Environmental Management at Munich Airport

Department:
Environmental Strategy und Management
by Matthias Linde 2009
Location
Impressions

Opened May 17, 1992
Location

Two Runways with
Length:
4000m = 13120ft
Width:
60m = 200ft
Distance in between
2300m = 7544ft
Offset
1500m = 5000ft
Movements:
90 per hour
Travel to and from Munich Airport by car
Travel to and from Munich Airport by train
Travel to and from Munich Airport - statistics

2008:
- 42% (2007: 45%) - Car
- 32% (2007: 31%) - Train
- 11% (2007: 11%) - Bus
- 6% (2007: 6%) - Taxis
- 6% (2007: 7%) - Transfer services/Sammeltaxis
- 3% - Mietwagen

Flughafen München
Traffic - Passengers

Fluggäste in Millionen

<table>
<thead>
<tr>
<th>Year</th>
<th>Passengers</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>21.3</td>
<td>10.2%*</td>
</tr>
<tr>
<td>2000</td>
<td>23.1</td>
<td>8.7%</td>
</tr>
<tr>
<td>2001</td>
<td>23.6</td>
<td>2.3%</td>
</tr>
<tr>
<td>2002</td>
<td>23.2</td>
<td>-2.0%</td>
</tr>
<tr>
<td>2003</td>
<td>24.2</td>
<td>4.4%</td>
</tr>
<tr>
<td>2004</td>
<td>26.8</td>
<td>10.8%</td>
</tr>
<tr>
<td>2005</td>
<td>28.6</td>
<td>6.7%</td>
</tr>
<tr>
<td>2006</td>
<td>30.8</td>
<td>7.5%</td>
</tr>
<tr>
<td>2007</td>
<td>34.0</td>
<td>10.4%</td>
</tr>
<tr>
<td>2008</td>
<td>34.5</td>
<td>1.7%</td>
</tr>
</tbody>
</table>
Traffic - Movements

<table>
<thead>
<tr>
<th>Year</th>
<th>Flights</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>299,071</td>
</tr>
<tr>
<td>2000</td>
<td>319,009</td>
</tr>
<tr>
<td>2001</td>
<td>337,653</td>
</tr>
<tr>
<td>2002</td>
<td>344,405</td>
</tr>
<tr>
<td>2003</td>
<td>355,602</td>
</tr>
<tr>
<td>2004</td>
<td>383,110</td>
</tr>
<tr>
<td>2005</td>
<td>398,383</td>
</tr>
<tr>
<td>2006</td>
<td>411,335</td>
</tr>
<tr>
<td>2007</td>
<td>431,815</td>
</tr>
<tr>
<td>2008</td>
<td>432,296</td>
</tr>
</tbody>
</table>

Percentage changes:
- 1999 to 2000: 7.4%
- 2000 to 2001: 6.7%
- 2001 to 2002: 5.8%
- 2002 to 2003: 2.0%
- 2003 to 2004: 3.3%
- 2004 to 2005: 7.7%
- 2005 to 2006: 4.1%
- 2006 to 2007: 3.1%
- 2007 to 2008: 5.0%
- 2008 to 2009: 0.1%
## Ranking 2008

<table>
<thead>
<tr>
<th>Rank</th>
<th>Airport</th>
<th>Passengers</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>London-Heathrow</td>
<td>67.1</td>
<td>-1.5%</td>
</tr>
<tr>
<td>2</td>
<td>Paris-Charles-de-Gaulle</td>
<td>60.9</td>
<td>+1.6%</td>
</tr>
<tr>
<td>3</td>
<td>Frankfurt</td>
<td>53.5</td>
<td>-1.3%</td>
</tr>
<tr>
<td>4</td>
<td>Madrid</td>
<td>50.8</td>
<td>-2.4%</td>
</tr>
<tr>
<td>5</td>
<td>Amsterdam</td>
<td>47.4</td>
<td>-0.8%</td>
</tr>
<tr>
<td>6</td>
<td>Rom-Fiumicino</td>
<td>35.1</td>
<td>+6.9%</td>
</tr>
<tr>
<td>7</td>
<td>München</td>
<td>34.5</td>
<td>+1.7%</td>
</tr>
<tr>
<td>8</td>
<td>London-Gatwick</td>
<td>34.2</td>
<td>-2.9%</td>
</tr>
<tr>
<td>9</td>
<td>Barcelona</td>
<td>30.2</td>
<td>-8.1%</td>
</tr>
<tr>
<td>10</td>
<td>Paris-Orly</td>
<td>26.2</td>
<td>-0.9%</td>
</tr>
</tbody>
</table>

No. 27 in the world
How to manage the environment?

Environmental Management System (EMS)

- Environmental Policy
- Validation of environmental aspects
- Measurement program
- Depiction on environmental processes
- Internal audits
- Environmental statement
- External audit by independent assessor

DIN ISO 14001
Environmental Issues

- Air traffic noise
- CO₂ Emissions
- Air quality
- Travel of Passengers and Employees
- Waste
- Wastewater / Deicing
- Mobility
Sustainability

Economical

Environmental

Social

CO₂ Emissions

Air traffic noise

Mobility

Air quality

Waste

Travel of Passengers and Employees

Wastewater / Deicing
CO$_2$ emissions

Web based system (client/server)

• Basis GHG protocol
• Including all causers of CO$_2$ emissions
• Scope 1-3
• Listing of measurements
• Calculation of the footprint
**CO₂ emissions - Reduction Strategy and Target**

**CO₂ neutral growth on basis of 2005**

- CO₂-Emissions will grow thru the planned development from about 155,000t (2007) to about 234,000t (2020).
- By the Reduction of nearly 80,000t CO₂ emissions can be kept at a constant level.

