Demand analysis in CBA and the project development cycle

NP Event on CBA in the Transport sector
Paul Riley – JASPERS Vienna
30 September 2015
Two perspectives…

a) Demand based planning is a key tool in creating user-centered sustainable transport

b) Transport systems would be safer and more efficient without drivers, passengers, cars or goods
Content of presentation

Why?
1. More emphasis on demand analysis in legislation and guidance
2. What is demand analysis used for?

What is needed?
3. What modelling do I need?
4. Forecasting the Future
5. Data, surveys and evidence

Implementation
6. Procuring, operating and maintaining models
7. Strengths/weaknesses in the last period
8. Case study: Hungarian national model + experience

Conclusions
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Conclusions
1. Increased emphasis for 2014-2020 (1)

Philosophy behind increased emphasis

- Key input to CBA benefits
- Evidence wanted for benefit estimates

- Value for money viable solutions
- Avoid:
  - Underperformance
  - Under-dimensioning
  - Over-dimensioning
1. Increased emphasis for 2014-2020 (2)

**CBA legislation (IA 207/215 annex III)**

- Demand analysis quantifies the social need for an investment, document:
  - Current demand by use of models and actual data
  - Forecast demand from macro-economic and sector forecasts and considering demand elasticities to relevant determinants
  - Supply side aspects and network effects
1. Increased emphasis for 2014-2020 (3)

Funding application legislation

- IQR Criteria (IA 480/214) 4.1:
  - Demand analysis - reliable and based on realistic estimates reflecting trends and developments

- Funding application documentation required (IA 207/215 – Annex II D.1)
  - Methodology, assumptions and baselines
  - Historical/current/forecast demand
  - Forecast per option
  - Supply side aspects, network effects
1. Increased emphasis for 2014-2020 (4)

CBA guidance 2014-2020

- 2.6.1 Reflects annex III of legislation
- 3.5.1 - Factors influencing demand analysis
- 3.5.2 - Hypotheses, methods and inputs
- 3.5.3 – Analysis outputs / inputs into CBA
- Transport modelling expected
- Transparency of method and assumption
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Conclusions
2. What is demand analysis used for?

Problem/functional analysis
Concept / options development
Options appraisal / CBA

Demand analysis through the whole project cycle leads to user-led, cost-efficient, feasible design
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Conclusions
3. What demand modelling do I need?
3. What modelling do I need? Concepts

- **NETWORK MODEL**
  - Area scope
  - Modes
  - Network detail

- **Cost/utility model**

- **DEMAND MODEL**
  - Segmentation
  - Origin-Destinations
  - Zone detail
  - Sensitivity to change in costs

- **Traffic Behaviour Model**
3. What modelling do I need? Considerations

No One-Size-Fits-All
Analyse the Context!

- Review Existing Models
  - Geographical/Modal/Market
    - Scope of Impacts
      - Model Plan
        - with Data Plan
      - Calibrated Current Model
      - Future Model(s)
  - Problems expected
  - Significant Benefits/Changes to Assess
    - Future developments
      - e.g. policy/land-use?
  - Types of Project Options Tested
3. What modelling do I need?
Example types of model for different scope of impacts

<table>
<thead>
<tr>
<th>Main Impact Scope</th>
<th>Junction</th>
<th>Section</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Junction modelling software OR Simulation model</td>
<td>Spreadsheet with O-D matrix / costs / elasticities OR Mesoscopic/simulation model</td>
<td>Macroscopic monomodal transport network model</td>
</tr>
<tr>
<td>Intra-modal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-modal</td>
<td>ABOVE + Mode shift model</td>
<td>ABOVE for all modes + Mode shift model OR 4 Phase multimodal model</td>
<td></td>
</tr>
</tbody>
</table>
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Conclusions
4. Forecasting the future

Is this the only way?
No, but certainly not a precise science
Over-optimism / wishful thinking is the main sin
4. Forecasting the future

Reaction of the Model to the project (options)

Key external variables e.g.
- GDP, car ownership development
- Developments of O+Ds (migration+land-use/economic policy etc.)

Rational Demand Forecast
- Scenarios to deal with Uncertainty
- Longer-term: less precise

Reaction of the Model to

Future capacity constraints
- Policy changes
Future infrastructure development
- Changes in travel costs

Explanatory external model of the future based on key variables?
- History-future regression
- Expert polling?
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4. Data, surveys and evidence

Model Plan

Is existing data transferable / sufficient?

Data plan
- Standard/statistical Inputs, Other Models
- Regular Transport Surveys
- Special Project Surveys

Key impacts / sensitivities
- Mode shift / New traffic / Rerouting?

Existing data from models and surveys available?

Rubbish in
Rubbish out

Weak data = simpler model and conservative assumptions
## 4. Data, surveys and evidence

### Example Outline Data Plan

#### National Passenger Model

<table>
<thead>
<tr>
<th>Standard/statistical Inputs, Other Models</th>
<th>Regular Transport Surveys</th>
<th>Special surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Census data</td>
<td>• National household survey</td>
<td>• Modal OD surveys</td>
</tr>
<tr>
<td>• Network/Service database</td>
<td>• National road/rail/bus traffic counts</td>
<td>• Stated preference surveys</td>
</tr>
<tr>
<td>• Demographic data</td>
<td></td>
<td>• Freight market interviews</td>
</tr>
<tr>
<td>• Road model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• TRANSTOOLS</td>
<td></td>
<td></td>
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<tr>
<td>• GDP forecast</td>
<td></td>
<td></td>
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<tr>
<td>• Car ownership</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Demographic trends/plans</td>
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Route to quality / effective demand analysis

**Tendering Models**
- Models + data closely specified in study ToR
- Allow enough time and resources in study
- Embed rules in contract

**Institutional Rules**
- Institutionalize required regular data collection / guidance / modelling
- Models (+data) owned by the public sector
- Make models and data openly available

**Institutional Capability**
- Buy/develop know-how to specify models/surveys
- Outsource model building and maintenance if necessary
- In-house model operations and survey capability best

**Successful Demand Modelling**
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7. Strengths/weaknesses in the last period

<table>
<thead>
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<th>Weaknesses -</th>
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<tbody>
<tr>
<td>Increasing development/use of models</td>
<td>Lack of demand analysis at problem identification / concept phase</td>
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<tr>
<td>Urban models increasingly available</td>
<td>Insufficient scope of models</td>
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<tr>
<td>Development of national models</td>
<td>Non-transparent documentation</td>
</tr>
<tr>
<td>Increasing collection of survey data</td>
<td>Limited data/evidence collection</td>
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<tr>
<td></td>
<td>Over-optimistic / poorly justified assumptions</td>
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<tr>
<td></td>
<td>Ownership / availability of existing models</td>
</tr>
<tr>
<td></td>
<td>Limited local know-how</td>
</tr>
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<td>Not enough resource/time for models</td>
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**Conclusions**

Why?

Realistic demand analysis in strategic and project development cycle is the way to cost-efficient, user-centered projects.

Legal requirements for realistic demand analysis and rational forecasting.

What is needed?

- Model scope covering key project + future development impacts.
- Sufficient data/evidence.
- Forecast with rational basis.
- Transparent documentation.

Key to institutional success

- Develop the right institutional rules and capability.
- Ensure demand analysis is well specified in study tenders.

Demand analysis in CBA and the project development cycle.
For more details on modelling - see:

JASPERS Appraisal Guidance (Transport)
The Use of Transport Models in Transport Planning and Project Appraisal -


NP Event on CBA in the Transport sector
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