Accessibility of regions

First results of the IBC development module «Accessibility»

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The project
Organisation

BAK IBC International Benchmark Club ®

IBC Steering committee & management

IBC Module «Accessibility» - Financing partners (steering group):

Kanton Zürich (Amt für Verkehr) - Kanton Basel-Stadt (Wirtschafts- und Sozialdepartement)
Schweizerische Eidgenossenschaft (Amt für Raumentwicklung) - Regione Veneto
SWISS International Air Lines - ab 2003: Kanton Basel-Landschaft (Amt für Raumplanung)

Other IBC modules (Tax, Innovation...)

IVT
ETH Zürich
Prof. Dr. Kay W. Axhausen
Transport networks
Scientific support

BAK
Basel Economics
Andreas Bleisch
Project management
Calculations & reporting

WWZ
University of Basel
Prof. Dr. René L. Frey
Scientific support
The project
Schedule

**Prelaunch**
- Project Definition
- Acquisition

**Phase 1**
- Calculations intercontinental
- Calculations intra-regional
- Mode specific Calculations, Introduction of Project Data
- Definition intra-regional Model

**Phase 2**
- Calculations intra-regional
- Update intercont. Interreg.

**IBC Forum**
- Fall 2002
- Fall 2003
- Fall 2004
**The model**

What accessibility to measure?

<table>
<thead>
<tr>
<th>Focus:</th>
<th>Representatives of international companies and institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of accessibility:</td>
<td>Outbound (Origins ➔ Destinations)</td>
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<tr>
<td>Origins:</td>
<td>IBC regions (Focus: Enlarged Alpine Space)</td>
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<tr>
<td>Destinations:</td>
<td>Markets for inputs &amp; goods</td>
</tr>
<tr>
<td>Spatial impedance:</td>
<td>Travel time (fastest connection)</td>
</tr>
<tr>
<td>Traffic modes:</td>
<td>Rail, road and air</td>
</tr>
<tr>
<td>Spatial scale:</td>
<td>Intercontinental (global) &amp; interregional (within Europe)</td>
</tr>
</tbody>
</table>
The model
Area of calculation (Origins)

220 European regions
- Enlarged Alpine Space
- Germany & Netherlands
- European Benchmark Metropoles (●)
The model
List of destinations

- **Intercontinental** destinations:
  120 international airports
  representing the world economy
  outside Europe

- **Interregional** destinations:
  400 regional centers
  representing European economy
The model

Accessibility measure

- Multiple definitions of differing complexity
- Choice of a measure derived from welfare economics: the log sum term of destination choice model:

\[ A_i = \ln \sum_{k_{ij}=0}^{k_{ij}<k_{\text{max}}} X_j f(k_{ij}) \]

- Elements:
  - Opportunities for interaction/activity \( X_i \)
  - Exponentially weighted generalised cost of travel \( k_{ij} \)
Network data
Road network for Europe

- Sources:
  - Switzerland: IVT network
  - Rest of Europe: PTV, Karlsruhe
  - (Capacity restraint functions for 50 types of roads)

- Size:
  - Zones 657
  - Nodes 75,966
  - Links 223,238
Network data
Isochrones from Basel - Road
Network data
Air traffic

- Sources:
  - All OAG flights for 23 - 29 September 2002
  - European airport co-ordinates by IRPUD
  - 3 levels of minimum transfer times allowed for
  - Check-in-times according to information from Swiss and Lufthansa

- Size:
  - Airports 349 (all European airports and all hubs outside Europe)
  - Links 8‘904
  - Flights 49‘967
Network data
Departures and links with more than 10 flights/day (Europe)
Network data
Railways

- Sources:
  - Network geometrics by IRPUD, Dortmund
  - Timetable according to Thomas Cook September 2002
    - Enlarged Alpine Space: trains from Regional Express-level upward
    - Rest of Europe: all high-quality services (EC, TGV, etc.)
  - Airport access according to information on airport authority web sites (ca. 85); others are approximated by road distances

- Size
  - Zones 657
  - Nodes 35,836
  - Stations with services 2,004
  - Links 77,662
  - Trains 5,335
Network Data
Swiss railways service frequencies

IBC Forum 2003
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Network data
Calculation of shortest intermodal travel time for every connection

- **Intercontinental connections:** 220 (Origins) \(\times\) 120 (Destinations)
  - Central station origin ➔ Destination airport outside Europe
  - Fastest connection including:
    - Access time to departure airport (average of public transport and car access)
    - Transfer time (change of traffic mode)
    - Check-in time (destination- and airportspecific)
    - Flight time including connecting time

- **Interregional connections:** 220 (Origins) \(\times\) 400 (Destinations)
  - Central station origin ➔ Central station destination
  - Fastest connection from modes:
    - Road
    - Railway
    - Flight (travel time including access and transfer time departure airport, check-in time, flight time, transfer time at arrival airport and access time from arrival airport to central station destination)
Activity data
Regional GDP’s 2000

- **Intercontinental activity data**
  National GDP’s at current US-Dollars, regionalized for polycentric states with a GDP > US$ 100 Mrd.
  Allocation to the 120 international airports, serving as entry gates for the corresponding regions
  
  **Datasource:** World Bank Indicators, National Statistical Agencies, Calculations BAK

- **Interregional activity data**
  Regional GDP’s at current Euros (Level NUTS-2/NUTS-3), Allocation to the 400 regional centers, serving as entry gates for the corresponding regions

  **Datasource:** Eurostat, World Bank Indicators, IBC Database, Calculations BAK
Calculations & results

- Calculation of intermodal potential accessibility (negative exponential function)
- Integration of service frequencies (time slots)
- Indexation of accessibility values:
  Average Enlarged Alpine Space = 100
- Results for interregional and intercontinental accessibility
Calculations & Results
Overview Ranking intercontinental

- Distribution of Index values for 220 origin regions
Calculations & results
Ranking intercontinental accessibility (fall 2002)

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Total 220 cities - Index 100 = Average EAS
Calculations & results
Intercontinental accessibility map 2002
Calculations & Results
Overview Ranking interregional

- Distribution of Index values for 220 origin regions
### Calculations & results

#### Ranking interregional accessibility (fall 2002)

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Total 220 cities - Index 100 = Average EAS
Calculations & results
Interregional accessibility map 2002
Outlook

- Detailed analysis of the results
- Benchmarking for single modes road, rail and air
- Accessibility calculations for scenarios (infrastructure projects, changes in flight schedules etc.)
- Sector specific accessibility indicators
- Definition of intraregional accessibility indicators
- Freight accessibility model