![Graph showing CO₂ emissions growth and reduction strategy](image)

- Possible target for CO₂ neutral growth
- Necessary cutback to remain CO₂ neutral
- Anstieg der CO₂-Emissionen ohne Gegenmaßnahmen bei unterstelltem Wachstum/Invest

Quelle: Berechnungen TE/KEU
**CO₂ emissions - Measures**

**Basis – Greenhouse Gas Protocol**
- CO₂ sensor in terminal to govern the ventilation
- Adjust the luminous period of the apron illumination
- Purchase of CNG vehicles
- Use of alternative fuel
- Solar cooling system for buildings
- Change in behavior by the employees (Light, PC, air condition, etc.)
CO₂ emissions - Combined heat and power plant

- Driven with natural gas
- Degree of efficiency above 80 %
- Low emission levels
- Advanced cooling machines convert heat for cooling purpose
- Provide half of the required energy
CO₂ emissions - Solar panels

- Consortium of different companies
- Established in 2002
- 457 kWp
- 450000 kWh/a
- CO₂ Reduction of about 400 Tons
Central Control Technology

Specifications
- 230,000 measuring points
- 22,000 installations
- 9,000 process diagrams
- 250 users

Purpose
- Energy saving programs
- Lighting off with flight schedules
Air Traffic Noise

- Compliance of regulations from the planning approval:
- Noise Monitoring (static/mobile)
- Operation of the engine test hangar
- Monitoring of the night flight activity
- Computing of the Noise levels and contours
- Public Relations
Air Traffic - landing fees

Based on noise
- Loud aircraft pay more
- Loudest pay 8 times more than quietest
- Charge is a fixed amount for each noise category
- Classification based on the average noise levels

<table>
<thead>
<tr>
<th>Classification</th>
<th>Aircraft</th>
<th>Level (dB(A))</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AT44, B250, C750, E120, J631</td>
<td>69.0-71.5</td>
<td>57.00</td>
</tr>
<tr>
<td>2</td>
<td>A43, A10, B190, E145, J631</td>
<td>71.6-73.9</td>
<td>61.00</td>
</tr>
<tr>
<td>3</td>
<td>A320, A319, A320, A321</td>
<td>74.0-75.0</td>
<td>111.00</td>
</tr>
<tr>
<td>4</td>
<td>A320, A319, A320, A321</td>
<td>76.0-77.7</td>
<td>149.00</td>
</tr>
<tr>
<td>5</td>
<td>B737, B737, B737, B737</td>
<td>77.8-79.1</td>
<td>253.00</td>
</tr>
<tr>
<td>6</td>
<td>A320, A319, A320, A321</td>
<td>78.2-81.0</td>
<td>293.00</td>
</tr>
<tr>
<td>7</td>
<td>A320, A319, A320, A321</td>
<td>81.1-82.9</td>
<td>341.00</td>
</tr>
<tr>
<td>8</td>
<td>A320, A319, A320, A321</td>
<td>85.0-85.9</td>
<td>451.00</td>
</tr>
<tr>
<td>9</td>
<td>A320, A319, A320, A321</td>
<td>86.0-90.0</td>
<td>114.00</td>
</tr>
<tr>
<td>10</td>
<td>A320, A319, A320, A321</td>
<td>91.0</td>
<td>174.00</td>
</tr>
</tbody>
</table>

Based on emissions
- Inducement to use aircraft with reduced NOx Emissions
- Nationally harmonized
- Required data are retrieved from a recognized airline fleet database
Air Quality

- sulfur dioxide (SO₂)
- carbon monoxide (CO)
- nitrogen monoxide (NO)
- nitrogen dioxide (NO₂)
- ozone (O₃)
- hydrocarbons
- dust
- PAH-hydrocarbons benzene, toluol, xylene (since 1999)
- Weather

Concentration mainly in a low levels
Only few substances (e.g. NO₂) have medium level of concentration
Trend since 1992: Most values remain constant but increasing level of NO₂
Biomonitoring

Survey
• Heavy metal
• PAH

Duration
Before and during opening
1991/92/93
And
With a triplication of traffic
2006/07/08

Results
• No Accumulation of heavy metal
• PAH-higher levels in autumn due to domestic fuel (individual heating)
Airport Honey

Does an airport pollute the environment?

- Bee colonies were placed near to the airport fence
- Honey were analyzed
- Compared with samples with honey from the neighborhood
- An influence of the environmental situation couldn’t be detected
- Airport Honey can be enjoyed without hesitation
Mobility – concept for alternative motor fuel

CNG – Compressed Natural Gas

Rape Oil

Ethanol E85
Wastewater / De-icing

- Aircraft de-icing only at appropriate de-icing areas
- Particular drainage system
- Mix of glycol and melt water is collected in concrete underground tanks
- Trucked to a recycling plant
- New aircraft de-icing agent is produced
- Recycling quote of 60%
Waste

Best practice example (1)

• Mono bin at terminal
• Sorting facility handles the mixture of recyclable materials and residual waste
• Reuse of about 70% of the material
Waste

Best practice example (2)

- Sorting of recyclable materials by the customer
- Waste is weighed and matched to the customer
- Exact billing
- It saves money for customer by separating
Thank you

Munich Airport

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