Time to sweat the assets?: The analysis of two airport cases of restricted capacity in different continents

Miguel Mujica Mota, Geert Boosten, Catya Zuniga

Hogeschool van Amsterdam
Amsterdam University of Applied Sciences

UNIQ
Universidad Aeronáutica en Querétaro

Defining and measuring airport capacity

Capacity has been analysed and defined by different authors…

- Reichmuth, Berster, & Gelhause (2011)

"Capacity is related to capability of a facility to handle people, freight and vehicles…"

- Barhart et al. (2012)

"Capacity is defined by the number of movements per hour …"

- Upham, Thomas, Gillingwater, & Raper (2003)

"Capacity is a function of operational and environmental constraints…"

Airport operations approaches tends to focus on:

- The relationship between flight schedules, airport capacity and delays
- The relationship between airports and airlines and their respective business models
- As the interaction between four main factors:
    1. Operational, sizing and design of airside and landside infrastructure
    2. Economics
    3. Environmental restrictions and regulations and
    4. Social perception towards airport infrastructures

However…

no single/ unique definition of airport capacity can be found;
Interaction between drivers can vary per airport

Our definition

It is proposed to define airport capacity as a multifactor function leaves

$$Airport\ capacity = f(Factor\ 1, Factor\ 2, Factor\ 3, .., Factor\ n)$$

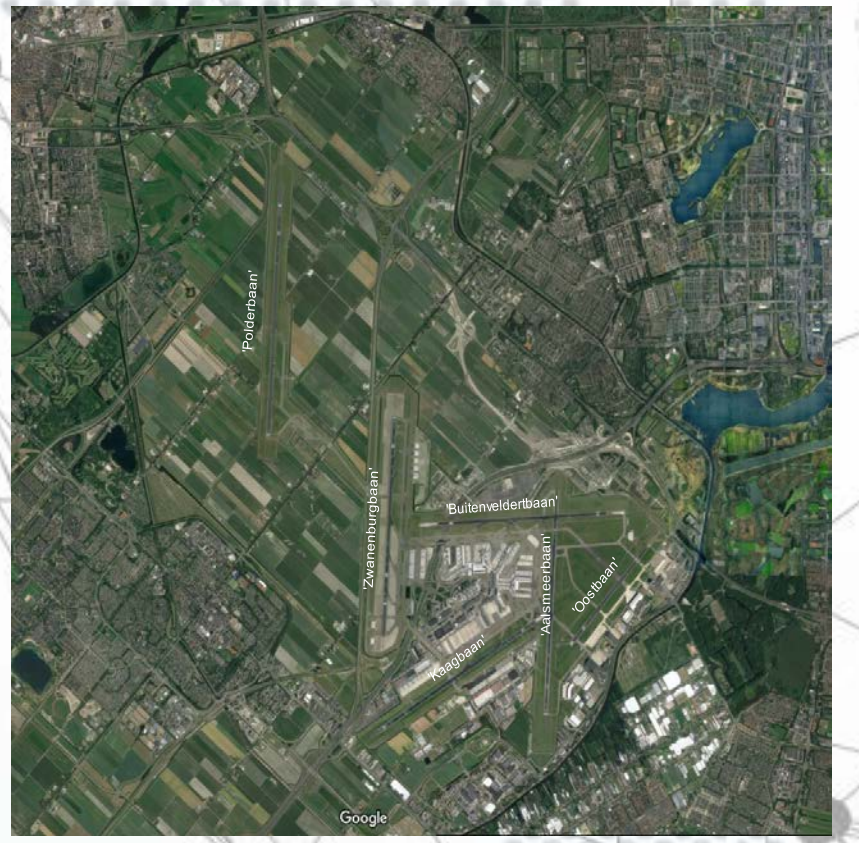
Technical Constraints
Environmental Constraints
Physical Boundaries
Airline Business Models
Airport Business Models
Relationship Airport-Airline
Relationship Region-Airport
Governmental Regulations
Societal Behaviour

