.*

*Other airports have paved the way, particularly in the US: Boston, Chicago, San Francisco or Washington airports all have a strategy dedicated to cyclists. London airports share this goal too in their “Surface Access Strategies”.*

# ENVIRONMENT

The aviation industry is experiencing rapid growth and there are increasing environmental concerns related to noise pollution and degradation of air quality. Reducing environmental impacts while meeting the growing demand is a key challenge for the air transportation system today. Thanks to the remarkable technical innovations, aircrafts have evolved and become cleaner, less noisy and more fuel-efficient. However, the rapid growth in demand in the aviation industry menaces to exceed the technical progress while environmental concerns are growing continuously. At airports in particular, there are also non-aircraft pollution sources related to land-based transport, aircraft supply and support equipment, fuel tanks, refueling facilities, etc.

Noise has been historically considered as dominant environmental concern related to airport areas because it is directly perceived by the local population. However, other issues causing negative impact have risen later as air and water pollution, CO<sub>2</sub> emissions and energy consumption, wildlife etc. Climate change was primarily related to operations at high altitude but it also proved to be an important issue to be taken in consideration on the ground.

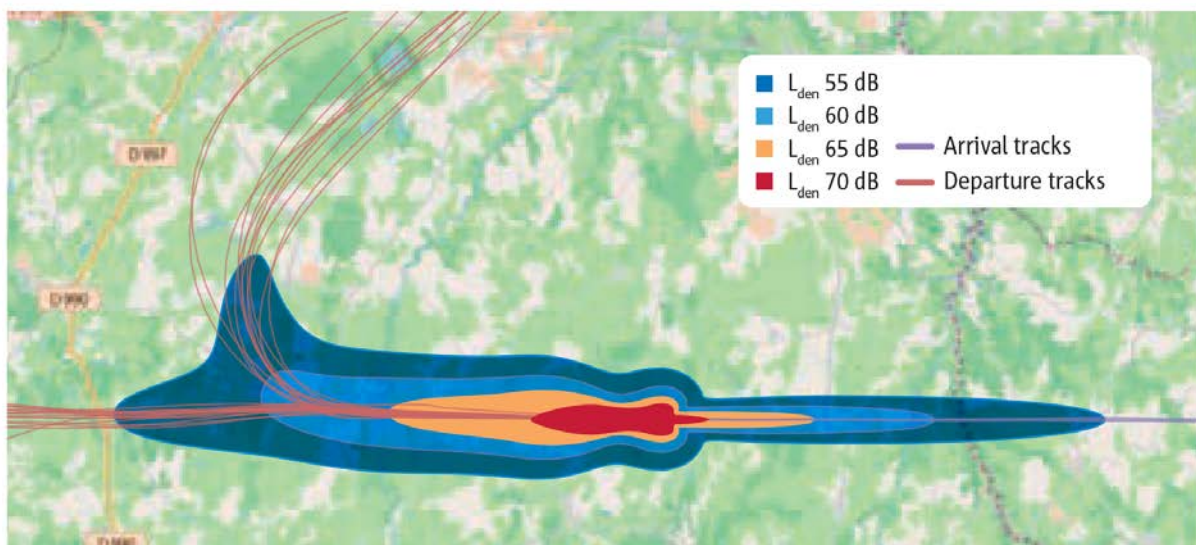
Managing environmental impacts is a complex matter because issues are experienced on different geographic scales: local, regional, national and international. A single aircraft would produce takeoff noise for short time on the surrounding airport area, while carbon dioxide emissions from fuel burn remain in the atmosphere for centuries and cause impacts on a global scale.

## I. Noise

### o Aircraft Noise

During the early years of aviation, there were few flights and hence limited aviation noise concerns. In the 50s, the first generation jet aircraft with an extremely noisy engine conducted to the rapid expansion of civil aviation. Severe disruption in nearby communities led to establishment of residents groups opposing the airport expansion and drew considerable media attention and governmental intervention.

Airport-specific noise limits were put in place at London/Heathrow and New York/Kenedy airports to allay public concerns in the early 60s. As a consequence, the International Civil Aviation Organization (ICAO) promoted the noise certification standards globally in the 1971 (Smith, 1989). The increasingly severe noise certification standards encouraged the development of low-noise technologies for new aircrafts. Most reductions in aircraft noise have been achieved through improvements in engine technologies (especially the transition from turbojets to high bypass ratio turbofan engines, though less fuel-efficient).



National airport noise contours

Source: European Aviation Environmental Report, 2016

Noise exposure has stabilized over the last ten years. The total population inside the STAPES<sup>23</sup> Lden<sup>24</sup> and Lnight<sup>25</sup> contours decreased by only 2% and 1% respectively between 2005 and 2014. This noise reduction is due to technological improvements, fleet renewal, increased ATM<sup>26</sup> efficiency and the 2008 economic downturn (European Aviation Environmental Report, 2016). However, European airports still consider noise to be the first environmental priority as noise currently affects airports' ability to use their full operational capacity. They are subject to operational restrictions as well as limited flight movements and operating hours. ICAO recommends a "balanced approach" to aircraft noise management (ICAO, 2007a, 2010b). It comprises the following issues:

- Reduction at source.
- Land use planning and management
- Noise abatement operational procedures
- Operating restrictions.

A critical issue for airport authorities and governments is the need for more effective land use planning, to prevent noise sensitive uses such as new residential development in the noise sensitive areas around the airports, thereby ensuring the future airport capacity growth.

## RECOMMENDATIONS AND GOOD PRACTICES

- **Implement quota count system**

### ***London Airports Night Noise Quota Count System, UK***

*The Quota Count system have been developed and implemented in Europe to help airports manage the impact from aircraft noise. It is often combined with a limit on total number flights. Restrictions on night flights at Heathrow airport firstly introduced in 1962, were subsequently applied at both Gatwick and Stansted airports. Till 1993 the maximum amount of noise from a night flight was based on data provided only by aircraft manufacturers. The new Quota Count system was introduced to replace the previous non-transparent method. It links directly noise certification levels to noise exposure in the vicinity of the airport. A Quota Count, based on 3dB-wide bands, is assigned to all certified aircrafts that have already applied for operating at night. Each airport can thus manage its quota locally. The Quota Count system is reviewed every five years and have been working well since 1993.*

- **Create Noise Mitigation Program**

### ***San Francisco Airport, USA***

*Noise Mitigation Program was adopted at San Francisco airport. It includes different measures such as:*

- *Insulation of 15,000 homes and businesses within 62 dB Noise Contour Map costing about \$183 Million;*
- *Implementation of gradual descent approach for incoming aircraft;*
- *Stakeholder input through a community roundtable;*
- *Routing of landing and takeoff paths away from populated areas (Esmaili, 2011).*

---

<sup>23</sup> SysTem for AirPort noise Exposure Studies - a multi-airport noise modelling system capable of providing valuable input into both European and international policy-making analyses, including, in particular, ICAO's Committee on Aviation Environmental Protection (CAEP)

<sup>24</sup> Lden – equivalent sound pressure level averaged over a day, evening and night time period

<sup>25</sup> Lnight – equivalent sound pressure level averaged over a night time period

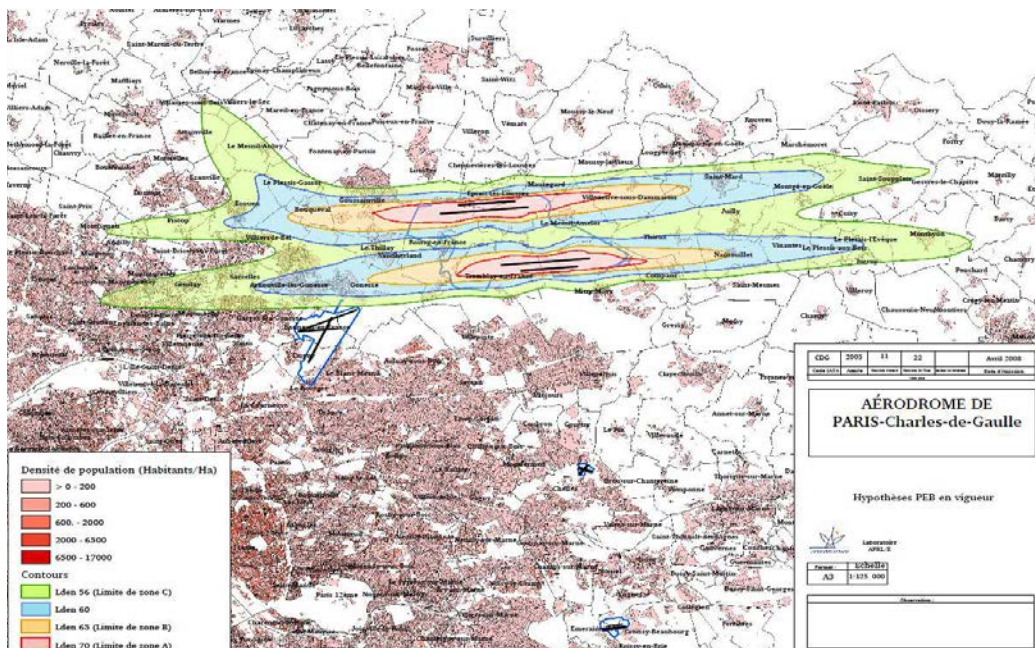
<sup>26</sup> Air traffic management



- **Adopt Noise Exposure Plan**

**Paris Airports, France**

**PEB (Plan d'Exposition au Bruit) - Noise Exposure Plan** is an urban planning document adopted to define the land use constraints in the airport area. PEB of Orly was created in 1975, whereas the PEB of CDG, in 2007. They are both based on long-term traffic measurements and are drafted on a 15-20 years horizon. Four zones of exposure are delimited for CDG Airport: zone A & B (very high exposure, where housing is not allowed), zone C (moderate exposure to noise, where small individual housing at low density is accepted) and zone D (low exposure, where noise insulation is required). The purpose of the PEB is to manage the effects of urbanization.



Noise Exposure Plan of Paris-CDG  
Source ACNUSA

- **Adopt compensation measures**

**Paris Airports, France**

**PGS (Plan de Gêne Sonore) – Noise Disturbance Plan** defines the zones in which inhabitants may be eligible for home sound-proofing grants. The grants can only be allocated under certain conditions. This map is based on estimated air traffic, applicable air traffic procedures and infrastructures that will be in use the year following the publication. The map is drawn under the authority of the prefect and submitted to the town councils of the communities concerned for approval, to the residents' aid committee and to ACNUSA. In France only 12 main airports have a PGS. It is revised every 4-5 years. Three noise exposure zones are delimited: Lden 56dB (moderate exposure), 65dB (high exposure) and 70dB (very high exposure).

**Schiphol Airport, Gatwick Airport and Frankfurt Airport**

Buy-out and compensation schemes for value depreciation are available at Schiphol Airport, Gatwick Airport and Frankfurt Airport. In Schiphol and Gatwick regions those measures are highly appreciated. However they have very limited effect in Frankfurt, as they are offered by the airport in return for compliance with acceptance of aircraft noise (QLAIR report, ARC, 2009).

- **Use sound-insulation to reduce noise in the residential area**

Insulation is necessary but often not sufficient, to increase quality of life in the airport areas because most people prefer being able to open their windows or use their garden. Although the level of dissatisfaction remains high after sound-insulation measures, ARC's QLAIR<sup>27</sup> report lists several important lessons to be learned:

- Being able to choose between various options of insulation (even if it is not done at the end) is an important element for inhabitants for valuing the effects.
- Voluntary schemes offered by the airport without consent of the region or inhabitants are not effective.
- Inhabitants are mostly interested in financial compensation. Implementation of insulation programs so far has been inefficient, in time and cost.
- Properly informing citizens and newcomers should be part of the compensation policy.

- **Involve different stakeholders to take part in regular discussions**

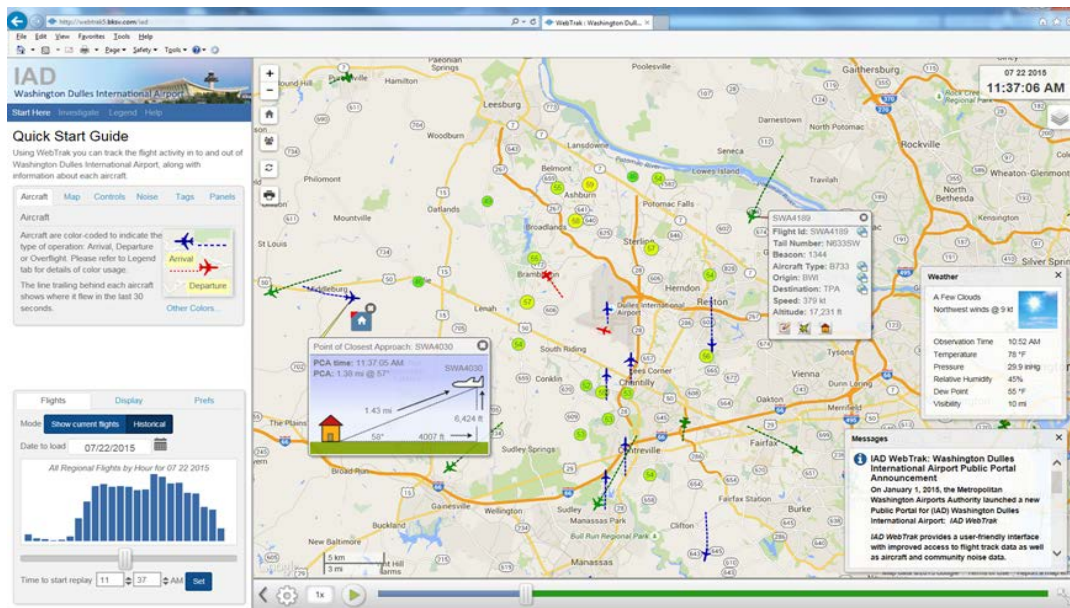
**Vienna Airport and Salzburg Airport, Austria**

AustroControl<sup>28</sup>, associated to Vienna and Salzburg Airports, has established a formal consultation process to involve different stakeholders (airspace/airport users, communities, political parties, civil initiatives etc.) to participate in regular discussions about aviation noise. The Vienna Airport Dialogue Forum was founded in 2004, while the Citizens' Council Salzburg Airport Forum gathered together for the first time in 2013.

- **Communicate on airport operations and expansion, inform citizens**

**Washington-Dulles Airport, USA**

On January 1, 2015, the Airports Authority launched a new Public Portal that provides public access to flight track and noise data for Dulles International called **IAD WebTrak**. It allows users to view flight activity and noise levels in the metropolitan Washington region. Noise levels at monitor locations are updated every second and shown as an A-weighted decibel level (dBA). The Airports Authority is the first airport system in the United States to implement a technologically advanced methodology, via Bruel & Kjaer's ANOMS software, to detect noise events by adjusting threshold parameters to capture aircraft and community noise events. All flight track and noise information provided on this site is intended for general public use.



IAD Web Trak at Washington-Dulles Airport, USA  
Source: Washington-Dulles International Airport

<sup>27</sup> Quality of life in airport regions, Main report, December 2009, ARC (Airport Regions Conference)

<sup>28</sup> Austrian Air Navigation Service Provider

**Schiphol and Gatwick Airports** have well-functioning consultative bodies and provide good access to and availability of relevant information to citizens.

**Frankfurt Airport** is actively working on the development of various plans and measures in this field albeit they need further implementation.

**Vantaa Airport's** communication body is the Aircraft Noise Abatement Group led by Uusimaa Regional Council. The members are municipalities, regional and state environmental organizations and Finavia. The Aircraft Noise Abatement Group communicates on airport operations and airport expansion. There is no legal base, the group is working on a voluntary basis to gain better understanding between the airport and local and regional authorities (QLAIR report, ARC, 2009).

- **Support research programs in new aircraft technologies to reduce noise at source**

- **Paris airports and Iroqua program, France**

*Iroqua is a research program aiming the reduction at source of the aircraft noise by 50% (ACARE objective) through engine and airframe modifications and technology enhancements as well as operational procedures improvements and low noise trajectories. Airbus, CNRS, Dassault Aviation, Safran, ADP (Airports of Paris) and Air France have been involved in the project since 2005. Iroqua launched several research programs like: Aerocav (noise reduction at landing), Bruco (noise reduction from combustion), Comatec (noise absorbing materials) etc.*

- **Ground noise**

Ground noise is not included in noise measurements, calculations or policies. This is a real problem because it often affects areas that are not covered by noise zones. There is an increasing number of complaints about this issue by citizens living in the airports areas. Ground noise is mostly related to aircraft ground operations, such as engine testing, taxiing of aircraft, preparing before take-off and noise from Auxillary Power Units (APU). Airfield and landside activities represent another ground noise source in the airport areas. The nuisance focuses on the nature of the ground noise, which is a low frequency noise. In many airport regions, ground transportation of both passengers and goods, is an additional factor for high levels of sound pollution in the area. Ground noise problems, policies and solutions vary largely between the different airport regions (QLAIR report, ARC, 2009).

