Improving the representation of modal choice into bottom-up optimization energy system models

Tattini, Jacopo; Ramea, Kalai; Gargiulo, Maurizio; Yang, Christopher; Mulholland, Eamonn; Yeh, Sonia; Karlsson, Kenneth Bernard

Publication date: 2017

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
• Bottom-up energy system models (E4 models) describe in detail the technical, economic and environmental characteristics of the technologies
• They are weak in representing consumer behaviour: only one average-representative decision maker is considered [1], [2]
• The behavioural dimension cannot be neglected, as it is fundamental in decision making in the transportation sector [3]
• This study proposes and discusses a novel methodology to incorporate modal choice within E4 models

MOTIVATION AND OBJECTIVE

RESULTS

1. Validation of MoCho-TIMES
MoCho-TIMES is reliable in determining modal shares because it is able to reproduce the results of its support model LTM satisfactorily (Figure 5).

2. Scenario Analysis
The model is tested under alternative assumptions regarding the variables in the scenario matrix (Figure 6). Results concerning CO₂ emissions and modal shares are presented in Figures 7-8.

CONCLUSIONS

• MoCho-TIMES introduces endogenous modal choice within an integrated energy system model
• MoCho-TIMES allows exploring how modal shift occurs in the different regions and types of urbanization and provides an insight on the modes adopted by the different consumer groups in the future
• Heterogeneity avoids the "winner-takes-all" phenomenon: each group of consumers chooses its optimal modes, thus resulting in a variety of modes
• A new set of variables regarding the level of service and the consumer perception of the modes is introduced in the model, which allows performing new types of policy analysis to understand barriers to adoption of more sustainable modes
• From the case study of Denmark it results that authority commitment and in particular availability of infrastructure for transit and non-motorized modes are fundamental for reducing transport related CO₂ emissions

REFERENCES

3. Venturini, G., Tatiani, J., Mutholland, E., O’Gallachóir, B., Improvements in the representation of behaviour in integrated energy and transport models, Submitted to International Journal of Sustainable Transportation on 03/04/2017