Factors that define capacity of an airport

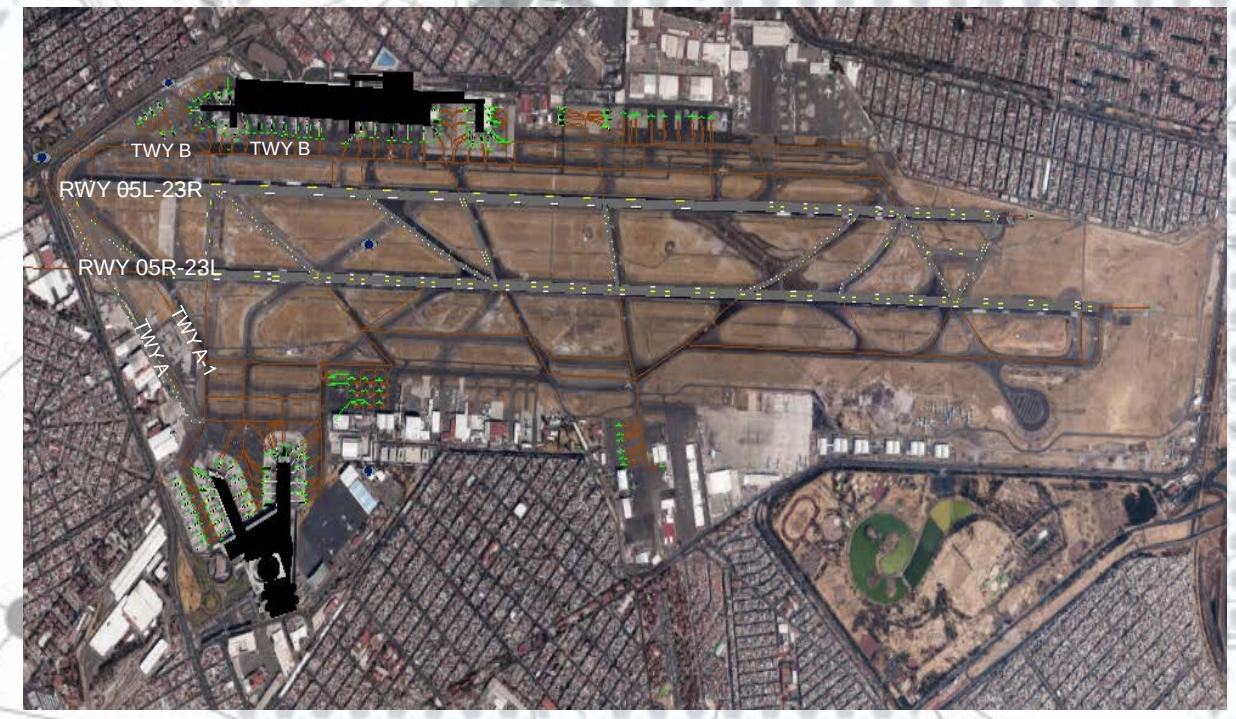
Limiting Factor	
Technical Constraints	• Runways • Terminal buildings • Taxiways • Technology on board/airport
Environmental Constraints	• Noise emissions • Pollution • Weather
Physical Boundaries	• Available land on and off-airport
Airline Business Models	• Hub and spoke/ point-to-point • Connectivity • Frequency
Airport Business Models	• Aeronautical business • Non-aeronautical businesses
Relationship Airport-Airline	• Low-cost carriers / Full Service Carriers • Minimum connection times • Position of dominant airline
Relationship Region-Airport	• National economy, demand for connectivity, triple helix • Business/development models of government
Governmental Regulations	• Security regulation • Night curfew • Land-use planning
Societal Behaviour	• Human behaviour inside and outside the airport • New technology influencing passenger choice

Case studies

Amsterdam Airport Schiphol



Mexico City Airport (AICM)