## RECOMMENDATIONS AND GOOD PRACTICES

- **Reduce ground noise negative impact on local population**

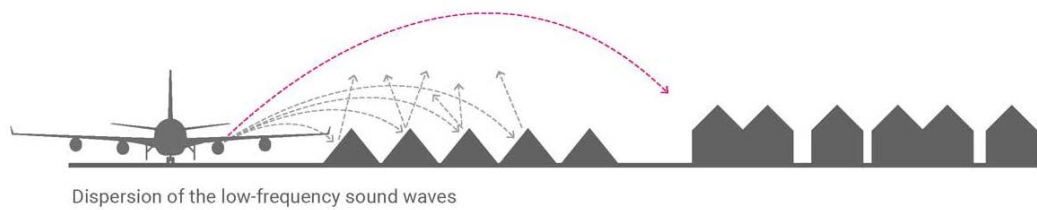
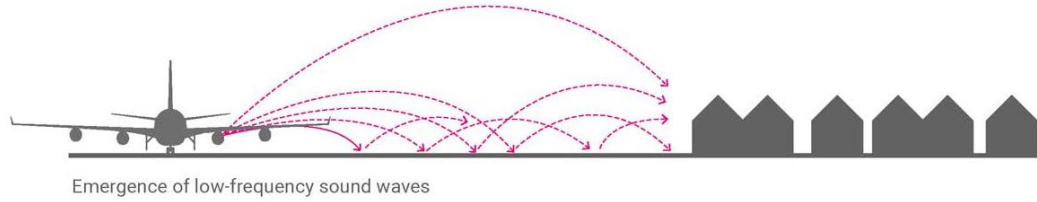
- **Land Art Park Buitenschot, Schiphol Airport, Netherlands**

*When the 5th runway of Schiphol Airport (the 'Polderbaan') was opened for operation in 2003, residents living in the area Hoofddorp-North were burdened with ground noise. Extensive research has been carried out in order to find solutions. Technical analysis has revealed that a high noise barrier, high buildings, improving soil absorption and operational measures are possible solutions against the ground noise nuisance.*

*A multidisciplinary project team<sup>29</sup>, designed a 36 ha recreational park aiming to reduce ground noise from the airport. The basic elements consist of 150 three meter high embankments (artificial pyramids of grass), which disperse the ground noise. One meter wide paths between the ridges serve as walking and cycling paths for visitors from the Hoofddorp neighborhood. The*

<sup>29</sup> H+N+S Landscape Architects in collaboration with the artist Paul de Kort, TNO and Witteveen en Bos

ground ridges are placed perpendicular to the sound waves for optimal sound reduction. This ingenious method, based on the groundbreaking work of acoustician Ernst Chladni, has effectively reduced noise pollution in the region by half.



Reduction of aircraft ground noise, Land Art Park Buitenschot, Schiphol Airport, Netherlands  
Source: H+N+S Landscape Architects



Land Art Park Buitenschot, Schiphol Airport, Netherlands  
Source: Your Captain Luchtfotografie

## II. Air quality

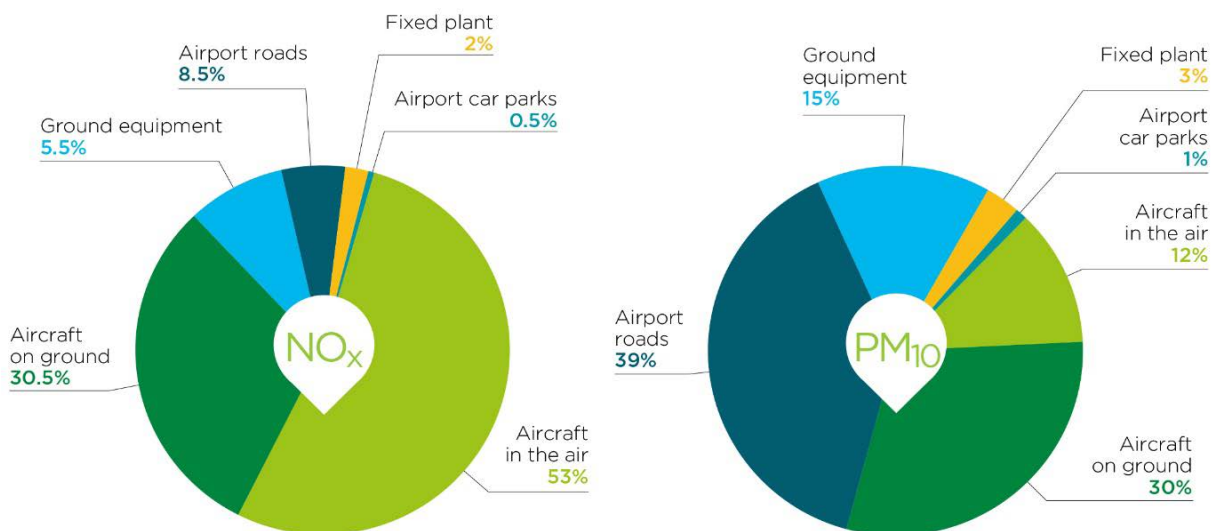
Air quality in the airport areas is determined by a number of factors. The major pollution sources are ground transport, aircraft emissions and apron activities (aircraft fueling for ex.). Air quality legislation has the potential to limit airport growth either through aircraft movement or road traffic restrictions or both.

Major airports are a significant source of air pollution in their territories. Aircraft and ground support equipment emissions contain many different chemical species. Generally, the following ones could be considered as primary species in emissions inventories (ICAO, 2011):

Pollutant	Health Effect
Particulate matter (PM)	<ul style="list-style-type: none"> <li>• Premature mortality</li> <li>• Aggravated respiratory and cardiovascular disease</li> <li>• Lung function impairment</li> </ul>
Nitrogen oxides (NO <sub>x</sub> )	<ul style="list-style-type: none"> <li>• Lung irritation</li> <li>• Lower resistance to respiratory infections</li> </ul>
Unburned hydrocarbons (UHCs)	<ul style="list-style-type: none"> <li>• Eye and respiratory tract infections</li> <li>• Headaches/dizziness/memory impairment</li> </ul>
Carbon monoxide (CO)	<ul style="list-style-type: none"> <li>• Aggravation of cardiovascular disease</li> </ul>

*Air Quality Pollutant Health Effects (Source: adapted from ICAO, 2010a)*

Carbon dioxide (CO<sub>2</sub>) is sometimes included in inventories but it has to be recognized that CO<sub>2</sub> is of a global rather than a strictly local concern. Additional emissions species of potential health and environmental concern may also need to be considered in emissions inventories (1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter, formaldehyde, naphthalene etc). More detailed information can be found in ICAO Airport Air Quality Manual<sup>30</sup> (Edition 2011).



*On-airport emission sources for oxides of nitrogen (NO<sub>x</sub> left) and particulate matter (PM<sub>10</sub>, right), based on emission inventories for Gatwick (2010) and Heathrow (2013) airports  
Source: Sustainable Aviation, UK*

Ten years after the promotion of the aircraft noise certification standard in 1971, the first aircraft engine emissions standard was also adopted to address local air quality issues. CAEP<sup>31</sup> is responsible for maintaining and updating the standards, as they form the basis for the EU legislation. Different measures

<sup>30</sup> [https://www.icao.int/environmental.../FINAL\\_Doc%209889.1st%20Edition.alltext.en.pdf](https://www.icao.int/environmental.../FINAL_Doc%209889.1st%20Edition.alltext.en.pdf)

<sup>31</sup> ICAO's Committee on Aviation Environmental Protection

have been implemented in order to reduce emissions in all flight phases through more efficient aircraft operations, such as the U.S./European Atlantic Interoperability Initiative to Reduce Emission (AIRE) and the U.S./Australasian Asia & South Pacific Initiative to Reduce Emissions (ASPIRE). Operation in the LTO<sup>32</sup> flight phase and on surface are of particular interest from the local air quality perspective.

Airport air quality impacts can be mitigated through different measures and procedures. Below are listed some of them.

### **Reducing air pollution at source**

Aircraft engines (except APUs) respect a strict international regulation defined by ICAO, since 1981. Fine particles are a more recent regulatory issue. The first international standard was agreed in 2016 and will be applicable to all engines in production after 1st January 2020.

Manufacturers' efforts have been focusing on NO<sub>x</sub> reduction for long time. The most efficient and promising solution appeared to be based on Lean Combustion, which equips the LEAP engine (on A320Neo and B737Max). However Lean combustion is also beneficial for reducing fine particles (ARC, UFPs event in Brussels, 2017<sup>33</sup>).

### **Operational Procedures**

Many of the policies reducing noise impact, such as less engine time-on resulting in lower fuel-burn, are also affective in improving air quality. They include surface congestion management, single-engine taxi; restrictions on when engines can run-up for test; preferential runway assignment; extended towing of aircraft using efficient tugs; airfield designs reducing taxiing distances and time; and limited use of APUs. Detailed guidance can be found in ACRP (2012).

### **Emissions Charges**

Emission charges can be adopted to encourage operators to use cleaner aircraft. They become increasingly common for the European aviation. The different engine types are assigned to emission categories, which are charged depending on their level of pollution. ICAO guidance recommends that airports should design charges to recover no more than the cost of measures to mitigate or prevent the damage caused by the aircraft emissions, while accounting for special needs of developing countries (ICAO, 2007c).

### **Airport Authority Policies**

It is also possible to improve air quality through implementation of reducing emission policies from the ground transportation. Public transportation or high-occupancy may be encouraged as well as the use of alternative vehicles, such as electric or hybrid cars (for more detailed information, refer to chapter: MOBILITY & ACCESSIBILITY). Airports can promote the reduction of tolls and parking rates for more sustainable vehicles or use low impact fuels (compressed natural gas) for the transportation on the platform.

## **RECOMMENDATIONS AND GOOD PRACTICES**

- **Adopt an Air quality action plan**

### ***Air quality action plan in UK***

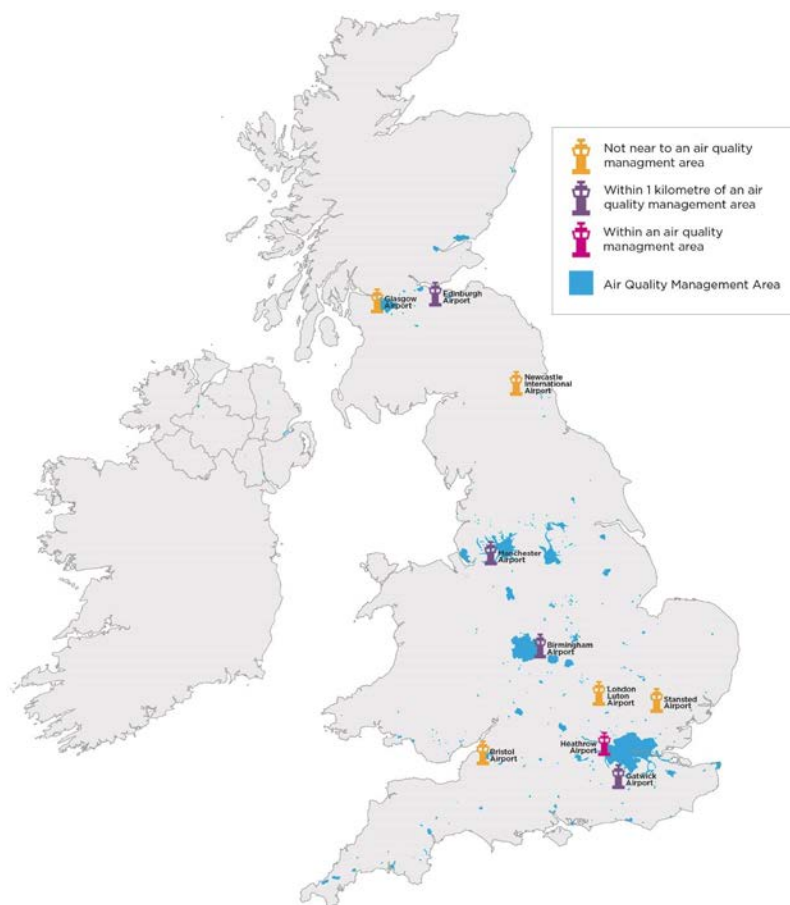
*An AQMA (Air quality Management Areas) is designated by the local authority where locations fail to meet air quality objectives. The map shows the location of the ten busiest UK airports,*

---

<sup>32</sup> LTO - Landing Take-Off cycle

<sup>33</sup> Pollutant emissions from aircraft engines, Penanhoat, ARC, Ultrafine particles event, Brussels, mars 2017

which collectively handle 85% of UK passengers and 90% of UK air cargo (Civil Aviation Authority, 2016) as well as some motorways and main roads locations. Local authority air quality action plans (AQAPs) are important regional strategies, primarily created to improve air quality but offering a range of secondary benefits – such as improvements to public transport and support for green spaces.



Air quality management areas (Defra, 2016) and top 10 UK airports.  
Source: Sustainable Aviation, UK

### **Copenhagen Airports Air Quality Program**

Since 2007, Copenhagen Airport has made targeted efforts to reduce fine particles pollution and improve air quality at the airport apron. It involves local initiatives such as various forms of behavioral regulation as well as the introduction of so-called 'Green Equipment'. The Air Quality Program is using Collaborative Environmental Management tool to dialogue with stakeholders (local authorities, union representatives, handling companies, ANSP<sup>34</sup> and main carrier). Four working groups were formed managing 26 different projects (Behavior group, Ground support equipment group, Stand technologies and operations group and Research and analysis group).

- **Adopt aircraft emission charges**

#### **Zurich Airport, Geneva Airport and Swedish Airports**

Switzerland was the first country to implement a market-based system for reducing aviation-related nitrogen oxides and volatile organic compound emissions. In 1997, the Zurich Airport

<sup>34</sup> Air Navigation Service Provider

established emission-based landing fees incentive measure for emission reduction. The incomes from the emission rates are exclusively used air quality improvement projects on the airport (air quality monitoring, emissions inventory modeling, installation of Ground Power in all positions, natural gas filling station). The Geneva airport followed the same experience in 1998. The Swedish Civil Aviation Administration approved such charges in January 1998 and implemented a similar fee scheme to all the Swedish airports. Those measures affected the operations of airlines with frequent flights to airports in these countries. Although, according to Zurich Airport Authority, the results of the emission-based landing fees can be shown only on a long term, they have caused airlines to begin considering the cost of nitrogen and volatiles compound emissions as part of their business decisions.

- **Ensure sustainable surface access to the airport** (for detailed information, refer to chapter Mobility & Accessibility)

#### **Public transport access to Gatwick Airport, UK**

Gatwick is a very well rail-connected European airport, with over 129 direct station connections. Because of the convenient link from train to plane, 38% of passengers arrive to the airport by rail. In addition, Gatwick works with bus and coach companies to enable a wider range of public transport routes in the airport area. For passengers who choose to travel by car, the airport has introduced electric vehicle charging solutions – promoting the uptake of ultra-low emission vehicles. In 2015, 44% of Gatwick Airport’s passengers used public transport to travel to the airport – sustaining a trend above 40% even as passengers have grown by a third since 2010 (Sustainable Aviation, UK, 2016).

#### **Birmingham Airport has introduces fast charging electric stations**

Electric cars do not emit exhaust pollutants, providing both air quality and climate change benefits. Fast charging stations were introduced at Birmingham Airport allowing E-drivers to rapidly charge their electric vehicles. The chargers are powered with 100% renewable energy (Green energy company Ecotricity) – enabling 35 different models of electric and plug-in hybrid cars to recharge in between 20 and 30 minutes.



Electric charging stations at Denver Airport, USA  
Courtesy of Denver International Airport

- **Use new sustainable technologies on the airfield**

#### **Electric ground service equipment at Manchester Airport**

**Manchester Airport is the first UK airport using renewable-powered ground handling vehicles that ensure better air quality and reduce emissions during aircraft turnarounds.** The new electric vehicles replaced the traditional diesel-fueled equipment for loading and towing aircraft, including the ‘push back’ tug, belt loader conveyor and multi-purpose cargo tractor, which lowered the environmental impact on the airfield (UK Aviation and Air Quality Report, 2015).

#### **Electric bus at Nice-Côte d'Azur Airport**

The first electrical bus with unlimited range and no heavy infrastructure, equipped with PVI’s WATT system, runs at Nice-Côte d’Azur Airport. The major innovation of the WATT System is the vehicle’s opportunity charging, which consists in supplying power from the bus stop pole (Totem). At each stop, during the passenger exchange time (approximately 20 seconds) a robotic arm on the bus roof automatically hooks up to an energy accumulator totem mounted on the bus stop and powered by the existing electrical grid. The bus battery will then allow the bus to reach the next stop (about 800m) where it will recharge again.



