

## AIRCLIP – Airports and Climate Preservation

*Manfred Schrenk, Stephanie Rüscher, Gregor Wilschko, Andor Farkas, Christian Eizinger*

(Dipl.-Ing. Manfred Schrenk, CEIT Alanova, Am Concorde Park 2/F, A-2320 Schwechat, m.schrenk@ceit.at)

(Dipl.-Ing. Stephanie Rüscher, CEIT Alanova, Am Concorde Park 2/F, A-2320 Schwechat, s.ruesch@ceit.at)

(Dipl.-Ing. Gregor Wilschko, CEIT Alanova, Am Concorde Park 2/F, A-2320 Schwechat, g.wilschko@ceit.at)

(Andor Farkas MSc., CEIT Alanova, Am Concorde Park 2/F, A-2320 Schwechat, a.farkas@ceit.at)

(Christian Eizinger, CEIT Alanova, Am Concorde Park 2/F, A-2320 Schwechat, c.eizinger@ceit.at)

### 1 ABSTRACT

The research project *AIRCLIP* focuses on potential international Best Practices related to land-based activities introduced at airports (including all possible airside and landside activities) which reduce the airport's environmental impact in terms of CO<sub>2</sub> emissions. The project consists of an online survey/questionnaire, the quantitative and qualitative description of best practices and concludes with recommendations that could be applied to the operations of Vienna International Airport (VIE) as well as to other airports in Austria. Through such measures, the main goal of *AIRCLIP* is to help VIE and other Austrian airports become more environmentally friendly in terms of CO<sub>2</sub> emissions.

### 2 AIRCLIP RESEARCH

#### 2.1 Introduction

Research activities in different areas of the air transport industry deal with the development of technologies for climate protection, energy efficiency and sustainability, whereas airports represent one field of action in this area.

The Project *AIRCLIP* is part of the research programme *TAKE OFF*, conducted and financed by the Austrian Federal Ministry for Transport, Innovation and Technology (BMVIT) as the programme owner and the Austrian Research Promotional Agency (FFG) the programme management. The aim of *AIRCLIP* is information gathering, classification and evaluation of best practices dealing with climate protection at airports in the areas of airfield operations, transport and mobility, energy efficiency, renewable energy and administrative activities. The results of the *AIRCLIP* project comprise recommendations and strategies for the implementation of relevant technologies and infrastructural investments at Austrian airports. Included in the results of the research project are an overview of potential for the implementation of measures aimed at reducing CO<sub>2</sub> emissions and recommendations on courses of action for Vienna and other Austrian airports.

#### 2.2 Research Methodology

The research methodology followed a four stage research approach. The stages of the research effort included:

- Focused literature review, expert interviews and a survey to gather data on relevant state-of-the-art environmental practices and technologies at airports around the world.
- Analysis of relevant documents provided by the air transport industry at the international level, online-research of environmental activities at and around airports and data collection from approximately 180 examples relevant to the study and documentation thereof in a database.
- Detailed analysis and evaluation of selected national and international Best Practices based on information provided by contact persons from the relevant airports and information available online.
- Recommendations for implementing relevant technologies and infrastructural investments at Vienna International Airport and other Austrian airports.

In addition, the project included two relevant dissemination activities:

- A session involving international experts organized at *REAL CORP 2008* conference entitled "Mobility Nodes as Innovation Hubs" under the topic "Climate Protection and Airports", and;
- A workshop held at the Vienna International Airport (VIE) in Fall 2008 involving experts from the field and representatives from different sectors.

### 2.3 Airports, the aviation industry and the environment

Recent developments in civil aviation can be attributed to an increasingly globalized society in which mobility over long distances becomes ever more important. Paradoxically, the improvement of Information and Communication Technology infrastructure does not appear to lessen air travel, but actually to foster it as the global reach of companies is extended and information about recreational (touristic) opportunities abroad become more easily accessible via the Internet. Because globalization and the concomitant increase in air travel has been accompanied by rising energy consumption and emissions, environmental protection and efforts to prevent climate change have become the modern scientific challenge of our times. To date, research into eco-friendly measures for the air transport industry have focused primarily on developing technical improvements for aircraft. Although aircraft contribute a large share of emissions, groundside operations and infrastructure also produce a significant amount of pollution. Moreover, the emissions associated with such operations continue to grow as airports evolve into city-like hubs of economic activities – airport cities.

In addition to carbon emissions, other major *environmental* concerns at most airports include noise, local air quality, ground and surface water and soil quality, recycling and sustainability as well as habitat and wildlife management (ACI, 2008a). Because of the growing importance of landside operations and the evolution of airport cities, environmental and *climate protection* measures and technologies at airports should focus on airside as well as landside activities. Airside operations include ground movements of aircraft (taxiing) as well as maintenance vehicles. Also, machinery and infrastructure at airports - whether on the runway apron or for waste management - require special climate-friendly measures. Relevant landside operations include energy consumption and emissions from airport buildings, waste disposal, but also the impact of passengers and employees commuting to and from the airport.