Limiting Factor	Schiphol	AICM
Technical Constraints	• Five runways, not most constraining factor • Taxiway system • Peak hour capacity	• Peak hour movements runway most constraining • Two runways operate in a segregated mode • The soil conditions of the airport
Environmental Constraints	• 500,000 ATM per annum • Noise contour • Emissions	• Fog in winter • Cumulus clouds on summer (on Santa Lucia approximations) • Wind (related to runway)
Physical Boundaries	• Airport land • Noise contours • Land-use planning • Local communities	• Airport surrounded by urban (3-4floor buildings, antennas) • For landing and departs ops, mountains and building (mainly on the south) • Airport landside layout: • TWB (blocking taxi ops) and T2 (“U” shaped)
Airline Business Models	• Main user KLM/Skyteam 70% of business • Hub operations with competition on frequency • Important LCC and charter market	• Main user AeroMexico/Skyteam • Mainly O/D traffic • High LCC participation
Airport Business Models	• Airport City concept	• Aero- and non-aerobusiness in terminals • Mix Tourist/Business model
Relationship Airport-Airline	• Strong demand for connectivity, triple helix • Airport important economic factor	• Dominant carrier and alliances • Long term commitments (AMX-T2) • Slots to operate at AICM
Relationship Region-Airport	• Strong demand for connectivity, triple helix • Airport important economic factor • Airport involved in regional development	• Mexico hub • Political parties (only for 6 years duration at the most)
Governmental Regulations	• Slot reguations • Night limitations • Airport system development • Security	• Slot regulations • Night limitations • No formal relationship with domestic airports • Security
Societal Behaviour	• Experienced travellers • Human size facilties • Limited acceptance for hinder • New technology implemented in to support passenger choise	• Tourist/Business travellers • Proposal of New AICM land used of communal lands

Main drivers to increase operational capacity

For Amsterdam Airport Schiphol:

- **Negotiations with stakeholders on ATM-capacity**
- **Creating leverage by supporting quality of life and nature in the airport area**
- **Slot allocation**
- **Moving flights to other airports in system**
- **Increase peak hour capacity**
- **Economic instruments/regulation**
- **Mainport policy: contribution airport to national economy**
- **Smart use of existing infrastructure/facilities**

For Mexico City Airport (AICM):

- **Revisiting the slot allocation policies**
- **Traffic deviation (TLC)**
- **Analyse in deep current operations**
- **Simulation to understand airport operations**
- **Flexible use of existing facilities**
- **Coordination within airport network (with domestic airports)**
- **Airport layout/ New airport project**
- **Transparent procedures from all stakeholders**

Current challenges

Schiphol

- Schiphol reaching 500,000 ATM earlier than expected
- How to assign slots within ceiling
- How to divide traffic over Schiphol and reliever airports
- Invest in off-airport activities or in improving quality of life within communities
- Very complex Air Space in between the airport system: how to improve ATC with traffic growth at all airports
- Need to solve problems within a network context
- Investment decisions in expanding airport facilities and airspace

AICM

- Maximum arrivals per hour limit development airport and block new airline entries
- Network solutions (ground delay) cause delay at domestic airports
- Unbalance in use terminal facilities compared to domestic and international peak
- Exploit the benefits for all stakeholders of other slots policies
- Deviate some of the traffic to relievers airports
- Optimize the information processes (knowing what is happening, CDM)
- Need for simulation to gain insights in optimization options for operations

Conclusions

Both airport look for solutions to meet the growing demand.

Schiphol Airport growth potential is limited by

environmental limitations in terms of noise and emissions

while

the International Airport of Mexico City is limited by

the technical capacity of the runway and air traffic control.

Understanding operational airport capacity drivers is key to optimize airport capacity; simulation can be a useful tool to gain insights.

In case of environmental constraints the solution can be outside the airport in dealing with the local communities.

Thank you!!!!

Questions??

Miguel Mujica Mota
m.mujica.mota@hva.nl

Geert Boosten
g.boosten@hva.nl

Catya Zuniga Alcaraz
catya.zuniga@unaq.edu.mx