### ***Distributed Electrical Aerospace Propulsion (DEAP) project***

*Airbus Group Innovations and Rolls-Royce, together with Cranfield University, are jointly working on the DEAP project. Innovative technologies are developed in order to enable improved fuel economy, fewer exhaust gases and reduced noise for new aircraft through incorporation of Distributed Propulsion (DP). DP requires a higher level of integration with airframe design than actual aircraft models. The DEAP project aims to deliver a breakthrough in future aircraft design, significantly reducing air emissions and other environmental impacts (UK Aviation and Air Quality Report, 2015).*



*Denver Airport photovoltaic modules  
Courtesy of Denver International Airport*

### **III. Climate Change**

Concerns about the impact of anthropogenic emissions on climate change have grown significantly since 1990s, particularly in terms of global warming. Transportation is one of the main sources of green-house gas (GHG) emissions. Aviation is annually responsible for about 13% of all transport associated CO<sub>2</sub> equivalents (CO<sub>2e</sub>) emissions, which is equivalent to only 3% of all anthropogenic CO<sub>2</sub> emissions. Although it remains a major climate change issue because of the high rate of growth of this industry.

The large number of chemical species<sup>35</sup> produced through burning of aviation fuel cause GHG emissions and aerosols. They react by trapping the thermal infrared radiation and thus are modifying the atmosphere energy balance.

---

<sup>35</sup> The main climate change emissions sources are: CO<sub>2</sub>, water vapor in the stratosphere, nitrogen oxides (NO<sub>x</sub>) leading to ozone production, sulfate (SO<sub>x</sub>) and soot aerosols, and condensation trails.

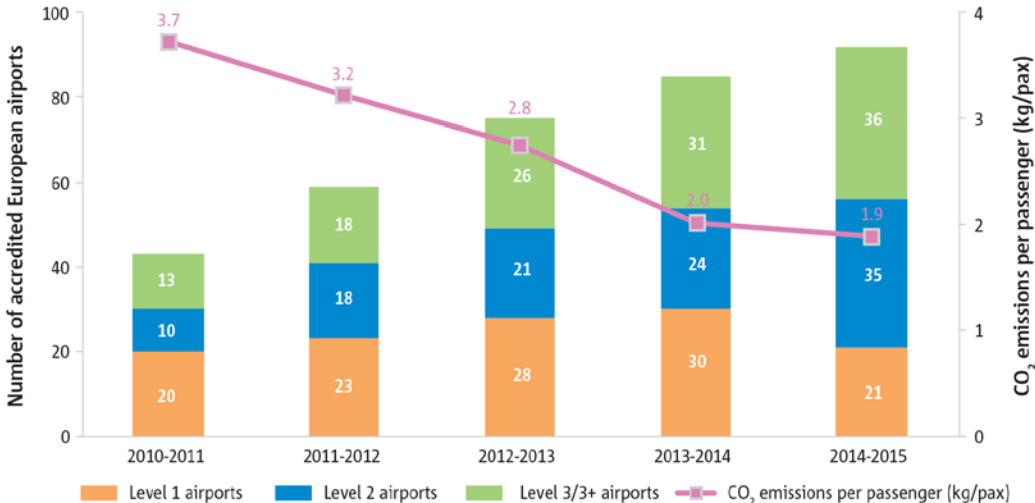
There are few specifically designed standards (on fuel burn or carbon dioxide) for GHG emission reduction similar to noise and air quality. However many of operational techniques applied for reduction of noise and air quality impacts are effective in GHG emission lowering as well.

**RECOMMENDATIONS AND GOOD PRACTICES**

- **Take part in the Airport Carbon Accreditation**

**Airport Carbon Accreditation**

Launched in 2009, the Airport Carbon Accreditation is the only institutionally-endorsed, carbon management certification standard for airports. The program provides a unique common framework and tool for active carbon management at airports with measurable results. It covers the operational activities that contribute most to carbon emissions. It is adaptable to different airport areas and can be used at any airport as part of its daily environmental management activity and long-term strategy. It helps guiding and supporting airport environmental management through a process of continual improvement and partnership with airport stakeholders. Airport Carbon Accreditation recognizes and accredits the efforts of airports to manage and reduce their carbon emissions. There are four levels of certification: 'Mapping', 'Reduction', 'Optimisation' & 'Neutrality'.



Increasing number of accredited airports and related reduction in CO<sub>2</sub> emissions per passenger  
 Source: Airport Carbon Accreditation

- **Create a sustainable management plan**

**Hartsfield-Jackson Atlanta International Airport – Atlanta, Georgia**

The Hartsfield-Jackson Atlanta International Airport created a Sustainable Management Plan (SMP) in 2011 based on the Airport’s sustainability guiding principles. In order to identify key areas of the plan, officials in Atlanta created baselines from a comprehensive assessment of existing facilities and operations in 2008. Before creating the plan, data from 2010 was compared to these baselines in order to determine areas of concern and where improvements were needed.<sup>36</sup>

<sup>36</sup><http://www.atlantaairport.com/docs/Airport/Sustainability/2011%20Annual%20Sustainability%20Report%2011-15-12.pdf>

- **Use sustainable energies**

### Solar energy

Airports are usually large, isolated and shading-free, which are main factors for the use of solar energy. This type of renewable source can be directly integrated in the architectural concept of the airport where the conventional external building materials are replaced by solar/photovoltaic modules.

Those elements can be used also as an additional envelope element installed on various locations, such as: roofs, walls, carports, curtain walls, etc. **Denver Airport, Brainerd Lakes Airport in Minnesota, Toronto-Pearson Airport, La Palma Airport and Barcelona – El Prat Airport** are using different solar setups as well as Cochin Airport in India, which operates entirely on solar energy.

#### **Cochin International Airport, India**

*Cochin International Airport is the first airport in the world that completely operates on solar power. The 12 MWp solar power plant was inaugurated on 18<sup>th</sup> August 2015, comprising of 46 150 solar panels laid across 45 acres near cargo complex. It is producing 50 000 to 60 000 units of electricity per day to be consumed for all its operational functions, which technically make the airport 'absolutely power neutral'. This plant will produce 18 million units of solar power annually- the power equivalent to feed 10 000 homes for one year. Over the next 25 years, this green power project will avoid carbon dioxide emissions from coal fired power plants by more than 3 lakh metric tons, which is equivalent to planting 3 million trees or not driving 750 miles.*



© CIAL/REX Shutterstock  
Cochin International Airport solar power plant, India

### Wind energy

Wind energy can be a very useful source of renewable energy for airports, due to the fact that airports often contain large unoccupied areas. Examples of this type of energy source can be found at Gran Canaria Airport and at Burlington International Airport. However, airports have strict limitations on the placement of obstacles that may restrict the installation of wind turbines in the area. As the turbine is regarded as a physical barrier and a possible interference to radio navigation systems, it is necessary to analyze more in detail the conditions for implementation of wind energy at the airport (Ortega and Manana, 2016).

## Geothermal energy

Large amounts of available land can be used to implement geothermal technology in airport areas. Several airports are using geothermal energy for heating/cooling of terminal buildings: **Juneau airport, Portland jetport in Maine, Hamburg airport, Oslo airport, Reus airport** as well as at the **Thessaloniki airport** in Greece.

## Biomass

Biomass gathered and recycled at airports (such as food or wood waste) can be used as energy source, through gasification for CHP plants or for water heating by biomass boilers, powered by woodchip at Stansted airport. Such schemes can even be extended in order to include the collection of waste from surrounding areas.

### **Gatwick Airport, UK**

*The logistics firm DHL has recently opened a biomass burning facility at Gatwick airport, for treating Category 1 waste from international flights. Catering waste including food and packaging coming into the airport from non-EU flights is classed as 'Category 1', which is deemed a high risk waste stream as it can contain animal products, required to be treated to strict safety standards. The plant uses an International Catering Waste-compliant biomass combustion system to treat the waste safely on-site. The Category 1 waste is converted into energy to heat the waste site and Gatwick is also exploring plans for the facility to heat the airport's North Terminal.*

### **Hamburg Airport, Germany**

*Since 2004, Hamburg airport is carrying out a pilot test of biomass self-production. Fast growing trees (5 years growth) are grown in a plantation. The wood is used for electric energy production in a biomass central (ARC, 2007<sup>37</sup>).*

- **Use alternative fuel**

Studies from the industry indicate that the industry's emissions are estimated to almost triple by 2050 (relative to a 2005 baseline) in the absence of fuel efficiency gains and other mitigation measures. Research on a full carbon lifecycle basis has shown that using the equivalent quantity of some alternative fuels could reduce CO<sub>2</sub> emissions by around 80% compared to the conventional jet fuel. Industry and partners have been working intensely since 2008 when the first biofuel flight in a commercial aircraft took place.

The aviation industry is researching only in second-generation biofuels in order to avoid the mistakes made with the first-generation sources and is aiming any supply to be fully sustainable. The industry is working together through groups such as the Sustainable Aviation Fuel Users Group (SAFUG) and the Roundtable on Sustainable Biomaterials (RSB) to check if the fuels used by the industry are really sustainable.

### **Initiative Towards sustAinable Kerosene for Aviation (ITAKA):**

*ITAKA is an EU initiative under FP7<sup>38</sup> aiming to contribute to the European Commission's 'Biofuel Flight Path Initiative' target for annual production of two million tons of aviation biofuel by 2020.*

*It is a collaborative project, focusing on production and testing of sustainable renewable aviation fuel during normal flight operations in EU. ITAKA is linking supply and demand by establishing a relationship under specific conditions between feedstock grower, biofuel producer, distributor and final user (airlines), encompassing the entire supply chain.*

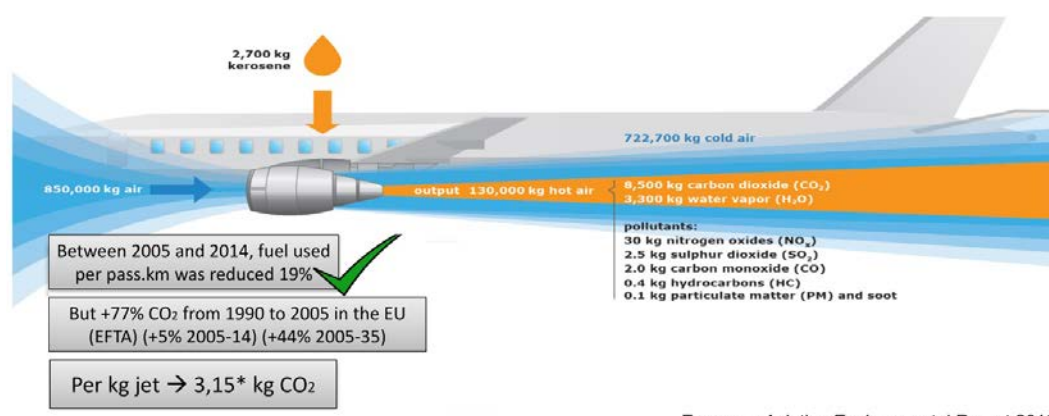
*ITAKA targets European camelina oil and used cooking oil, in order to meet a minimum of 60% of greenhouse gas emission saving compared to fossil jet A1. The use of biojet can reduce by 50-60% the amount of PM (particulate matter) also.*

---

<sup>37</sup> 50 Good Practices: CO<sub>2</sub> and NO<sub>x</sub> emissions reduction in airport regions, ARC, Barcelona 2007

<sup>38</sup> Seventh Framework Programme

The project aims the certification of the entire supply chain of the renewable aviation fuel, based on the Roundtable on Sustainable Biofuels (RSB) EU RED standard. In addition, the production and the use of camelina as a biofuel feedstock will also be assessed in regards to its contribution to food markets and its potential impact on direct and Indirect Land Use Change. The research have to evaluate the economic, social and regulatory implications of the large-scale biofuels utilization in aviation.



European Aviation Environmental Report 2016

Emissions from a typical two-engine jet aircraft during 1 hour flight with 150 passengers  
Source: FOCA

**Oslo Gardermoen Airport:**

Oslo Gardermoen airport is using a blend of biojet from camelina oil produced in EU which is available to all airlines landing at the airport. The sustainable biojet is supplied from the airport's main fuel farm via the existing hydrant mechanism.

**Alternative fuel initiatives around the world**

Industries from across aviation's value chain are working together on projects around the world to develop the alternative aviation fuels. Some international initiatives are listed below<sup>39</sup>:

- Nordic Initiative for Sustainable Aviation (Denmark, Sweden, Norway, Finland, Iceland)
- Aviation Initiative for Renewable Energy in Germany (Germany)
- Commercial Aviation Alternative Fuels Initiative (United States)
- Aliança Brasileira para Biocombustíveis de Aviação (Brazil)
- Brazilian Biojetfuel Platform (Brazil)
- Australian Initiative for Sustainable Alternative Fuels (Australia)
- Midwest Aviation Sustainable Biofuels Initiative (United States)
- Sustainable Aviation Fuels Northwest (United States)
- Bioqueroseno (Spain)
- SEASAFI (South-east Asia, no official website)
- Biofuelnet (Canada)

**EasyJet using hybrid systems to power aircraft ground operations**

In February 2016 easyJet is working on a project to use hydrogen fuel cells on its aircraft to save up to 50,000 tons of fuel a year, reducing both carbon and air quality emissions. The airline hopes to trial technology in the next few years. The "hybrid plane", originating from a competition run with Cranfield University would use a hydrogen fuel cell stowed in the aircraft's hold. Energy generated by brakes on landing would be captured and used to charge the system's lightweight

<sup>39</sup> Source:<http://aviationbenefits.org/environmental-efficiency/sustainable-fuels/>

batteries on the ground. A similar system was developed in Formula 1 cars. The aircraft would also use electric motors in their main wheels when taxiing (Sustainable Aviation, UK, 2016).

#### IV. Water and soil quality

**Water and soil quality impact** is an important environmental issue in airport areas. Airport operators have to pay attention to a wide range of fluid discharges such as discharges from de-icing of aircraft, handling fuels and stormwater runoffs.

**De-icing and anti-icing** of aircraft are done to ensure safe operations in the case of precipitation at freezing or near-freezing temperatures. De-icing removes any contaminants from the surfaces of the aircraft, whereas anti-icing covers these surfaces with a protective fluid that protect the aircraft from further contaminants. In case of non-available central de-icing facilities, special trucks de-ice aircraft directly at their gates. To prevent ADF from polluting the soil and mixing with ground water, airports have to install special drainage system in ramps, use valves and sewer plugs or use special vehicles to vacuum up the fluid. New York/Newark and Kennedy Airports have been developing infrared heating system in hangars to help melting the ice. Although it reduces significantly the ADF use, this system is too energy consuming to be sustainable.

**Fuel and other chemical leaks** represent another danger for the soil and the water quality of the airport area. They are mitigated through reliable storage and distribution, secondary containment and effective cleanup procedures.

**Stormwater Runoff** issues are mitigated through properly sized and installed drainage systems. In the U.S.A., airports have to secure a discharge permits under National Pollution Discharge Elimination System (NPDES) if their discharges go directly to surface water. Samples are collected monthly to check the water quality. They are tested for pH, oil and grease, total suspended solids, bacteria levels, de-icing fluids and other harmful components.

#### RECOMMENDATIONS AND GOOD PRACTICES

- **Reduce chemical use on airfield**

##### ***Finnair's Check Time decision-support system***

*In order to reduce unnecessary chemical use, Finnair uses precision weather measurement equipment and real-time environmental data, to provide dynamic information on the state of the de-icing and anti-icing fluids on the aircraft. The Check Time decision-support system helps determine if the surface of the aircraft is sufficiently protected against icing.*

***Denver International Airport, Montreal Trudeau Airport and Toronto Pearson Airport*** use centralized de-icing facilities located to the end of the departure runways to reduce the time between the fluid application and the takeoff. Special draining system is used to capture and direct the ADF (acetate-based fluid) to special retaining areas. The fluid can be then recycled and sold for other purposes.

- **Implement soil recovery projects and initiatives**

##### ***Aena Aeropuertos, Spain***

*Aena Aeropuertos, launched a project aiming to monitor the decontamination activities carried out by the contractors responsible for polluting the ground (primarily fuel suppliers) to ensure that the areas once used are properly decontaminated before the leased property is returned to Aena. This guarantees that all of the land owned by Aena Aeropuertos is below a certain pollution index and that other activities can be carried out on that same property.*

## V. Protection of agricultural land

Please refer to Chapter “Urban Planning and Development”.

## VI. Biodiversity

Airports cover large areas of land and are generally hostile to wildlife. Concerns about biodiversity have severely delayed or altered airport developments. Given the commitments made at Rio Earth Summit to protect biodiversity, such constraints will gain popularity in the future.

At the same time, collisions with large birds or flocks of birds are a particular source of danger for aircraft. As around 90% of bird strikes take place close to airports, airport operators are obliged to minimize this risk.

