Integration of a land use transport model into a planning game for developing strategies against rising energy prices

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mobil.TUM 2014
International Scientific Conference on Mobility and Transport

Munich, 20th May 2014
Mobility and housing are two important expenditure items for German households

Both are dependent on energy costs, the development of which has been consistently underestimated.
€LAN research project

- **main questions**
  - Which **regions** are particularly affected by rising energy costs?
  - How will **households** react in the short and in the long run?
  - How will politics respond to this situation?

- **academic consortium**
  - Hamburg University of Technology
  - University of Cologne (FiFo)
  - University of Stuttgart (IREUS)

- **research period**
  - October 2010 – March 2014

- **funded by the German Ministry for Education and Research**
  - Research Area: Sustainable Land Management
Integration of a land use transport model into a planning game...
Why use a model?

- New energy scenarios are expected to have broad and interdependent spatial consequences for:
  - Mobility
  - Housing
  - Labor market
  - Demographic developments
  - Public finances
  - etc.

- Dealing with complexity
Model + X

Why not use only a model?

- Awareness of inherent limits of a quantitative tool
  - Lack of transparency, simplifying assumptions, data hunger etc.
- Models cannot cope with extreme situations
  - Energy prices are not expected to increase only marginally
    → Usual elasticity calculations may not be helpful
- Models cannot simulate the political process
  - Search for more accurate representation of political responses
  - Provision of more accurate scenarios shall take into account the “human factor”

Are there methodological alternatives to the development of even larger and more sophisticated models for dealing with complexity?
Research design

- Coupling a model with a **serious game**
  - provides a planning-political testfield
  - can enhance the quality of decision making
  - explores interfaces between quantitative and qualitative planning methods
Serious game

- Political science experiment depicts reactions of decision makers
  - series of moderated sessions

**Two-tier serious game**

**federal states/government level**
- Serious game on federal states/government level in Berlin
- Formulation of framework and visions
- Translation of serious game outcomes into model parameters
- Simulation for period t+1

**municipal level**
- Serious game on municipal level in Hamburg
- Formulation of demands towards federal states/government
- Formulation of strategies and measures
- Simulation for period t

Generating future scenario for the extended Metropolitan Region of Hamburg

Statement of lobbies

Integration of a land use transport model into a planning game...
From the model into the serious game

- Scenario forecasts for the years 2015 and 2025:
  - Crude oil barrel price:
    - $200 in the year 2015 (already used in current forecast scenarios)
    - $400 in the year 2025

- Model indicators for
  - Population growth variation for age classes
  - Housing costs for representative households
  - Mobility costs for representative households
  - Share of housing and mobility costs over net income for representative households
  - Average kilometers travelled by private car per person and day
  - Average kilometers travelled by public transit per person and day

- Aggregated indicator values presented for 7 municipality classes
Municipality typology

- HH: Hamburg
- OZ: Main cities
- VR: Dense region around HH
- OR (A): Suburban axis
- OR (Z): Suburban area (between axes)
- MZ: Other cities with central functions
- LR: Rural area
Integration of a land use transport model into a planning game...

Presenting model results

Share of income spent on mobility and housing - Single parent, low income

Fuel price
2015: 2,20 €
2025: 2,20 €
From the serious game to the model

- Strategies, guidelines and measures for dealing with energy price increases (selection)
  - Land use
    - promotion of higher energetic standards for housing
    - improvement of child care opportunities
  - Social and technical infrastructure
    - mobile provision of services (e.g. health)
  - Transport policy
    - expansion of the rail network
    - ride sharing in rural areas
  - Energy and environmental policy
    - energy advice for private households
    - organization of local/regional energy markets
- Generalisation and degree of implementation of developed strategies
Spatial concretization of strategies

Measure field

Transport infrastructures

- HH
- OZ
- VR
- OR (A)
- OR (Z)
- MZ
- LR

Public transport capacity improvement

New PT infrastructures

Alternative transport services

E-Mobility

Integration of a land use transport model into a planning game...
Presenting model results

Share of income spent for mobility and housing - Single parent, low income

Fuel price
2015: 2,20 €
2025: 3,50 €
Results

- A continuous energy price increase has diverse and multidimensional impacts on land use
  - Connection to other long-term issues like demographics and climate change
  - No general answer on how political stakeholders should react
- Understanding problems by decision-makers can be tackled through appropriate exchange schemes
- Models help to deal with complexity. But developing overly complex models can be misleading for decision making
- Solving new, complex and long-run problems demands:
  - innovative cross-sectoral policy responses (room for new ideas)
  - which can be tested in a planning testfield
  - which can be better implemented on basis of target-oriented intermunicipal cooperation (limits of own possibilities under scenario 2025)
Thank you for your attention!

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More information on €LAN:
http://www.energie-landnutzung.de/