Environmental protection has come to play a major role in the strategy and development plans of many airports around the world and is also recognized by the Airport Council International (ACI) which represents 1679 airports in 177 countries.

### 2.4 Airports, airport cities and airport regions

Apart from their primary functions such as handling passengers, freight and aircraft, airports nowadays play a strategic role in regional development and are key facilities for the competitiveness of any territory. Airports are engines for economic activity, create direct and indirect employment and may act as innovative centres for new (environmental) technologies within a region. Moreover, modern airports function as intermodal transport nodes and incorporate hotels, shopping facilities, office space, conference rooms and leisure facilities. As such, they are recognized as clusters from a general spatial perspective and “airport cities” in specific if they show the qualitative features of a city: density, access, quality, environment, services (Güller & Güller, 2003).

Although the evolution of airports into airport cities and airport regions is driven by the general increase in the role of aviation for both business and leisure travel, landside activities are being increasingly important sources of income for the airports themselves. Services, real-estate business, concessions, parking and other activities potentially make up 50% of the airport’s profit (Güller & Güller 2003, AT Kearney 2006). Concomitant to the economic development of the airport and its landside activities, airports are also evolving into transportation hubs. High speed trains and international bus lines complement the destination map of the airport and increase the accessibility of the region as well. As a result, the airport’s importance from an environmental perspective increases also through its role as a transport and interchange node combining different modes of transport, both public and individual. In consideration of airport city concept, three spatial layers (see figure 1) were applied in our research into the potential fields to reduce CO2 emissions at airports.

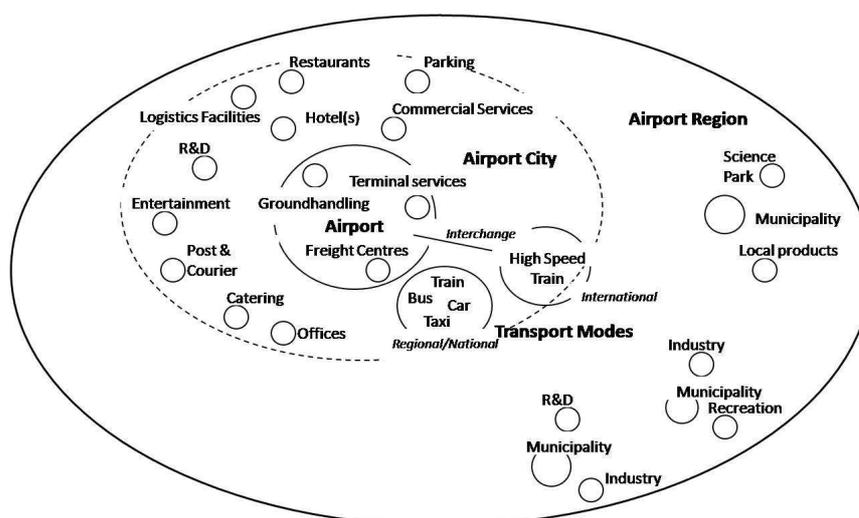


Figure 1: Airport, airport city and airport region (own illustration based on Güller & Güller 2003)

## 2.5 Potential fields of CO<sub>2</sub> reduction at airports

AIRCLIP differentiates six potential fields of action to reduce CO<sub>2</sub> emissions. These fields of action were considered when investigating Best Practices and are defined as follows:

- **Transport** - This potential field incorporates the reduction of CO<sub>2</sub> emissions through improvement of landside transportation concepts. It addresses improving (from an environmental perspective) modes of getting the passengers, employees, suppliers and visitors travelling to and from the airport.
- **Airfield operations** – Activities in this are target the reduction of CO<sub>2</sub> emissions through the improvement of airside activities on ground. Activities to reduce CO<sub>2</sub> emissions include, for example, the provision of GPUs and pre-conditioned air, and environmentally friendly ground vehicles.
- **Energy efficiency** – Significant reduction of CO<sub>2</sub> emissions (and costs) at airports can be achieved through the improvement of the energy efficiency of facilities at and around the airport. There is a huge potential for making energy use more efficient at airports and consequently the reduction of CO<sub>2</sub> emissions through efficient lighting systems, co-generation systems for producing heat and electricity or so-called Green Building Programmes.
- **Renewable energy** - Several international examples demonstrate that there are possibilities for airports in terms of producing solar power, geothermal power or wind power. The airport can use its existing facilities like roofs of parking houses or docks to install solar panels or even resort to its specific natural resources in its adjacent environment to access geothermal power.
- **Administrative** - Activities in this field cannot be measured directly in terms of CO<sub>2</sub> as they lead only to indirect reductions. Such activities may include several management initiatives within the airport but include also potential cooperation with stakeholders within the airport city and the airport region.
- **Others** - Relates to activities not assignable to the other categories mentioned above. Activities in this field are, for example, initiatives to utilize local materials or the creation of green areas in adjacent municipalities by the airport operator or waste management.