### RECOMMENDATIONS AND GOOD PRACTICES

- **Preserve endangered animal/vegetal species**

***Preserving bald eagles at Denver International Airport***

*Planning of Denver International Airport included detailed assessment of the possible negative impacts on local bald eagle populations and led to modifications and application of several conservation actions.*

- **Avoid bird/wildlife strikes**

***Willows are replacing grass at Billund Airport, Denmark***

*Chopped willows, a fast-growing plant, can be used to replace the grass at the airfield. Smaller birds are thus only attracted to flock there. The locally grown willows at Billund Airport cover 25% of the energy needed at the airport.*

***Biotop management against bird strike at Frankfurt Airport, Germany***

*Frankfurt Airport do not focus on driving birds away, but on special biotope management. For example, the site is made unattractive for typical bird strike species, such as geese, through particularly high growing grass planting, which prevents birds from hatching and resting. This measure incite the development of large number of smaller bird species such as the skylark, which do not represent a danger for flight operations. After the adoption of this biotype management, the bird strike rate based on verified reports by pilots has been at between 2 and a maximum of 3.5 cases per 10,000 aircraft movements in Frankfurt for the last 13 years.*

***Use of falcons at Silvio Pettirossi Airport, Paraguay and at Spanish Airports***

*Falcons are used to keep birds away from the airport at Silvio Pettirossi Airport in Paraguay as well as at Bilbao, Ibiza, Malaga-Costa des Sol and Sevilla Airports.*



Falconry at Silvio Pettirossi Airport, Paraguay

Source: [www.news.cn](http://www.news.cn)

#### **Use of Robotic Falcon at Edmonton Airport, Canada**

Edmonton airport is using drone to avoid bird strikes at runways. Flocks in the vicinity will be scared off by the combination of silhouette and wing movement. The birds believe that one of their natural enemies is eyeing them up, as the drone has the appearance and weight of a real falcon. The Robird is in function since the end of May 2017.

#### **Domestic goats at American Airports, USA**

Domestic goats graze fiends at the San Francisco Airport (SFO), SeaTac Airport (SEA) in Seattle, Chicago O'Hare International Airport (ORD) and Bend Municipal Airport (BDN) in Oregon.

SFO is employing goats to create a firebreak and protect the nearby residence areas during the dry season. It is an environmentally sustainable method for managing plant population in the airport area. Every spring for the past 9 years, the airport is replacing the noisy weed-shackers with a herd of 400 goats that graze away a 20-foot buffer along its western edge, without harming the San Francisco garter snake and California red-legged frog – two endangered species that inhabit the area. Goats are very useful as they can go places that are difficult for lawnmowers to reach. They are mostly deployed to rocky and hilly areas that are covered with dense brush.



# ECONOMIC DEVELOPMENT & COMPETITIVENESS

Airport areas are increasingly becoming major drivers of metropolitan economic development that generate thousands of jobs in airport-related activities (airlines, ground handling, security, customs, maintenance, etc.) within the airport precincts, as well as in an ever-widening range of non-aeronautical activities (logistics, retail, industries, R&D, hotels, leisure, offices, exhibition centers, BtB services, etc.) in the surrounding areas and the hinterland. Their economic attractiveness can be explained by the fact that they:

- Provide accessibility, speed and agility to global supply chains
- Connect businesses to their customers and partners
- Serve the needs of millions of air passengers, tourists and visitors
- Develop as significant employment, shopping, tourist, trade and business destinations in their own right.

This chapter explores strategies and tools that can help leverage airport areas as major assets to drive metropolitan and regional competitiveness, economic development and job growth.

## I. Assess and survey economic development in the airport area

The first step of an economic development strategy is having a good assessment and understanding of the local economy's existing conditions in terms of employment, industries, market trends, land use, real estate, etc. This step is important because:

- It establishes a common, documented foundation for moving forward,
- It explains opportunities and challenges,
- It puts the airport area in a larger context (the metropolitan region, but also competing international airport areas).

## RECOMMENDATIONS AND GOOD PRACTICES

### • Develop tools and policies to monitor economic activity in the airport area

*Collecting and analyzing data and indicators that accurately identify and measure economic trends affecting the airport area is a fundamental aspect of any successful development strategy. The relevant spatial perimeter (from the airport to the metropolitan region) can vary depending on the topics and projects. Major topics that should be monitored on a regular basis are:*

- *The airport areas' key economic assets:*
  - *Employment trends*
  - *Airport-related activities such as logistics and air cargo*
  - *FDI*
  - *The local businesses*
  - *Land use*
  - *Commercial real estate market analysis*
- *Market trends*
- *Available public aid schemes to support local economic development*
- *Competing international airport areas (benchmark)*
- *The other major economic hubs in the metropolitan area and their links to the airport area.*

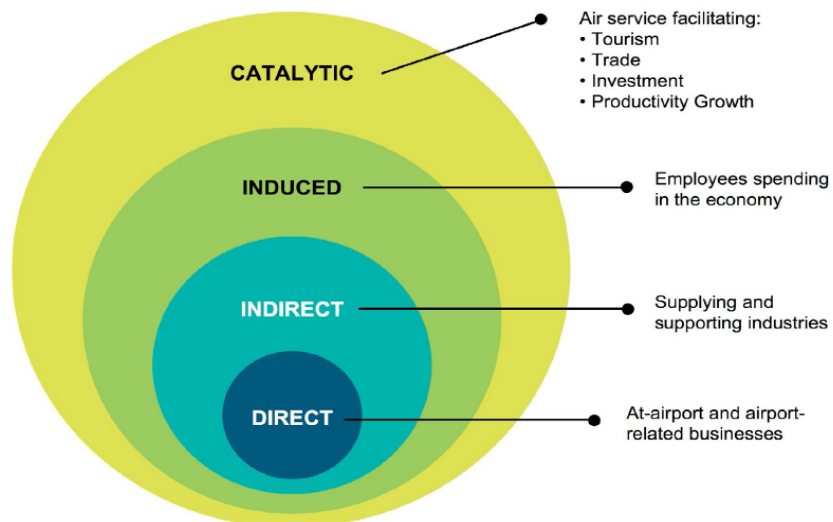
*All these different data are generally generated by various actors (the airport, the local governments and their agencies, the chambers of commerce, etc.). Data collection and analysis*

is therefore a good opportunity to share information and conduct joint studies between local partners.

- **Assess the economic impacts of the airport**

Having as comprehensive and accurate an assessment of the airport's economic impact as possible is important to understand its role in the metropolitan/regional economy and to promote the airport area among decision makers and investors. Several methodologies have been developed to evaluate the economic impacts of airports. One of the most frequently used methodologies is the one developed by ACI Europe, which distinguishes between four categories of economic impacts:<sup>40</sup>

- **Direct impact.** The employment, income and GDP associated with the operation and management of activities at the airports including firms on-site at the airport and airport-related businesses located elsewhere near the airport. This includes activities by the airport operator, the airlines, airport air traffic control, general aviation, ground handlers, airport security, immigration and customs, aircraft maintenance, and other activities at the airport.
- **Indirect impact.** The employment, income and GDP generated by down-stream industries that supply and support the activities at the airport. For example, these could include: wholesalers providing food for inflight catering, oil refining activities for jet fuel, companies providing accounting and legal services to airlines, travel agents booking flights, etc.
- **Induced impact.** This captures the economic activity generated by the employees of firms directly or indirectly connected to the airport spending their income in the national economy. For example, an airline employee might spend his/her income on groceries, restaurants, child care, dental services, home renovations and other items which, in turn, generate employment in a wide range of sectors of the general economy.
- **Catalytic impacts.** Also known as wider economic benefits, catalytic impacts capture the way in which the airport facilitates the business of other sectors of the economy. As such, air transportation facilitates employment and economic development in the national economy through a number of mechanisms, including trade, investment, tourism and productivity.



**Categories of economic impacts generated by airports**

Source: ACI Europe, *Economic Impact of European Airports. A Critical Catalyst to Economic Growth*. 2015

Using this methodology, ACI Europe estimates that European airports contribute to the employment of 12.3 million people, of which 7.9 million are employed in catalytic jobs. In addition, they generated € 675 billion in GDP in 2013, equal to 4.1% of GDP of Europe.

<sup>40</sup> ACI Europe, *Economic Impact of European Airports. A Critical Catalyst to Economic Growth*. January 2015.

## II. Foster a distinctive development strategy that builds on key assets of the airport area

Fostering a distinctive economic development for the airport area means focusing on the airport area's competitive advantages, in order to avoid redundancy and competition with the other economic hubs of the metropolitan region, as well as to stand out from competing international airport areas.

The "DNA" of airports and their surroundings is **connectivity**: international connectivity for passengers and for goods, as well as regional and local connectivity to the other metropolitan hubs through ground transportation. Air transport and connectivity is a critical factor in business location decisions. It is therefore crucial to build on the "just-in-time" connectivity of the airport as a framework for strategic economic development and enhanced global competitiveness.

### RECOMMENDATIONS AND GOOD PRACTICES

- Identify the key assets and opportunities of the airport area

*A first step is to identify target industries that achieve competitive advantage through proximity to the airport, as well as those industries positioned to take advantage of fast growth, human capital, government support, and access to markets.*

*These industries typically include (but are not limited to):*

- Logistics, freight forwarding and distribution
- Aerospace, aviation and advanced manufacturing
- Perishables and agri-business,
- E-commerce fulfillment,
- Tourism and entertainment
- Education, skills training and apprenticeships
- Bio-life sciences and medical devices
- Information communication technology



**A wide range of industries benefit from proximity to the airport, whether directly or indirectly**

Source: IAU île-de-France

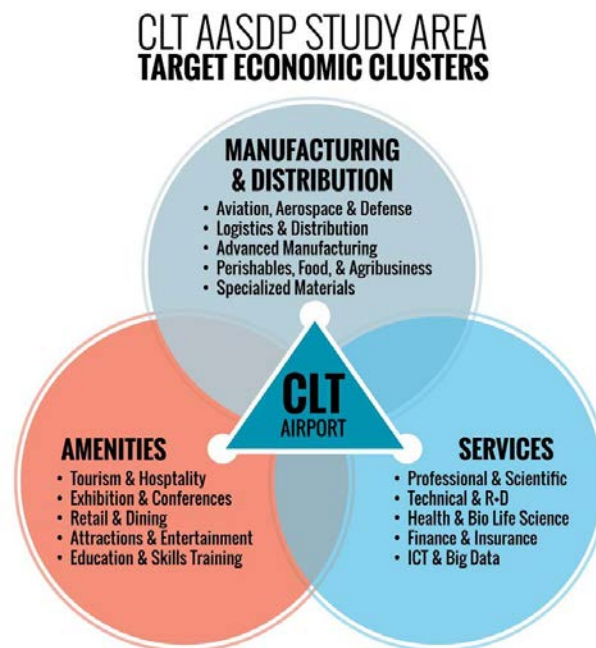
- **Identify distinctive market segments**

A second step is to find distinctive market segments vis-à-vis the other economic hubs in the metropolitan/regional area, as well as vis-à-vis competing airport areas. Target industries for the airport area must be based in regional strengths and local assets.

Getting support from local governments, communities and business associations is also important, as attracting some market segments may not be desired by local actors even though these market segments objectively appear as competitively advantageous in the airport area. Logistics, for instance, is “naturally” attracted to the connectivity, access to markets and available land that airport areas offer, however it is often perceived negatively by local governments and communities as a source of nuisance and as offering relatively few employment opportunities (low job/sq ft ratio).

**Charlotte International Airport: Identifying target clusters**

The Airport Area Strategic Development Plan (AASDP) of the Charlotte Airport (CLT) has identified three target economic clusters which align with local, county, and State economic development initiatives, and have substantial support from business groups and academics. These target clusters also embrace what the AASDP calls the “Airport Connected Development” approach for stimulating economic growth and defining the land use and development framework. They represent a range of economic activities that relate to the airport, benefit from locating in its vicinity, require excellent ground transportation connectivity, and are well-positioned for growth in the Charlotte Region economy.



**The three economic clusters identified in the Charlotte Airport Area**  
Source: CLT Airport Area Strategic Development Plan (AASDP), 2016

The primary objective of the AASDP is to “leverage the Airport’s connectivity to enable and accelerate existing and potential economic clusters and stimulate employment opportunities.” Other objectives include:

- Protect future growth and flexibility of CLT aeronautical operations through compatible use development.
- Maintain CLT’s competitiveness by growing non-aeronautical revenue opportunities to keep airline facility charges low.
- Leverage CLT and the Norfolk Southern Intermodal Facility as economic engines to diversify and grow the regional economy.
- Grow and enhance employment opportunities at all levels.

- **Integrate the airport area’s economic development in the regional development strategy**

*To avoid mutually detrimental competition between the airport area and other economic hubs in the metropolitan region, it is important to align the airport area’s development with the metropolitan/regional development strategy. A good way to achieve this is to ensure that the metropolitan/regional planning and development authorities are closely involved in the elaboration of all major strategic documents and policies of urban planning and economic development within the airport area.*

*In Atlanta for instance, the strategic framework that guides growth and development of the Atlanta airport area is the Aerotropolis Atlanta Blueprint (2016). One of the two major partners involved in this initiative is the Atlanta Regional Commission (ARC), which is the regional planning and intergovernmental coordination agency for the Atlanta metropolitan region. The other partner is the Aerotropolis Atlanta Alliance, a non-profit membership organization and a coalition of leading business and community leaders.*



### III. Support a balanced and inclusive economic development

Being distinctive does not mean being overspecialized in a narrow range of industries. Promoting a diversified economy in the airport area is important for three main reasons:

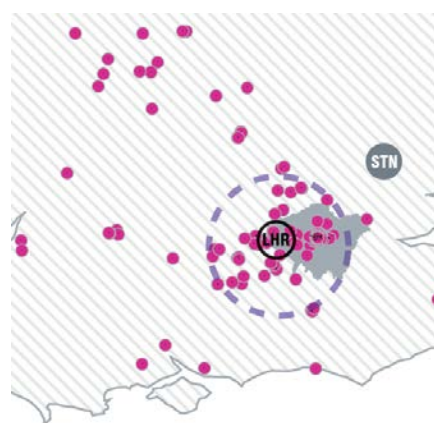
- A diversified economy is more resilient and less vulnerable to external shocks and temporary economic setbacks than an economy with a narrower base. For instance, a diversified economy will be less severely affected by the impacts of a major company leaving the area or by important jobs losses in a core industry in periods of poor economic conditions.
- It is a guarantee for a more inclusive economic development that offers employment opportunities in a large range of industries and job positions at all levels (from low-skill to high-skill) to the local workers.
- A diversified economy is also a key factor of mixed-use development and good urban quality of the airport area.

#### RECOMMENDATIONS AND GOOD PRACTICES

- **Attract all sizes of businesses, from major companies to small & medium-sized enterprises (SMEs)**

*International connectivity offers airport areas a significant competitive advantage that helps attract new businesses, particularly international companies and major corporates. For instance, 202 of the top 300 companies’ headquarters in the UK are clustered within a 25 mile radius of Heathrow.<sup>41</sup> Each new large company has a positive impact on local employment growth and economic development, as it typically employs several hundreds to several thousands of workers in a wide range of positions, from security to top management.*

*However, an important component of a balanced development strategy is not just focusing on the “big fish”, but also attracting small to medium-sized enterprises (SMEs), so that there is an ongoing churn of attracting, retaining and expanding businesses within the region. “It is the smaller*



**202 out of UK’s 300 top HQs are within a 25-mile radius of Heathrow**  
Credits: Heathrow Airport Ltd

<sup>41</sup> Heathrow Airport Limited, *Heathrow, best placed for Britain*, 2013.

companies that have a substantial impact when you add them up” (Jon Tuley, Principal Planner for the Atlanta Regional Commission).

- **Diversification strategy should be based on solid market analysis**

As mentioned above, a diversified economy is often more resilient than a more specialized one in troubled times. In order to increase and diversify their revenue sources, many airport operators and local governments are also tempted to develop new activities such as retail centers, congress & exhibition centers, office buildings, etc. However an all-out diversification strategy can be risky if not based on solid opportunity assessment and market analysis. Hence the importance of developing prudent and viable diversification strategies in order to avoid creating over-sized “white elephants”.

- **Organize an efficient spatial distribution of activities within the airport area**

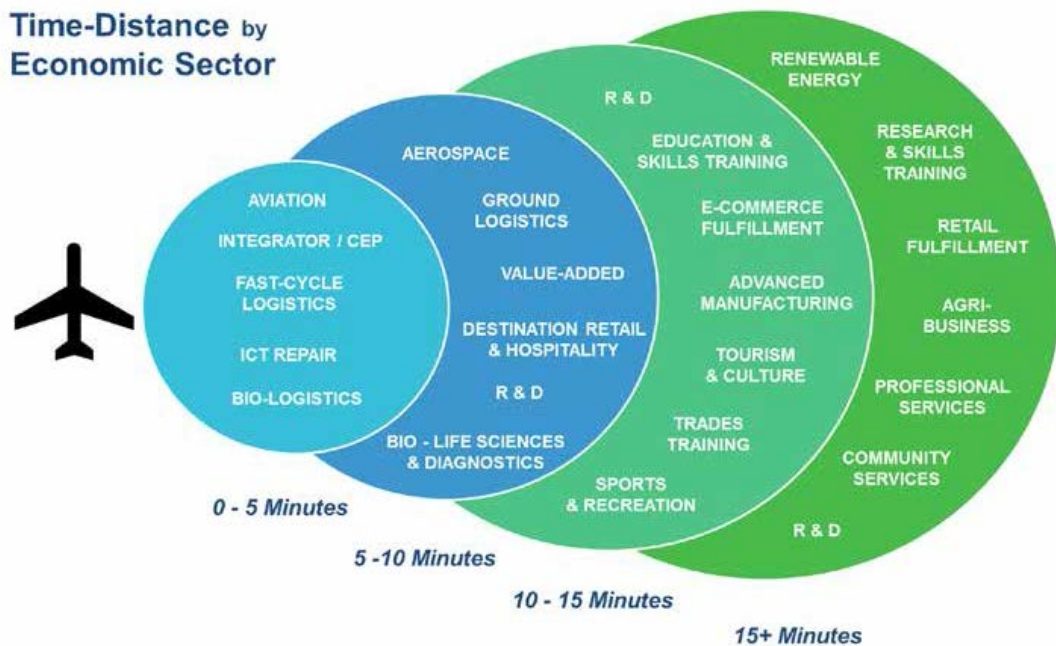
As mentioned above, airport areas can be home to a wide range of economic activities, from core airport activities to non-aeronautical activities. Land availability being a finite resource within airport areas, it is important to guide the spatial distribution of activities according to their respective requirements. Among the main types of requirements are:

- Time sensitivity and transportation requirements
- Land use & real estate requirements

**Time sensitivity and transportation requirements**

Companies that directly interact with airplanes (MRO) or that are time-sensitive (perishable goods, express mail & parcel delivery services) must locate airside or in the immediate vicinity of the airport. Ground logistics look for locations close to access roads that are directly connected to highways.

However, the number of economic sectors that imperatively require immediate proximity to the airport is not so large. Many businesses do not have this requirement, they just need a guaranteed access time. They also wish to benefit from the positive image and visibility of the airport. They may therefore locate not so close to the airport and/or to highways and main roads. The two diagrams below illustrate the relationship of different types of economic sectors and their preferred driving distance to the airport in two US airport areas: Charlotte airport area and Atlanta airport area.



**Time-distance by economic sector in Charlotte AA**  
 Source: CLT Airport Area Strategic Development Plan (AASDP), 2016

CATALYTIC PROJECTS						
						AIR CARGO HUB
						AEROSPACE HUB
						AEROSPACE PARTS DISTRIBUTION
						FAST CYCLE LOGISTICS/E-COMMERCE/VALUE ADD
						AUTOMOTIVE + EQUIPMENT PARTS DISTRIBUTION
						TRADE MART + EXHIBITION CENTER
						DESTINATION RETAIL OUTLET CENTER
						RESTAURANT CLUSTER
						BIO-LOGISTICS HUB + DISCOVERY PARK INCUBATOR
						MEDICAL TOURISM HUB
						DATA CENTER
						INCUBATOR HUB
						MEDIA PRODUCTION CREATIVE CLUSTER
						STUDIO CITY THEME PARK TOURIST ATTRACTION
						WATER PARK HOTEL
						SPORTS CITY TOURNAMENT + TRAINING CENTER
						AUTO MALL SHOWROOMS + BRAND GALLERIES
						ENERGY CITY - SOLAR POWER
						ENERGY CITY - WASTE TO ENERGY + BIO FUELS
						MARTA TOD INTENSIFICATION - COLLEGE PARK
						MARTA TOD INTENSIFICATION - EAST POINT
						MARTA TOD INTENSIFICATION - FORT MCPHERSON

CATALYTIC PROJECTS AND THEIR TIME-DISTANCE RELATIONSHIP WITHIN THE AEROTROPO



JACOBS

**Time-distance by project in Atlanta AA**

Source : Aerropolis Atlanta Blueprint, 2016

**Land use and real estate requirements**

Likewise, businesses have different land use requirements depending on their economic sector. For instance, logistics and e-commerce fulfillment sector have large space requirements for their warehouse distribution centers. Therefore, they often locate in areas where large tracts of land are available at cheap costs. They should also be located within reasonable distance from high-density residential areas in order to minimize the impacts of their activity on local residents in terms of traffic and noise nuisances.

Other activities like R&D, advanced manufacturing or professional services can be accommodated in business parks where they will find adapted spaces such as labs or office space, as well as access to business services. Good public transport accessibility should also be considered, as many employees in these industries prioritize proximity to metro or regional train station over road accessibility.

**DYNAMISME**

## UN ESPACE DE TRAVAIL EST AVANT TOUT UN LIEU DE VIE

### PLUS DE FLUIDITÉ, PLUS DE FACILITÉS

— Situé à proximité des pôles d'échanges et de communication, parfaitement connecté au réseau de transport multimodal, le Parc Paris-Orly-Rungis favorise aussi la fluidité et la rapidité des déplacements sur son propre site.

Icade construit de nouveaux immeubles ou en restructure certains pour offrir des espaces de travail parfaitement adaptés à l'activité et à l'organisation des entreprises.

Enfin, pour que chacun s'y sente bien au quotidien, le parc innove également en termes de services. Accès à l'entreprise, cadre professionnel et qualité de vie se combinent pour offrir aux collaborateurs des conditions de travail idéales.



"Notre siège reçoit beaucoup de monde: les responsables de nos magasins, nos fournisseurs et nos prestataires, venant régulièrement de toute la France. C'est donc principalement l'accessibilité du Parc Icade qui a déterminé notre choix d'implantation. Situé près d'un nœud autoroutier et de l'aéroport de Paris-Orly, il est également proche des gares parisiennes. De plus, l'arrivée du tramway améliore encore la desserte de la zone."

Guillaume Darasse,  
Directeur général, Système U



**Diversified real-estate and services, road accessibility and public transport in the Icade Orly-Rungis business park, in the Paris Orly Airport Area**  
Source: Icade

### Denver International Airport, USA

In Denver, there used to be no real estate market within the airport area because it was considered too far away from the CBD, until the airport authorities and local governments “primed the pump” by tying up land, planning it and marketing it to the target end-users. Marketing is a very important aspect because attracting the right end-users is key to the success of such innovative funding mechanism. The end-user has to meet criteria for the kind of use that the planning authorities are looking for, such as having a solid long-term investment capacity. Indeed, this kind of investment generally returns in ten to twenty years rather than in three to five years.

- **Ensure a coherent and diversified real estate development**

*It is important to develop sustainable real estate solutions for all types and segments of businesses within the airport area, from Grade A office spaces for corporate headquarters to co-working spaces and start-up incubators, and from facilities for retail & entertainment to state-of-the-art warehouses for e-commerce fulfillment.*

- **Have a dedicated team**

*It is definitely a plus to have a dedicated team of economic development professionals who can pick up the phone when a company calls, give potential businesses all the information they need and help them through all the processes that may eventually lead them to the decision of settling in the airport area.*

*Its missions should include: collecting data and conducting surveys on the airport area’s economic development (see section I); promoting the airport area; helping businesses establish and grow in the airport area; helping business creation; and business network management.*





**Four examples of commercial real estate developments in the Paris Roissy-CDG airport area. Clockwise from top left: Paris Nord 2- International Business Park-Villepinte (1); Hubstart Center business incubator, Roissypôle (2); Aéroville shopping center (3); Mitry-Compans logistics zone (4). Credits: Hubstart Paris (1, 2, 4); La Compagnie du Paysage (3).**



# SOCIAL INCLUSION & WORKFORCE DEVELOPMENT

## I. Workforce development is key to linking social inclusion and economic development in airport areas

- **Airport areas generate thousands of jobs in an ever-widening range of activities**

*Airport areas are increasingly becoming drivers of metropolitan and regional economic development. They generate thousands of jobs in core airport activities (airlines, ground handling, security, customs, maintenance, etc.), as well as in an ever-widening range of non-aeronautical activities: retail, industries, R&D, hotels, leisure, offices, exhibition centers, BtB services, etc.).*

- **That means many job opportunities for the local workforce**

*The many job opportunities offered in airport areas require very diverse professional skills and qualifications, from low-skill (waiter, counter clerk, security agent), to high-skill (engineer, senior executive, etc.). Ensuring that all segments of the local working-age population benefit from these jobs opportunities is a crucial way of improving social inclusion.*

- **Workforce skills are key to attracting businesses**

*According to annual surveys of corporate executives, available skilled workforce is on top of the key location criteria to attract businesses (see Box X). As an airport area gets more and more economically diverse, developing a large range of skills and qualifications among the locally available workforce (from high-skilled to low-skilled) will therefore be key to retaining existing businesses and attracting new ones.*

*“Sustainable success in attracting and retaining corporate business investment requires excellence across a range of location factors, but chief among them is workforce”.*

*Phil Schneider, President, Schneider Consulting, LLC (Workforce, Q4 2014)<sup>42</sup>*

- **However, many airport areas are faced with skills shortages and skills mismatches**

*In many airport areas, businesses face difficulties in finding local applicants who have the skills and qualifications they need. Shortage of available workers can affect a wide variety of activities and positions, from low-skill to high-skill, from ground handling to jobs in the hospitality industries to health care, security or aviation engineering.*

### What Matters Most: Site Selectors' Most Important Location Criteria

- 1 Workforce skills
- 2 Incentives
- 3 State and local tax scheme
- 4 Transportation infrastructure
- 5 Land/building prices and supply
- 6 Workforce development
- T7 Utilities (cost, reliability)
- T7 Higher education resources
- 9 Ease of permitting and regulatory procedures
- 10 Quality of life

Source: Site Selection survey of corporate real estate executives, October 2016

<sup>42</sup> <http://www.areadevelopment.com/laborEducation/Q4-2014/creating-sustainable-flexible-evolving-workforce-29928745.shtml>

*There can be various reasons for a shortage of available workers. One major reason lies in the lack of attractiveness of many airport-related jobs to many people, especially when it comes to jobs with staggered working hours such as night shifts.*

*But another major reason is the existence of "skills mismatches" between the workforce available locally and the employers' needs. Many airports face this issue, especially those that are located within or close to areas with high levels of social relegation and unemployment, low residential attractiveness and a high percentage of the local population with low educational level.*

*Besides skills mismatches, there also exist "**spatial mismatches**" whereby segments of the local workforce have limited access to job opportunities, due to long distances between where they reside and where jobs are located, as well as to insufficiently developed transport system.*

*In this respect, equally important to connect workers and job-seekers to training and job opportunities are policies that improve physical accessibility, mobility and transportation within the airport area. For more information on this topic, please refer to the **Mobility & Accessibility chapter**.*

- **The purpose of workforce development is to bridge skills gaps/mismatches and to improve the employability of local manpower**

*Workforce development is about linking local workforce and economic development by providing well-suited, high-impact workforce development and training services in the airport area. The purpose is to:*

*\* Optimize the local human resources,*

*\* Best meet the jobs and skills needs of existing and target companies, and anticipate evolutions in the local labor market,*

*\* Provide jobs and new opportunities to local workers, especially to those who are most affected by unemployment and skills mismatch issues.*

## **II. Foster cooperation among workforce development partners within the airport area**

Airport areas are still too rarely perceived as being at the right scale to implement workforce development actions. Most of the time, workforce development is organized at the regional or metropolitan level on the one hand, while on the other hand, airport authorities and airlines often have their own workforce services dedicated to airport jobs, but they rarely deal with workforce training needs outside the airport fence.

And yet, as seen in section 1, airport areas face specific workforce issues that challenge their efforts towards more social inclusion and economic competitiveness. Good practices among airport areas show that a major step towards an efficient airport area-wide workforce development strategy is to create cooperation arrangements that strengthen connections, collaborations, and practices among the key stakeholders involved in workforce development across the airport area, such as:

- Regional / metropolitan and local authorities,
- Workforce development agencies, service providers and other workforce organizations,
- Educational entities,
- The airport authorities,
- Business and community interests.

The shape and objectives of such partnership arrangements depend on the specific local circumstances, as can be illustrated by the following good practices.

**RECOMMENDATIONS AND GOOD PRACTICES**

**The Helsinki airport area: Aviapolis Jobs network**

*Aviapolis is the largest and strongest growing business area and employment center in the Helsinki region<sup>43</sup>. This international working hub hosts 1,000 companies from a wide range of sectors employing 35,000 people. Concerns about the availability of a skilled labor force and safeguarding economic growth led to the creation of the Aviapolis Jobs network.*

*Promoters of this cooperation have been the City of Vantaa (where the airport is located), Finnair (the largest airline in Finland) and Finavia (the State-owned airport operator). The Aviapolis Jobs network brings together around forty different partners, including the largest employers in the Airport area, local companies, employment agencies, universities and educational institutions.*



*The aim is to improve the visibility of job and career opportunities in the rapidly growing area, to promote business cooperation, as well as to market together the wide range of job and career opportunities in cooperation with the metropolitan area’s universities and schools.*

**The GIP Emploi Roissy in the Roissy CDG Airport Area**

*The “GIP Emploi Roissy CDG” was created in 1998 as a nonprofit organization that brings together more than 150 public and private partners dedicated to employment, workforce development and professional training within the Roissy CDG airport area<sup>44</sup>. The key stakeholders are the central State, the Paris Region, two local authorities and Paris Aéroport.*

*Based on principles of co-construction, subsidiarity and project management, the “GIP Emploi Roissy CDG” steers and coordinates shared actions and projects that aim to strengthen cohesiveness among all the involved partners, and to foster workforce development services that efficiently meet the present and future skills and jobs needs of both companies and residents within the airport area.*



**The Workforce Development Collective in Aerotropolis Atlanta**

*Since its formation in 2014, the Aerotropolis Atlanta Alliance (see chapter on Governance for more details) has identified workforce as one of their critical issue areas. Despite the Hartsfield–Jackson Atlanta International Airport being a key economic driver to bring employment opportunities, the Atlanta airport area lags behind metro Atlanta income mediums and employment rates. Besides, even though many workforce development agencies already provide services to local workers and job seekers, there was no collective structure to coordinate and leverage their actions.*

<sup>43</sup> <http://aviapolis.fi/en/home/>

<sup>44</sup> <http://gipemploiroissy.fr/>

In 2016, the Aerotropolis Atlanta Alliance launched a Workforce Development Collective to address these workforce issues within the Atlanta airport area<sup>45</sup>. Among the key partners involved in the creation of the Workforce Collective are two non-profit organizations - Atlanta CareerRise and the McKinsey Social Initiative -, the Atlanta Regional Commission and local workforce organizations.



The main missions of the Workforce Development Collective are:

- To create an integrated workforce development plan to better prepare residents for career opportunities in and around Atlanta's bustling airport.
- To facilitate development and implementation of solutions to bridge the gap between area employees and job opportunities, increasing economic growth and prosperity in the region from within.
- To help the multiple agencies that provide services to this area target and connect their programs to supply local talent for local jobs.
- To help make sure the labor base is prepared when new jobs arrive.
- To foster collaborative approaches to deliver coordinated services to employers for current and future workforce needs.

### III. Survey the local labor market: what are the current and future recruitment needs of employers, and does the local workforce meet these needs?

#### RECOMMENDATIONS AND GOOD PRACTICES

- **Identify the skills gaps and mismatches**

Workforce development is about bridging the skills gaps and skills mismatches between local workers and job opportunities. The first step is therefore identifying these skills gaps and mismatches and their causes. Answering these questions requires up-to-date and accurate data documenting the main characteristics of the local labor market in terms of:

- The educational and professional skills that are available/lacking among the local workforce,
- The jobs and skills needs of the existing & target businesses
- The gaps between the local skills and the employers' needs
- The gaps in the local supply of workforce development services and programs.

It is also important to develop forecasting capacity to:

- Anticipate changes in business activity that might entail evolutions in jobs and occupations.
- Identify economic sectors and/or companies that are at risk.
- Spot where the potentials for job creation are.
- Identify businesses and occupations that are faced with manpower shortages.

---

<sup>45</sup> <https://aeroatl.org/development/workforce-development/>

*In this respect, it may be useful to develop perennial tools dedicated to documenting, monitoring and forecasting the evolutions in the local labor market. See for instance the Muteco initiative in the Orly Paris airport area (details below).*

#### **Orly Paris airport area: a workforce prospective management and action plan**

*“Muteco” is a workforce prospective management and action plan that is being implemented within the Orly Paris airport area. The Muteco action plan pursues the following objectives:*

- *Coordinating the local organizations involved in supporting the local businesses and in helping them identify and meet their recruitment needs,*
- *Collecting detailed and up-to-date data and information on local businesses and their level of risk exposure,*
- *Collecting detailed and up-to-date data and information on the current jobs and occupations supplied by the airport area businesses, as well as forecasting their future recruitment needs,*
- *Assessing, for each working-age resident in the airport area, their “area of occupational mobility” depending on their skills, and providing them with personalized training programs through a dedicated public website called “my better job in Orly Paris”.*<sup>46</sup>

## **IV. Provide high-impact workforce development programs**

Workforce programs that target airport area workers and job seekers need to:

- Offer training and opportunities for the entry-level to highly-skilled worker.
- Effectively meet the recruitment needs of employers in core airport activities as well as in non-aeronautical activities.
- Be flexible, so that they can change when market or workforce conditions change in the airport area.
- Broaden the workers' skills sets in order to improve their job opportunities and employability in the airport area as well as outside the airport area.