## 2.6 The research

As a backdrop to the research effort and literature review, an online questionnaire was developed and distributed to the environmental departments of airports through ACI Europe and ACI North America. The responses of the 21 airports that participated in the survey provided valuable insight into the activities described above. Based on the theoretical framework offered by the literature review and survey research, a comprehensive best practice database was developed with detailed descriptions of CO<sub>2</sub> reducing measures undertaken at airports across the world. The database contains approximately 200 Best Practices classified

according to various research criteria including: airport classification, spatial classification (of the activity), benefits, measurement, stakeholders, investment and associated operation costs, time horizon and transferability. From these criteria, a system was developed to filter the best practices in accordance to their relevance to Vienna International Airport (VIE) and other Austrian airports. These Best Practices were then further developed into specific recommendations for Vienna International Airport (VIE).

## 2.7 Recommendations

The following table summarizes the recommendations for Vienna International Airport (VIE) and sets the planning horizon and the level of influence for the airport operator.

Recommendations to reduce CO <sub>2</sub> emissions at VIE		Planning Horizon	Years	Influence
<b>A Transport</b>				
A1	Mobility management	short-term	1-2 years	indirect
A2	Rideshare	short-term	1-2 years	indirect
A3	EcoTaxis	medium-term	3-6 years	indirect
A4	Airport busses with biodiesel	medium-term	3-6 years	indirect
A5	Promotion of bicycle use	short-term	1-2 years	indirect
A6	Provide parking for environmentally friendly cars	immediate	<1 year	direct
A7	Promoting Inter-Modality	long-term	>6 years	indirect
<b>B Airfield Operations</b>				
B1	Development of eco-friendly ground vehicles	immediate	<1 year	direct
B2	Development GPU / Pre-conditioned Air	medium-term	3-6 years	direct
<b>C Energy Efficiency</b>				
C1	LEEDs + efficiency standards	medium-term	3-6 years	direct
C2	LED Lighting	medium-term	3-6 years	direct
<b>D Renewable</b>				
D1	Biogas energy production	medium-term	3-6 years	indirect
D2	Solar-Energy (AUA-Hangar, roofs of parking decks)	short-term	1-2 years	indirect
<b>E Administrative</b>				
E1	Modernization Program	short-term	1-2 years	direct
E2	EcoBusinessPlan	short-term	1-2 years	indirect
E3	Offset Carbon emissions	short-term	1-2 years	indirect
E4	Dialog Forum VIE and Environmental fund	short-term	1-2 years	direct
E5	VisitAir Center and Environmental Information	immediate	<1 year	direct
E6	Promotion of successful best practices of VIE	immediate	<1 year	direct

Table 1: Recommendations for the VIE depending on the planning horizon, the needed years for implementation and the possible influence for the airport operator

The recommendations described above cover three key sectors:

- Energy
- Administrative
- Transport and Mobility

VIE should be lauded for its efforts to improve efficiency as energy consumption is concerned, despite drastic increases in passenger load over the past decade, total energy requirements have increased at the airport by only a fraction. Nevertheless, despite the airport's positive example as an energy efficient consumer, it remains one of the region's largest energy consumers with consumption levels approaching that of a small city. With this in mind, the best practices cited for consideration above not only provide a means for the airport to improve further still on the efficiency front, but also would allow it to evolve into an energy producer providing energy from renewable resources.

Within the framework of the Dialogue Forum, VIE has demonstrated its ability to take on a role as a leader in a collaborative effort among regional stakeholders to address environmental issues such as noise pollution. Our recommendations advocate expanding this coordination role of the airport and its collaborative efforts at the regional level into other areas of environmental protection including CO<sub>2</sub> reduction and increasing environmental awareness among airport workers and travellers alike.

Further bolstering the need for VIE's adoption of a regional perspective and expansion of collaborative efforts is the fact that the area where the most significant potential for CO<sub>2</sub> reduction lies is one where the airport has the least direct influence - mobility. VIE lies at the center of a transportation hub, nevertheless, the other elements of the hub are to a large extent independent entities albeit dependent on the airport. Through the recommendations described above, VIE can position itself as a chief driver for the development and implementation of environmentally friendly regional mobility solutions.

### 3 CONCLUSION

The aim of this research was to help Vienna International Airport (VIE) position itself as an example of how airports can approach the issue of climate change. VIE is the gateway to Austria and thereby is in many ways Austria's face to the world. As such, it should follow in the nation's footsteps and strive to position itself as a positive example of sustainability at the forefront of the fight to prevent climate change. In this manner, it can join other European airports such as Stockholm Arlanda, Zurich, Frankfurt and Geneva in becoming another "Best Practice Airport" in the fight to reduce CO<sub>2</sub> emissions.

### 4 REFERENCES

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