#### **Expert Voice - Sean Brazier, CEO at Purpose Built Schools Atlanta<sup>47</sup>, on high-impact workforce development programs:**

“Lessons from high-impact workforce development programs can be leveraged to improve opportunities for airport area workers:

- Intermediaries connecting employers to training providers. Many of the most effective efforts serve as facilitators of collaboration between employers and training providers, ensuring curricula adequately prepare for on-the-job needs
- Marketing is just as important as services. Workforce programs need to show a value proposition to employers and to candidates as well. Customers span all skills levels and, as such, workforce programs need to offer training and opportunities for the entry-level to highly-skilled worker.
- Streamlined services to candidates and employers. Effective workforce organizations provide forums to align needs of stakeholders but also focus explicitly on streamlining services to both candidates and employers.
- Comprehensive approach to training across stakeholders. Candidates with barriers to employment often require support services, which should be coordinated with other services provided by workforce boards and training providers, creating a comprehensive approach to improving the employability of the customers.”

<sup>46</sup> <http://www.my-better-job.com/>

<sup>47</sup> <https://purposebuiltschools.org/>

## RECOMMENDATIONS AND GOOD PRACTICES

- A particular emphasis should be put on:
- Adapting the contents of the training programs to an evolving labor market, with new occupations and job opportunities emerging as the airport area tends to be more and more economically diversified.
- Developing tailored training programs that meet specific occupational needs of companies operating in the airport area. Economic sectors that are usually found in airport areas entail a wide range of occupations that are crucial to the proper functioning of an international airport. Some of them are little known or relatively rare, and necessitate targeted training programs (e.g.: customs broker, freight forwarder, etc.).
- Creating professional conversion programs to help workers transit into new jobs and careers.
- Promoting e-learning solutions such as MOOCs and interactive online tools that provide easy and shared access to knowledge and training for various target populations.
- Building stronger bridges between the various types of training programs and services, especially between the vocational training agencies and the higher education institutions, in order to facilitate enrolment for both initial and in-service training and to raise the general level of qualification among the local workforce.
- Adapting training programs to audiences with specific needs and constraints such as single mothers, family support workers, people with disabilities, etc.



Training center dedicated to aeronautical activities in the Paris Orly airport area  
© Afmae

The three following examples are examples of good practices that are being developed in airport areas to provide targeted, high-impact workforce development programs.

### ***The “Skills and Jobs Campus” in the Roissy CDG airport area***

*The “Campus des métiers et des qualifications” (“Skills and Jobs Campus”) is an initiative that fosters the coordinated development of training programs focused on high growth industries related to in airport activities and international trade within the Paris Roissy CDG airport area (also called Grand Roissy – Le Bourget airport area).*

*Five key target sectors with a high potential for jobs creation have been identified:*

- *Integrated maintenance and management of facilities and infrastructure*
- *Security and safety*
- *Hospitality jobs at hotels, airports, professional fairs and showrooms*
- *Business development, marketing, exports, event organization*
- *Management of logistics flows (including airport services)*

*These economic sectors represent an estimated 120,000 jobs, which is about 45% of the total number of jobs in the airport area. The Paris Roissy CDG airport area is however affected by a high level of unemployment among local residents, especially among the youth and the low-skilled workers. One major reason is that the supply in vocational training does not sufficiently match the current and growing workforce needs of the airport area’s major employers.*

*The Campus will contribute to address more efficiently this challenge by:*

- *Developing high-impact training programs dedicated to the five key target sectors,*



- *Strengthening cooperation and partnerships between all the stakeholders: high schools, universities, workforce development and training agencies, private businesses, public authorities.*

**The Startklar Program at Frankfurt Airport**

The "Startklar" program was started in 2012 by the airport operator Fraport, the Frankfurt Chamber of Commerce, and Pittler ProRegion Education Center<sup>48</sup>. It is carried out in cooperation with the Agentur für Arbeit Frankfurt am Main and the IHK Frankfurt.

The aim of this program is to prepare young people for a technical apprenticeship at the Fraport AG. The eight-month career preparation program is aimed at applicants who do not yet fulfill all the criteria for direct entry into vocational training. It gives them a chance to enter a 2-year technical vocational training program.



Students in the Startklar Program  
© Strohfeltdt

The methodology behind "Startklar" is based on:

- *Readiness to start technical job training*
- *Capabilities to succeed in job*
- *Strengthen social competencies*
- *Integration into specific Fraport company*

**The Aerospace Technology Campus at Vancouver International Airport**

In 1995, the provincial government of British Columbia, the airport authority and the British Columbia Institute of Technology (BCIT) engaged in a three-way partnership to create an aerospace technology campus near the south terminal.

The airport's contribution was to assemble the property, then underwrite it and ground lease it for sixty years for one dollar to the BC Institute of Technology. The BCIT used funding from the Province to erect a building dedicated to workforce training, as well as an office building to generate cash flow and revenue in conjunction with the developer.



BCIT's Aerospace Technology Campus near Vancouver International Airport  
© jmvq

Twenty years later, students now come from all over the world to get training and pre-job placement in aeronautical engineering and aircraft maintenance and repair. This embedded technology campus is also

<sup>48</sup> <http://www.fraport.de/content/fraport/de/karriere/schueler/einstiegsqualifizierung-startklar.html>

very much appreciated by WestJet and Air Canada, the two major Canadian carriers, as well as by the local MRO [maintenance, repair & overhaul] companies.

*“People at the Vancouver airport authority were brilliant because they knew that it would make them more competitive with their airlines and the MRO companies, they knew it would attract more businesses to set up at and around the airport – and it has been highly successful.” (Chris LeTourneur, CEO of MXD Development)*

## V. Connect local workers and job-seekers to training and job opportunities

Even when airport areas offer numerous high-impact training programs to match jobseekers and employers, the workforce development landscape is often fragmented and difficult to navigate. This can make it difficult for potential candidates to access valuable information on training programs and job opportunities they are entitled to. In Atlanta for instance, workforce organizations providing direct services cite “awareness” and “transportation” as the top two barriers to clients accessing training and other workforce development services.<sup>49</sup>

As a result, too many training programs turn out to be under-attended and available jobs are being left vacant because of sourcing issues.

### RECOMMENDATIONS AND GOOD PRACTICES

To address these issues, it is crucial to create information and communication initiatives that effectively reach out to potential candidates:

- **Online and physical advertising campaigns** targeted towards both the job seekers and the companies.
- **Sourcing campaigns** aimed at identifying, finding and attracting local job seekers who can match the recruitment needs.
- **Events that physically connect local job-seekers, workforce providers and employers**, such as job fairs, career talks, workshops, mentoring sessions.

The three initiatives below are examples of good practices implemented in airport areas to connect job-seekers to companies that have recruitment needs:

#### ***Job fairs and online job advertisement at Helsinki Aviapolis***

*Job Fair at Helsinki Airport in February 2016 was the first event collectively organized by Airport area’s employers. It was attended by more than 1,000 visitors. The Aviapolis Jobs network also organizes meetings twice a year and sub-projects on specific themes.*

*Applicants can find all the open job positions available in the Aviapolis area on an on-line portal<sup>50</sup>, as well as information about companies and career & training possibilities. Advertising a job located in Aviapolis area through this online portal is free of charge.*

#### ***Job Meetings at Orly Paris airport area***

*The “Orly Paris® Rendez-vous pour l’Emploi” is an event that brings together local job-seekers, aspiring entrepreneurs and the major stakeholders involved in employment,*

---

<sup>49</sup> <http://www.maxworkforce.org/aboutmax.asp>

<sup>50</sup> <http://tyopaikat.aviapolis.fi/>

professional training, workforce development and entrepreneurship within the Orly airport area. A strong emphasis is put on face-to-face meetings between participants<sup>51</sup>.

The project leader, Orly International, is a non-profit association created and funded by the Paris Region, two local jurisdictions and Paris Aéroport, the airport authority that owns and manages Orly Airport. It is dedicated to improving economic development and job creation within the Orly Paris airport area, and to promoting its international attractiveness. Key partners include more than 100 public and private organizations dedicated to employment, workforce development, professional training and entrepreneurship.

The “Orly Paris® Rendez-vous pour l’Emploi” is a one-day event that takes place twice a year at the Paris Orly Airport. It consists in four simultaneous events:

1. A recruitment and counseling fair where visitors can access hundreds of job postings, get personalized counseling provided by training and recruitment experts, and physically meet more than 50 companies with recruitment needs in airport-related activities and in non-aeronautical sectors within the airport area.
2. Job meetings where about 50 employers can each meet up to 20 candidates through 20-minute pre-recruitment interviews that have been planned in advance based on anonymous resumes.
3. A program of 40 conferences and workshops where visitors can participate in workshops on practical issues such as stress management or how to write a resume, attend conferences on job opportunities within the airport area, and benefit from individual coaching sessions.
4. Entrepreneur mentoring sessions, where 250 aspiring entrepreneurs can benefit from professional advice and counseling on how to develop entrepreneurial skills, how to set up a business plan, how to pitch, etc.



In 2015, the event attracted 7,000 visitors who had access to 1,000 job offers, to 130 recruiters representing 65 companies and to about 300 structures dedicated to workforce development, professional training and entrepreneurship. An estimated 375 recruitments were made during the event.

### Virtual Career Fair for airport jobs in Singapore

On February 2017, an online Virtual Career Fair<sup>52</sup> was organized as a complement to a physical two-day career fair held at Changi Airport where more than 40 employers from Singapore’s aviation sector were seeking to fill over 2,300 positions. Organizers of both the physical and virtual fairs are Workforce Singapore, the Civil Aviation Authority of Singapore (CAAS), the Labour Movement’s Aerospace and the Aviation Cluster and National Trade Union Congress.

<sup>51</sup> <https://rdvemploi-orlyparis.com/>

<sup>52</sup> <https://adaptandgrow.seemecv.com/>



Source: Workforce Singapore

The virtual fair is meant to allow job seekers to apply for over 19,000 positions available on the dedicated website and speak to hiring employers virtually at their convenience. Applicants can also book a half-hour career coaching sessions delivered over the phone or live chat.



Source: SeeMeCV.com

# MARKETING AND BRANDING

Airport areas are drivers of economic development because they offer key assets such as amenities and international connectivity to attract businesses engaged in the global economy. However, the attractiveness of airport areas is not an automatic process. There are four main reasons why economic actors and public authorities have to work hard to get some success in this field:

- Local competition. Airport areas expand across several jurisdictions and local authorities (the airport authority, municipalities, metropolitan government, etc.). Too often, these jurisdictions compete with each other to attract businesses, each marketing itself as the unique destination of the Airport Area;
- Global competition. Airport areas are in competition at regional level (Europe, Americas, Asia, Africa and Pacific). New competitors are emerging in every regional area. Each airport area has to find its "Unique Selling Proposition" to attract and retain businesses. In some cases, the public stakeholders are not always aware of that huge competition;
- Many people, including business managers, are not fully aware of the positive advantages an airport area can bring in terms of employment opportunities, attracting new businesses, improving competitiveness of companies, etc.
- The businesses (the Clients) are increasingly difficult to satisfy and permanently connected to online social media. Airport area managers have to engage social conversation with them.

For all these reasons, managers of airports areas and local governments have to use marketing and branding strategies to find their place in the market in order to attract and retain businesses and talents. This chapter explores the keys to success in marketing your airport area.

## I. Marketing & Branding: a Review of the Literature

Marketing and branding tools are more and more used by cities, regions and airport areas to reinforce their competitiveness. The concepts and methodology of marketing are not so simple to understand. We will therefore begin by describing them quickly.

The conventional marketing literature was largely written for companies. Progressively, a literature focus on territorial entities has emerged in the United States of America and then in Europe. Quickly, this discipline has spread throughout the world and adopted local particularities. Nowadays, academics and practitioners are still creating a tool box for territorial marketers and policy-makers.

What is marketing? What is branding? How do they differ? Why do we have to integrate Branding and Marketing in one strategic plan?

### Marketing

According to Lindsay Reul "Marketing occurs where ideas and values, which typically come in the form of goods and services, are exchanged between different members of society. All marketing actions and ideas involve the exchange of something – products, services, knowledge or money".

It's the same for cities and places. Territorial marketing (or Place marketing) is a discipline uniting activities aimed at branding a place and enhancing the potential for concrete results (attraction of new businesses, tourists, real-estate investors, talents, etc.). Marketing is both a function for economic developers and also a "philosophy" because, at strategic level, policy makers must understand what clients want, need and value.

At strategic level, a territorial marketing strategy goes after seven main objectives:

- Mobilize the key local economic and political players in the construction and implementation of the marketing strategy;

- Build a relevant diagnosis of the competitive position of the place;
- Define the target markets, objectives and strategic positioning of the territory;
- Strengthen the reputation of the territory through a branding policy;
- Increase results through actions focused on targeted audiences;
- Reinforce the territorial pride of belonging and mobilize the living forces of the territory in the logics of ambassadors;
- Measure and evaluate the marketing strategy and its key actions.

A complete understanding of the competitive arena is key to understand the value-added of the marketing. The competitive arena can be illustrated as followed:

The competitive arena is influenced by five main components:

- The **Supply** : the nature of the competitive advantages of the Airport Area;
- The **Demand** : the needs and aspirations of the targeted clients;
- The **Competitors**: the number and the competitive advantages of the competitors;
- The **Environment**: the external factors in a business' market and the broader economy that can influence a business. Marketers can divide the environment into the microeconomic environment, which affects business decision making - such as individual actions of firms and consumers - and the macroeconomic environment, which affects an entire economy and all of its participants;
- The **Intermediation**: the physical or digital marketplaces where the Airport Areas could meet the Businesses (for example a trade show).



Within the competitive arena, marketing will seek to act on each on these 5 previous components by: i) designing and branding the Supply (territorial offer), fueling the needs and aspirations of clients, iii) creating differentiation in regards of the competitors, iv) taking account of environmental factors and v) conducting commercial activities in the market places.

More precisely, the marketers want to influence, directly or indirectly, the decision process of the businesses (the demand). That means that marketers want to influence the perceived value of clients (demand) in order to i) stimulate needs and aspirations, ii) cause a favorable decision to the Airport Area. The audience of Airport Areas has a perceived value of each Airport Area. The objective of a marketing strategy for an Airport Area is to increase its perceived value in the mind of the targeted clients / businesses.

According to accepted definitions, a perceived value is the customer's opinion of a product's value to him or her. It may have little or nothing to do with the product's market price, and depends on the product's ability to satisfy his or her needs or requirements.

### Strategic and Operational Marketing

Marketing exists at the strategic level and also at operational (or tactical) level.

Airport Areas use strategic marketing to identify client needs and to create a marketing plan to achieve client satisfaction, improve company performance and increase attractiveness. Typically, an Airport Area organization will create a written strategic marketing plan that dictates what type of marketing programs it will use during a given time frame and how those programs will be implemented.

In this second case, operational Marketing is actively promoting the supply of the Airport Area: the products such as real estate, talents, local amenities, etc. and also the services provided by the organization or alliance of actors. Operational marketing is mainly a push tactic.



*The squire, a groundscraper located in Francfort Airport City (Hub of Star Alliance), is one of the largest office building in Germany and use by Fraport to attract international companies such as European activities of KPMG.*

Photo © The Squire

A push tactic needs a pull tactic too. That's the objective of Branding.

Airport Areas' Branding:

For Kotler, Armstrong, Wong, Saunders (2008): *"Brands are viewed as the major enduring asset of a place, outlasting the place's specific product and services"*. That means that brands are more than just names and logos. They are promises of value. They also are a key element in the place's relationships with prospects and clients. Brands represents clients' perceptions and feeling about an Airport Area; everything that the "product" or service means to prospects and clients. Brand exist in their mind.



Branding is a key component of marketing. Marketers need to position the brand of Airport Area in target prospects' and clients' minds. The primary task of place branding is to foster the legibility of an Airport Area. Branding is pull. A pull strategy involves motivating clients and ambassadors to seek out the brand in an active process. Marketers are used to say: "Getting the customer to come to you". Branding is the expression of the essential truth, identity or value of your Airport Area. It is communication of characteristics, values, and attributes that clarify what this particular brand is and is not. Branding is creating something more distinct, appealing & immediately identifiable. That's why a good place branding is based on an efficient storytelling. Examples of pull tactics: advertising and mass media promotion, word of mouth referrals, brand events, etc. Place branding builds brand equity.

A brand with a strong reputation will help encourage businesses to be interested in your Airport Area, or Airport Cluster. A good branding directly supports whatever sales or marketing activities are in play, but the brand does not explicitly say "choose me." Instead, it says "This is what I am. This is why I exist. If you agree, if you like me, you can come, support me, and recommend me to your peers." The brand is ultimately what determines if you will become a loyal client or not. To illustrate, Memphis claims its right to the title "North America's Logistics Center".

Many people may not be fully aware of the positive advantages an airport area can bring in terms of employment opportunities, attracting businesses, improving competitiveness, etc. Therefore, branding better on all the positive things that are going on in an airport area is a major challenge.

Last but not least, in the context of fragmented governance of airport areas, developing a brand, and more precisely a shared Brand, is useful to unite the local economic players under a neutral umbrella.

## II. Branding and Marketing Strategy: an overview of the 3 stages

Every Airport Area needs a marketing and branding strategy. This means that the strategy is a plan that aims to give the Airport Area a competitive advantage over rivals. In this context, the marketing and branding strategy answers the following question: "Why should your clients choose your destination and not those of your competitors?"

Before acting, governance and stakeholder alignment are among the greatest challenges to successful Airport Area Marketing and Branding Strategy. That's why, before engaging the process of creation of the Marketing and Branding Strategy, territorial marketers have to reinforce the strong partnership between all the actors engaged in the attractiveness. Finding approaches and solutions to this complex challenge is strategic.

After bringing together the stakeholders, the process of developing the territorial marketing strategy is divided into the 3 following stages:

- Marketing diagnostics such as market research and competitor analysis;
- Definition of strategic choice;
- Operational marketing.



*The 3 stages of a marketing strategy*

## III. Stage 1: market surveys and definition of the strategic choices

The marketing setting has undergone dramatic change in the past decade. Globalization, increasing competition between Global Cities, lifestyles, digitalization or development of mobility have compelled territorial marketers to rethink their marketing strategies and processes. That is why before defining the marketing and branding strategy, it is essential to conduct studies to better understand the markets and their environment.

To complete this first stage, the territorial marketers have to follow the six following steps:

- Step 1: collect useful data and relevant information to your Airport Area
- Step 2: study the markets by making market research. For example, Paris CDG Airport Area made several Market Research to better understand its competitive position for attracting HQ, World-class universities or training institutes.
- Step 3: study the environmental forces (demography, economy, environmental issues, politics, etc.) that affect an Airport Area competitiveness.
- Step 4: evaluate competitive positions of your Airport Area by making comparisons between your Strengths & Opportunities regarding your competitors
- Step 5: study the returns of the existing marketing operations of the Airport Area (trade shows, prospecting, road-show, etc.)
- Step 6: Synthesize previous analyzes, draw conclusions and recommendations for Stage 2.





## IV. Stage 2: the definition of the strategic choices

Strategy is at the heart of the stage 2. After the diagnostics, marketers have all the data and information to take the right decisions by defining the key options of the marketing approach. To succeed, the following steps can be followed:

1. Create a common ground for collective work. For example, marketers can organize meetings where the local players can collectively identify and openly discuss key marketing options to the Airport Area. In 2015, the regional council of the Paris Region organized, with the help of two planning and development agencies (IAU Ile-de-France and EPA Plaine de France), workshops with local key actors to identify key economic and attractiveness issues of the Airport Area.
2. Build a shared vision of what the Airport Area should look like in the mid-to-long term and define together the main marketing and branding objectives that have to be reached in order to implement this vision. KwaZulu-Natal Aerotropolis Strategy (South Africa) is a good example of this kind. The development of an aerotropolis is one of the catalytic projects that have been retained in 2015 by the Provincial Growth and Development Strategy (PGDS).



Source: Durban Aerotropolis, Presentation to eThekweni Planning Commission, 2015

3. Define the objectives of the marketing strategy: change the image and reputation of the Airport Area; retention of existing clients of the Airport Area (travelers or employees in companies for examples); intensification of the economic impact of existing clients (stimulate new investments by existing companies; increase the level of expenses for each tourist); attract new clients to the Airport Area (location, field of business, profile of clients, etc.); mobilization of local ambassadors or influencing the influential people.
4. It is a good practice to develop both long-term (two to three years) and short term (one-year) marketing objectives. The exercise of writing long-term marketing objectives force the marketers to focus on the future and consider the long-term implications of short-term marketing objectives, strategies, tools and actions. For example, exhibition at one congress, such as *Airport Cities conferences*, to promote its airport must be measured in the long term in order to benefit from the positive effects on reputation.

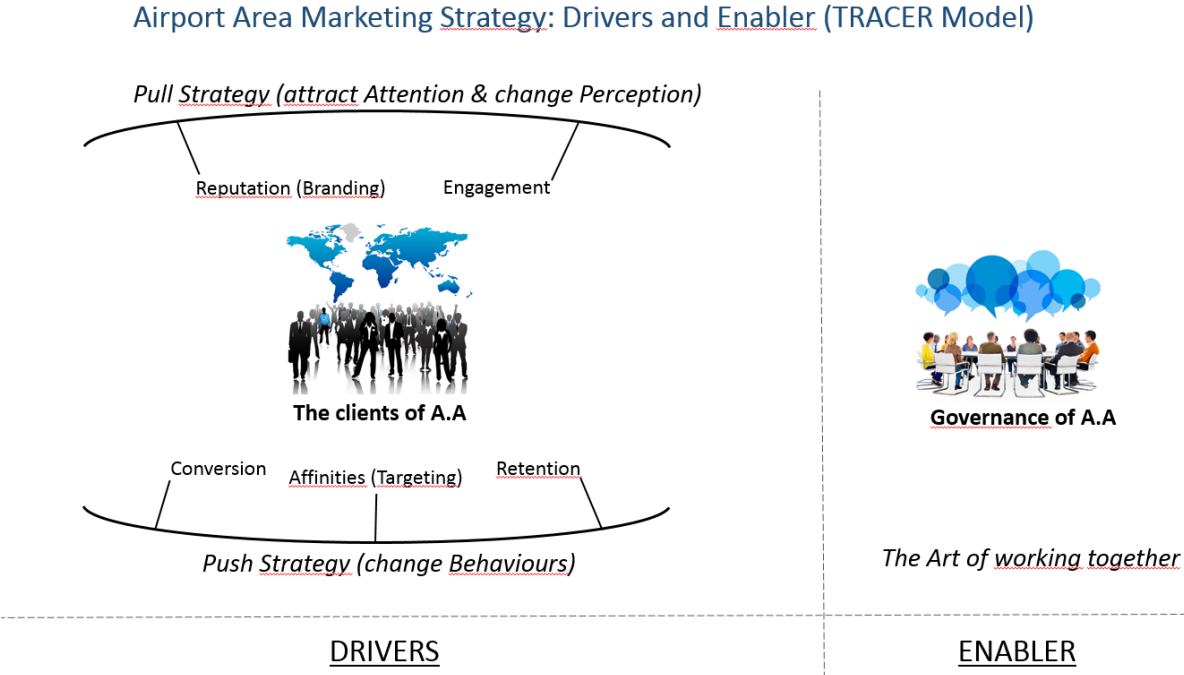
## V. Stage 3: The operational marketing

This third stage is focus on the operational field of the marketing and branding strategy. To help marketers to elaborate their marketing plan, they can use the TRACER Model.

### Six steps to succeed in operational marketing

According to Wikipedia, the AIDA model is widely used in marketing and advertising to describe the steps or stages that occur from the time when a consumer first becomes aware of a product or brand through to when the consumer trials a product or makes a purchase decision. AIDA is an acronym that stands for Awareness (The consumer becomes aware of a category, product or brand (usually through advertising), Interest (The consumer becomes interested by learning about brand benefits & how the brand fits with lifestyle), Desire (The consumer develops a favorable disposition towards the brand) and Action (The consumer forms a purchase intention, shops around, engages in trial or makes a purchase). This method was created by E. St. Elmo Lewis, an American advertising and sales pioneer.

To help marketers to create their branding and marketing strategy in the field of territorial marketing, we recommend them to use the TRACER Model derived from AIDA to be adapted to the situation of place marketing. Created in 2016 by V. Gollain, TRACER is also an acronym. Each word covers a group of actions that you have to put in place to succeed. The first one, "Together", is an enabler. The 5 others are the drivers of the operational marketing strategy: Reputation; Affinities; Conversion; Engagement and Retention. Two of them represent a pull strategy and three of them a push strategy (see the following chart).



Source: Vincent Gollain, TRACER Model, 2016

**Descriptions of operational marketing strategies of Airport Areas with the TRACER Model**

Marketers are directly in contact with targeted clients through different ways such as: commercial team, Trade shows, showrooms, face to face meetings, Point of promotion, etc. The objective is quite clear: pushing out the offer of the Airport Area to the Clients to get attractiveness results. Examples of messages: "Set-up in our Airport Area because it's better than the others." (Or because it's efficient, or because this global company likes it, etc.).

In the following pages, each step of the TRACER model will be explained and illustrated by operational actions and marketing tools implemented by Airport Areas.

**Together: reinforce the partnership between local actors for the marketing and branding**

Governance and stakeholder alignment are among the greatest challenges to successful airport city and aerotropolis development. First of all, marketers have to create a strong partnership between the Airport Authority and the future Airport Area (or Aerotropolis Alliance). Find approaches and solutions to this complex challenge is strategic.

According to our focus groups with experts and practitioners, the following actions can be implemented :

- 1. Create an alliance of key public and private partners. The governance of the alliance must be adapted to the local situation. In our survey, we have observed 3 categories of alliances:
  - a. A global brand with local Alliance. This is the model created by FedEx for Memphis and Paris. They would like to develop this brand in Asia.



- b. A local Brand such as Budapest Airport Region Cluster, Detroit region Aerotropolis, Orly Paris or Amsterdam Airport Area. In these cases, the brand is the identity of the Airport Area and also of the alliance of the different organizations engaged in. The alliance is in charge to manage the brand and to put in place the marketing plan under the “umbrella” of the brand.



- c. An Alliance of local brands such as Paris with Hubstart Paris Region (created in 2009); Aerotropolis Atlanta (created in 2014) and Pudong Airport Area in Shanghai. In this case, the manager of these brands and their alliance have decided to reinforce their international competitiveness by creating an alliance of their brands. For Paris, Atlanta and Shanghai, these three brands have signed a partnership and work together to foster the international attractiveness of these 3 airport areas.



We have also observed that more and more Airport Areas Brands are connected, or integrated, to the regional / City brand.

## Hubstart Paris Region®, a sub-brand of the regional Brand



2. Put in place a co-construction process to work collectively on the largest possible range of topics related to the development of the Airport Area such as in Vantaa, Finland.
3. Write together the collective marketing plan of the Airport Area such as in Amsterdam or Atlanta.

### Reputation: brand the Airport Area

Reputation (or Awareness) is key. If a territory doesn't exist in the mind of people or has a bad reputation, it's impossible to be attractive. The famous brand **I♥NY** illustrates the strong potential of a brand for the marketing of a city / destination. It's the same for Airport Areas. The branding is strategic to reinforce the reputation of an Airport Area.



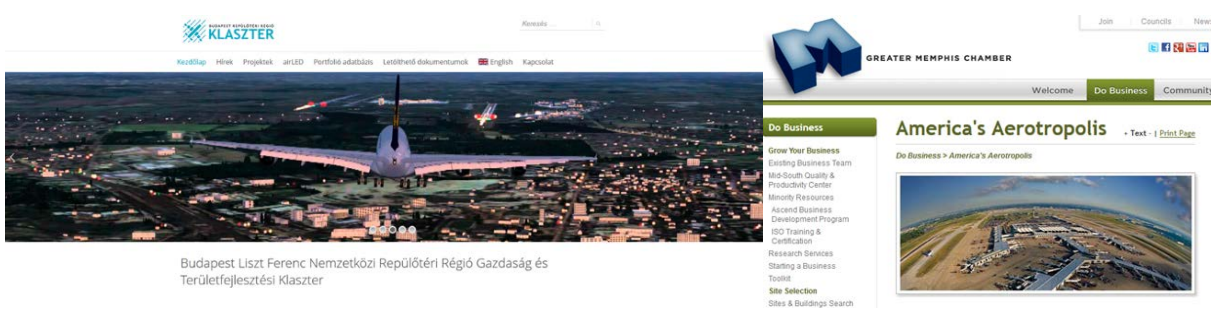
First, marketers have to keep in mind that a logo and the wording of tag lines are not branding.

Airport Area Branding is a strategic approach. First, A.A managers need to evaluate the reputation and attributes among the competitors. For a large number of business executives, an Airport Area is a place with a strong density of infrastructures but not a strong business area. It's a gate between the city and the rest of the world. So, the first challenge of Airport Areas' managers is to change this perception by using branding. By implementing a branding strategy, the objective will be to improve the perceived image and long term reputation of the Airport Area.

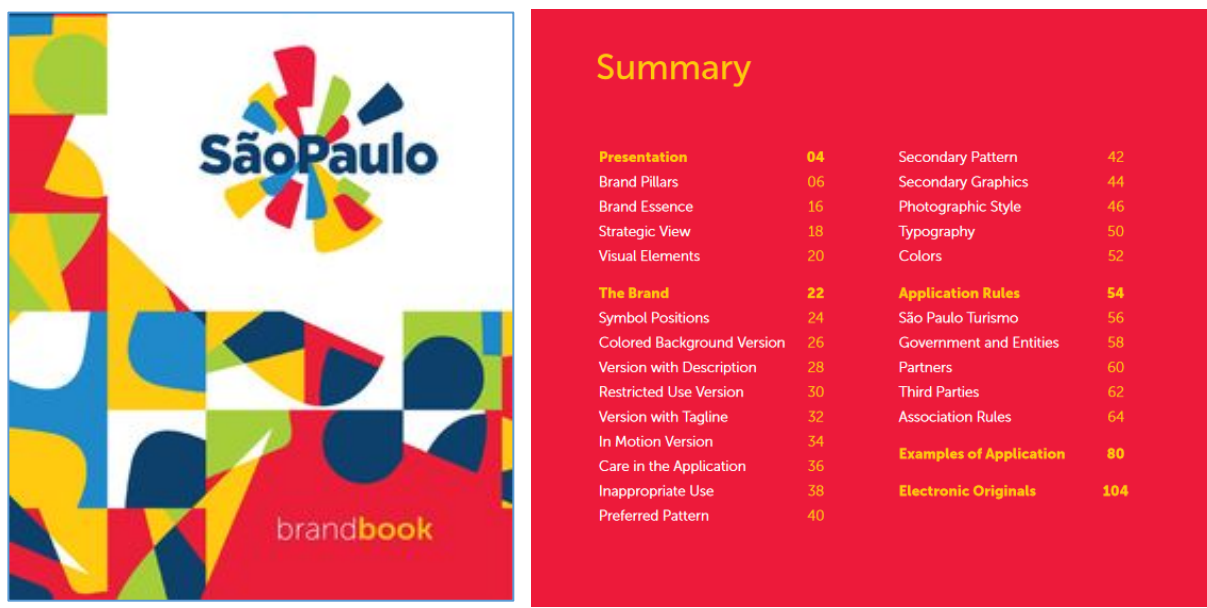
At the start, the place-branding strategy was only the management of the image of an Airport Area by making a powerful storytelling.

Nowadays, Branding is more complex. Its objective is to manage the brand to reinforce the long-term value of the reputation of the Airport Area. To do this, marketers have to define and manage :

- i) the strategy for the brand: mission and vision, values, concept, positioning, brand personality, etc.;
- ii) the brand identity: logo & baselines, storytelling, commitment, Key messages, Communication tools, etc.;
- iii) the brand architecture: Name, type of brand, sub-brand, etc.;
- iv) the brand development program: media, events, advertisement.



To gather the previous elements, marketers elaborate a Brand Book which summarize the Brand propositions. For *Paradux Media Group*, “a Brand Book is an integral element to a well-functioning brand. It’s about articulating the elements of your brand in a concise and consistent manner. It is written for two audiences, internal stakeholders, and marketing partners. The Brand Book has some beneficial outcomes for businesses that use them”<sup>53</sup>. The example of Sao Paulo illustrates a well-designed Brand Book for a City-Region<sup>54</sup>.



Source: Sao Paulo Tourism, 2015

**Affinities: sell the Airport Area to targeted prospects**  
 Because of their amenities, Airport Areas can attract a large scope of aeronautical or non-aeronautical activities, tourists, new residents, etc. Because of this diversity of potential segments of market and the level of competition, it’s very important for marketers of an Airport Area to identify and select target markets. By doing this targeting, they can concentrate their human and financial marketing resources to the targeted segments of market and better satisfy the needs and wants of people. By focusing, Airport Areas managers

<sup>53</sup> <https://paraduxmedia.com/>  
<sup>54</sup> [https://issuu.com/spturis/docs/brandbook\\_2015\\_eng\\_issu](https://issuu.com/spturis/docs/brandbook_2015_eng_issu)

can also create the best environment for publics that they have targeted. Last but not least, they can specify their assets and attributes for targeted clients. For example, they can define, for each targeted segment of market, the value proposition of the Airport Area. For example, the Aero Centre (Yorkshire, UK) is home to Doncaster Sheffield Airport promoted as “the UK’s fastest growing airport outside of London”<sup>55</sup>.

In Airport Areas, we observe that marketers want to attract in fields that:

- They are already strong in;
- They have a reputation for excellence in;
- They have assets to facilitate the development of these publics.

The following pages will illustrate marketing targeting strategies from affinities.

- In China, for example, the airport area facilitates the attraction of new businesses and the diversification of the economy. In Pudong, the strategy is also very clear for the Free Trade Zone dedicated to foreign investors. According to Jiewei JIANG the priority sectors for the zone are: international cargo transit, procurement and distribution, international express transit, repair and test, financing leasing, warehousing, export processing, commodity exhibition and its supporting business finance insurance and agency.

*“Pudong International Airport is the air gateway to Shanghai. It is one of the 3 largest airports in China. The Pudong Airport free trade zone with a surface of 3.59km<sup>2</sup> (1.81km<sup>2</sup> inside and 1.78km<sup>2</sup> outside the airport) was established in 2009. Priority sectors for the zone are: international cargo transit, procurement and distribution, international express transit, repair and test, financing leasing, warehousing, export processing, commodity exhibition and its supporting business finance insurance and agency”.*

Jiewei Jiang, Deputy Director, Shanghai Free Trade Zones Administration, 2013
- Manchester (Manchester Enterprise Zone, UK) and Incheon (Incheon Free Zone - Yeongjong) market their free zone with financial incentives to attract companies in different fields of activities. Manchester is targeting Advanced Manufacturing/Engineering; Aerospace; Business Services; Industrial Biotechnology and Pharmaceuticals & Healthcare in Manchester. Yeongjong, which is the area of the IFZ along the international airport, is targeting tourism by creating a city with a Korean Family complex resort and maritime leisure facilities; international cargo; aviation industry companies with related education institutions and manufacturing laboratory facilities.
- In Paris CDG Airport Area, the Hubstart Paris Region Alliance aims to attract companies to reinforce existing clusters such as executive aviation, airport services or air cargo. The alliance is also targeting business functions such as showroom, training Centres, Innovation Centres, etc.
- In Memphis, FedEx, the Chamber of Commerce and the City are marketing this destination as a global logistic hub. Thanks of its infrastructures and FedEx, the city has become a magnet for businesses that thrive on time-critical transportation. From Memphis, FedEx can deliver to any North American location within 24 hours and to most major global cities within 48 hours.
- In Canada, Edmonton International Leduc (EIA) Partnership have decided to attract and to market private and government investments for specific target compatible and complementary economic sectors including energy, aerospace, logistics, agri-business, perishables...
- In Amsterdam, the regional marketing Agency in charge of the brand l’amsterdam promotes the region including the Amsterdam Airport Area as a destination for business activities. To help companies to set-up, they have an economic map showing the real estate opportunities (offices, business parks, logistic parks, etc.).

---

<sup>55</sup> <http://wearedoncaster.co.uk/developments/aero-centre-yorkshire/>



Source: Iamsterdam, website, January 2017

- When completed, the Dublin Airport City aims to be recognized as a world class economic zone for international business headquarters, targeting next generation of foreign direct investment into Ireland.

**Airport Areas are also targeting Tourism activities.**

In general, Tourism development strategy can be built on the existing strength of the airport area in terms of already existing infrastructures. The airport is well connected to the greater region and the idea is to develop entertainment-driven tourism gateway at the airport area.

Hong Kong International Airport is an interesting example of entertainment-driven tourism development on an airport area. A wide spectrum of attractions are located around the airport: large scale entertainment center, cable car, Po Lin Monastery and Bronze Buddha statue, nature experiences, Disneyland etc.

In Memphis, the major tourist destination, with more than 600 000 visitors/year, Graceland, the home of Elvis Presley is situated only 1 mile away from Memphis International Airport. FedEx, the major company of the city, is very engaged in the marketing of this touristic destination.

The layover tourism is emerging in Airport Areas around the world. The idea is to convince the passengers to spend a night at the airport and the immediate airport area or to propose an interesting program for people spending several hours on the airport due to a long transfer. Seoul Incheon (ICN) and Narita airports are interesting examples of layover tourism, generating local employment.

Free Transit Guided Tours are offered to visit some of the most popular tourist destinations in Seoul. Several tour options are proposed, varying from 1 to 5 hours and booking is possible at any of the Transit Tour Desks located inside the airport. Each transit tour is accompanied by an English-speaking tour guide, so even those who do not speak Korean can enjoy the tours without any difficulties. Moreover, all tours are provided for free. However, tourist site admission fees and meals are excluded and must be paid individually.



Source: Visit Korea, 2017

In Los Angeles, the LA Tourism agency explains to visitors in January the “10 things to do near Los Angeles International Airport (LAX)”<sup>56</sup>. They propose very different subjects: to visit the Flight Path Learning Center, to discover a marina, to eat a famous hamburger, to shop not so far from the Airport, etc.



Source: Santa Monica Place Courtyard | Photo courtesy of Santa Monica Place Mall

<sup>56</sup> <http://www.discoverlosangeles.com/blog/10-things-to-do-near-los-angeles-international-airport-lax>



Airport Areas also target people (inhabitants, executives and employees) to increase the labor force. It's a key challenge<sup>57</sup> because some parts of the Airports are not places to live because of the noise and air pollution. In this context, Dallas Fort Worth International Airport Area is a key example of a successful strategy. Located at the heart of a booming Metroplex, the AA is also very dynamic. DFW's excellent connectivity has attracted many Fortune 500 headquarter offices (Exxon, ADP Marshal, Sabre etc.) in the Airport Area. Their high-qualified employees live in some of the highest income housing in the USA situated within the DFW airport area (Irving, Grapevine, Southlake...). Exxon and ADP are located in Las Colinas "edge city" in Irving.

Las Colinas was a suburban business park until the recent construction of Dallas Area Regional Transit (DART) light rail which connected the DFW international airport to the CBD of Dallas as well as to Las Colinas, stimulating the urban development in the area. Las Colinas attracts thousands of people each day. The TOD (transit oriented development) brought more affordable, multi-family residential projects near the train station areas, appealing to young people, families and employees without cars.

**THE HILLS ARE ALIVE**

- Safe Neighborhoods
- Booming Business
- Vibrant Restaurants
- Uncompromised Aesthetics
- Lush Landscaping
- Happenings in the Hills

**SETTLE DOWN FOR LIFE!**

It's more than a place. We're a thriving community! Nestled in the heart of the Dallas-Fort Worth Metroplex, just minutes from the DFW International Airport, Las Colinas attracts thousands of people each day. A booming business community, Las Colinas also offers eclectic shopping, vibrant restaurants and a fast-growing nightlife. With safe neighborhoods featuring lush landscaping and distinctive architecture, "The Hills" invite you to settle down, not for just a day, but for life!

**LASCOLINAS SETTLE DOWN FOR LIFE!**

This is a solicitation of the Las Colinas Association  
Copyright © 2015

Contact Us!

In Beijing, the Airport Area "Beijing New Aerotropolis" the total construction area for the Housing cluster represents over 1.2 million sqm on 144 hectares.



Source: Beijing New Aerotropolis, 2016

<sup>57</sup> More : <https://fr.slideshare.net/IAUIDF/key-factors-of-attractiveness-for-airport-areas-and-the-special-role-of-human-resources>

Close to Paris Charles de Gaulle Airport, the charming towns Louvres & Puisseux-en-France are developing a new eco-district for attracting new inhabitants in the Airport Area. This new destination for families and workers is promoted by Hubstart Paris Region.



The historical center of Louvres / © EPA Plaine de France

For each market that an Airport Area has targeted, marketers have to find the offer that best meets the expectations of clients. The closer the offer is to the needs of the customers, the stronger the affinities will be. In this case, the clients become interested by learning about brand benefits & how the Airport Area fits with business lifestyle.

To convince new clients that an Airport Areas is close to their needs, local marketers create dedicated websites, marketing brochures, economic & touristic maps, flyers, etc. By doing this, they want to identify prospects.

### An example of dedicated website: Manchester



Source: Airport City Manchester, April 2017

**Conversion: turn prospects into clients**

A prospect develops a favorable disposition towards the Airport Area. Marketers have to convert prospects into Client. A Client is someone who has already done something good for you (set-up a company, buy a services, book a room in a hotel of the Airport Area, etc.).

Airport Areas have to create a commercial funnel of conversion to transform their prospects into new businesses / clients. To succeed, they need to invest in commercial activities such as:

- A dedicated team in charge to help companies to set-up by providing tailored services
- A territorial Show-room such as the Georgia Ressources Center, The Hubstart Center
- A business Incubator such as the Agrivalue Processing Business Incubator (APBI) near Edmonton International Airport (Alberta, Canada)
- The use of collective booths in trade fairs
- Bootcamps such as Aviapolis City Bootcamp (Vantaa / Helsinki);
- Welcome packages
- Etc.



Hubstart Paris Region®, has thus created a dedicated facility to encourage new businesses to set-up in the Airport Area of Paris Charles de Gaulle: the Hubstart Center. The site, located in the heart of the Airport City, facilitates the reception of delegations by and for its partners, as well as hosting projects, entrepreneurs and companies in a dedicated building.



Source: Hubstart Center, Website, January 2017

### **Engagement: mobilize the Community for your benefits**

Airport Areas managers have to engage their communities and influencers in their strategy. More and more marketers are using the social medias to disseminate a positive image (word-of-mouth communication). Airport Areas marketers can also create a Club of Brand ambassadors. By providing information, data, pictures, etc. to these qualified people, they can disseminate a positive image of their Airport Area through a network of qualified and influenced professionals.

Join the  
**Business  
Ambassadors**

Sometimes, Airports try to involve local inhabitants and visitors too, such as in Vienna where the airport authority offers a view behind the scenes with its Visitor Terrace, in the VISITAIR Centre and on a tour of the apron, the VISITAIR Tour<sup>58</sup>.



Source: Vienna international Airport, website, 2017

### **Retention: Work to anchor and develop existing companies**

Put in place a Business retention and Expansion strategy is also important especially during crisis. The Business Retention and Attraction Program is a multifaceted approach that has been designed to preserve and enhance the Airport Area's business environment. They appreciate the businesses as corporate residents with long-term investments.

Business retention and expansion is the activity that a selling organization of an Airport Area undertakes in order to reduce loss of private sector businesses. Successful business retention and expansion starts with the first contact an organization has with a private sector business and continues throughout the entire lifetime of a relationship. An Airport Area ability to attract and retain new businesses is not only related to its assets, but strongly related to the way it services its existing private sector businesses and the reputation it creates within and across the Airport Area"

#### **Examples:**

- maintain and enhance the positive pro-business approach of Airport Areas staffs as they assist both current businesses and businesses seeking to relocate;
- enhance communication with the business community regarding areas of interest and concern to their ongoing operations. The creation of a club of local existing companies is a best Practice such as *Roissy Entreprises* in Paris CDG AA;

---

<sup>58</sup> [http://www.viennaairport.com/en/passengers/airport/visitair\\_centre\\_-\\_the\\_visitor\\_centre](http://www.viennaairport.com/en/passengers/airport/visitair_centre_-_the_visitor_centre)

- use new technology to increase visitors' experience. The travel and tourism industry, over the past couple of years has made significant strides to adopt new and innovative technologies like NFC, QR codes, sensors (such as iBeacon technology) and Augmented Reality among many others. Such connected technologies are helping reshape visitor experiences at airports and in Airport Areas as well. For example, the beacon-enabled app at Miami International Airport is helping improve passenger experiences by providing passengers with personalized updates, directions and tips based on their location and needs at the airport. For Airport Areas, tourists can be alerted about information on the history of the area, transportation schedules, weather updates and public services in multiple languages, and at relevant times during the day.
- assist and encourage the relocation of strong positive new businesses and retain existing businesses;
- help companies of the Airport Area to hire people such as *Orly Paris* in France;
- assist businesses in efforts to influence legislation and other factors to make the Airport Area more attractive place to do business;
- strengthen the competitive economic environment by developing programs and providing financial assistance for new construction and rehabilitation of a range of housing opportunities in the Airport Area.



Miami international Airport

Source: [toscandinavia.com](http://toscandinavia.com)



Nice Côte d'Azur international Airport



Hubstart App

Source : Hubstart Paris Region



# REFERENCES

- ACI, Airports Council International, *Guidance Manuel: Airport Greenhouse Gas Emissions Management*, Montreal, Canada, 2009.
- ARC, Airport Regions Conference, *A New Environmental Deal for Airport Regions*, December 2015.
- ARC, Airport Regions Conference, *Quality of life in airport regions – main report*, December 2009.
- ARC, Airport Regions Conference, *50 Good practices, CO2 and NOx emissions reduction in airport operations*, October 2007.
- ARC, Airport Regions Conference, *Climate Change and Surface Access*, Brussels, Belgium, 2008.
- Arup, *The Future of Airports and Real Estate Opportunities*, 2015, [www.arup.com](http://www.arup.com).
- BERTHON Etienne, « L'Airport City, oui mais... », *Ponts & Chaussées Magazine* n°4/5, mars 2010, p.30.
- European Aviation Safety Agency, European Environment Agency, EUROCONTROL, « European Aviation Environmental Report 2016 ».
- GOLLAIN Vincent, avril 2017, Réussir sa démarche de marketing territorial. Méthodes, techniques et bonnes pratiques, 3ème édition revue et augmentée, Territorial Editions.
- GARRIGA Jordi Candela, « Airport accessibility, a territorial approach », STAIR, 2006.
- Groupement Acadie, Atelier Christian de Portzamparc, Agence Güller Güller, *Etude d'orientation et schéma d'aménagement durable du grand territoire de Roissy*, Rapport final, DRIEA, juillet 2012.
- GÜLLER & GÜLLER, « From airport et airport city », Airport Regions Conference (ARC), 2001.
- Harvard Book Press, 2006, *Marketer's Toolkit: The 10 Strategies You Need To Succeed*.
- IATA, International Air Transport Association, *A Global Approach to Reducing Aviation Emissions*, Montreal, Canada, 2009.
- ICAO, International Civil Aviation Organization, *Airport Air Quality Guidance Manuel*, Doc 9889, Montreal, Canada, 2007.
- ICAO, International Civil Aviation Organization, *ICAO Environmental Report 2010*, Montreal, Canada.
- KASARDA John, LINDSAY, Greg, 2011, *Aerotropolis, the Way we'll live next*, Farrar, Straus and Giroux.
- KAVARATZIS Mihalios, WARNABY Gary, ASHWORTH Gregory J., 2015, *Rethinking Place Branding*, Springer.
- KNIPPENBERGER Ute and WALL Alex, "Airports in Cities and Regions, 1<sup>st</sup> International Colloquium on Airports and Spatial Development", Karlsruhe, 9-10 July 2009.
- KOTLER Philip, ARMSTRONG Gary, WONG Veronica, SAUNDERS John, 2008, *Principles of marketing*. Fifth European Edition, Pearson Education Limited.
- KWAKKEL Jan et al, "Adaptive Airport Strategic Planning", *EJTIR*, Issue 10(3), September 2010.
- NEUFVILLE (de) Richard and ODoni Amedeo, *Airport Systems – Planning, Design and Management*, Mc Graw Hill Education, 2013.
- ORTEGA Sergio Alba and MANANA Mario, "Energy Research in Airports: A Review", *Energies 2016 journal* 9, 349, MDPI, May 2016.
- PENEDA Mauro José Aguiar et al, "Critical factors for the development of Airport cities, Instituto Superior Técnico", Universidade Técnica de Lisboa, November 2010.

REUL Lindsay, 2013, Branding Study for Appalachian Local Food Economies, Central Appalachian Network. Web.

SIIVOLA Mari et al., “*Aviapolis – Frame plan*”, City of Vantaa, 2017.

SMITH M., *Aircraft Noise*, Cambridge University Press, 1989.

STRAIR, Territorial and environmental impact of airport development,

Sustainable Aviation, *UK Aviation and Air Quality*, 2015, [www.sustainableaviation.co.uk](http://www.sustainableaviation.co.uk).

UPHAM Paul et al., “Environmental capacity and airport operations: current issues and future prospects”, *Journal of Air Transport Management* 9, p.145-151, 2003.

ZASS Stephan, « *Spatial impact of airports in Germany – strategies towards a sustainable planning in airport regions* », Association for European Transport and contributors, 2007.

**Contacts:** [teodora.nikolova@iau-idf.fr](mailto:teodora.nikolova@iau-idf.fr) and [martin.hervouet@iau-idf.fr](mailto:martin.hervouet@iau-idf.fr)

**Report :** <http://www.iau-idf.fr/en/know-how/transport-and-mobility/transport-mobility/sustainable-airport-areas.html>







**METROPOLIS SECRETARIAT GENERAL**  
WORLD ASSOCIATION OF THE MAJOR METROPOLISES

AVINYÓ, 15. 08002 BARCELONA - SPAIN  
PHONE: (+34) 93 342 94 60 - FAX: (+34) 93 342 94 66  
[www.metropolis.org](http://www.metropolis.org)



**THE PARIS REGION PLANNING AND DEVELOPMENT AGENCY (IAU ILE-DE-FRANCE)**  
IS A PUBLIC FOUNDATION RECOGNISED TO BE OF PUBLIC UTILITY  
BY A DECREE DATED 2 AUGUST 1960.

15, RUE FALGUIÈRE - 75740 PARIS CEDEX 15 - FRANCE  
PHONE: (+ 33) 1 77 49 77 49 - [www.iau-idf.fr](http://www.iau-idf.fr)