

Integrated models of transport and energy demand

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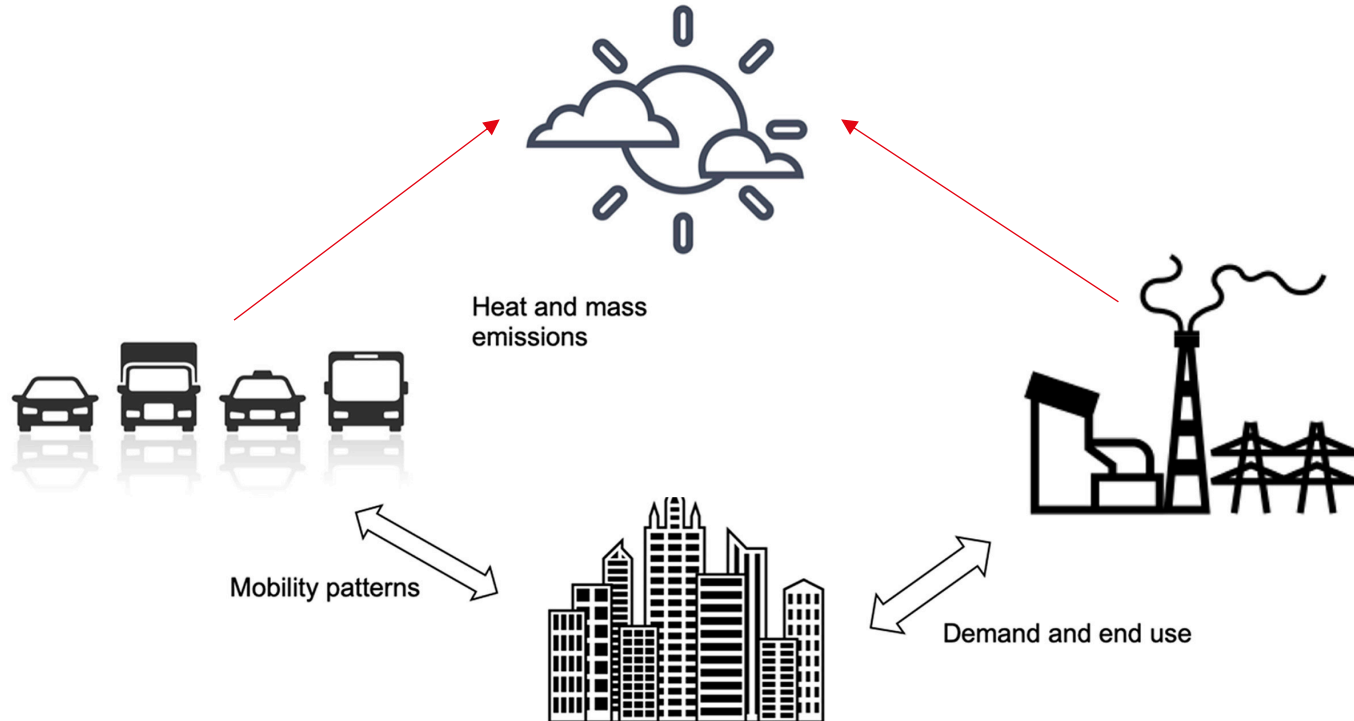
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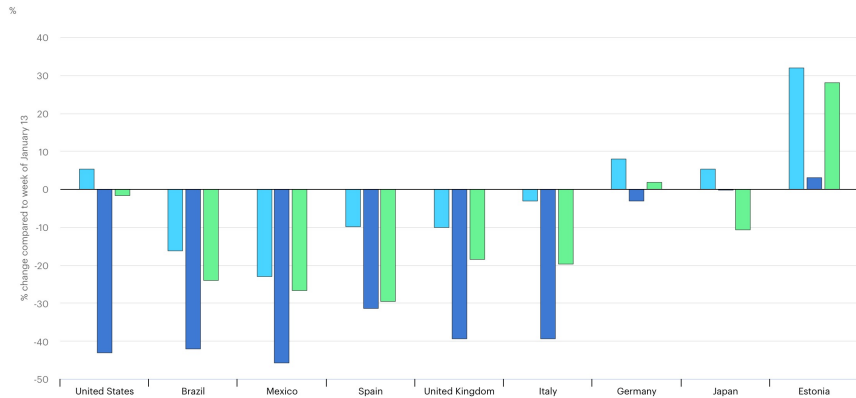
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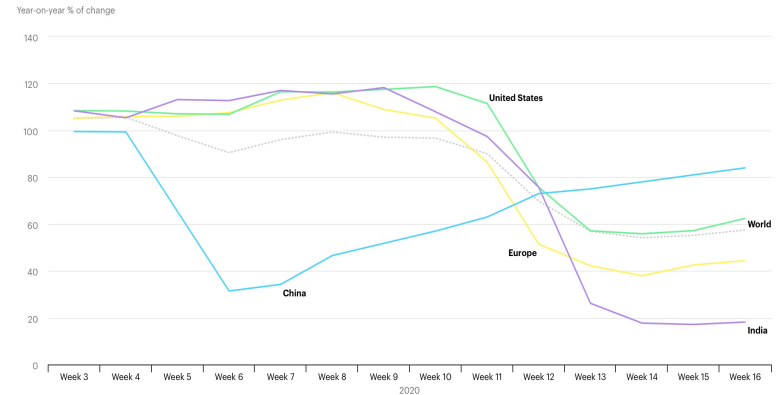
- Common element: behavior



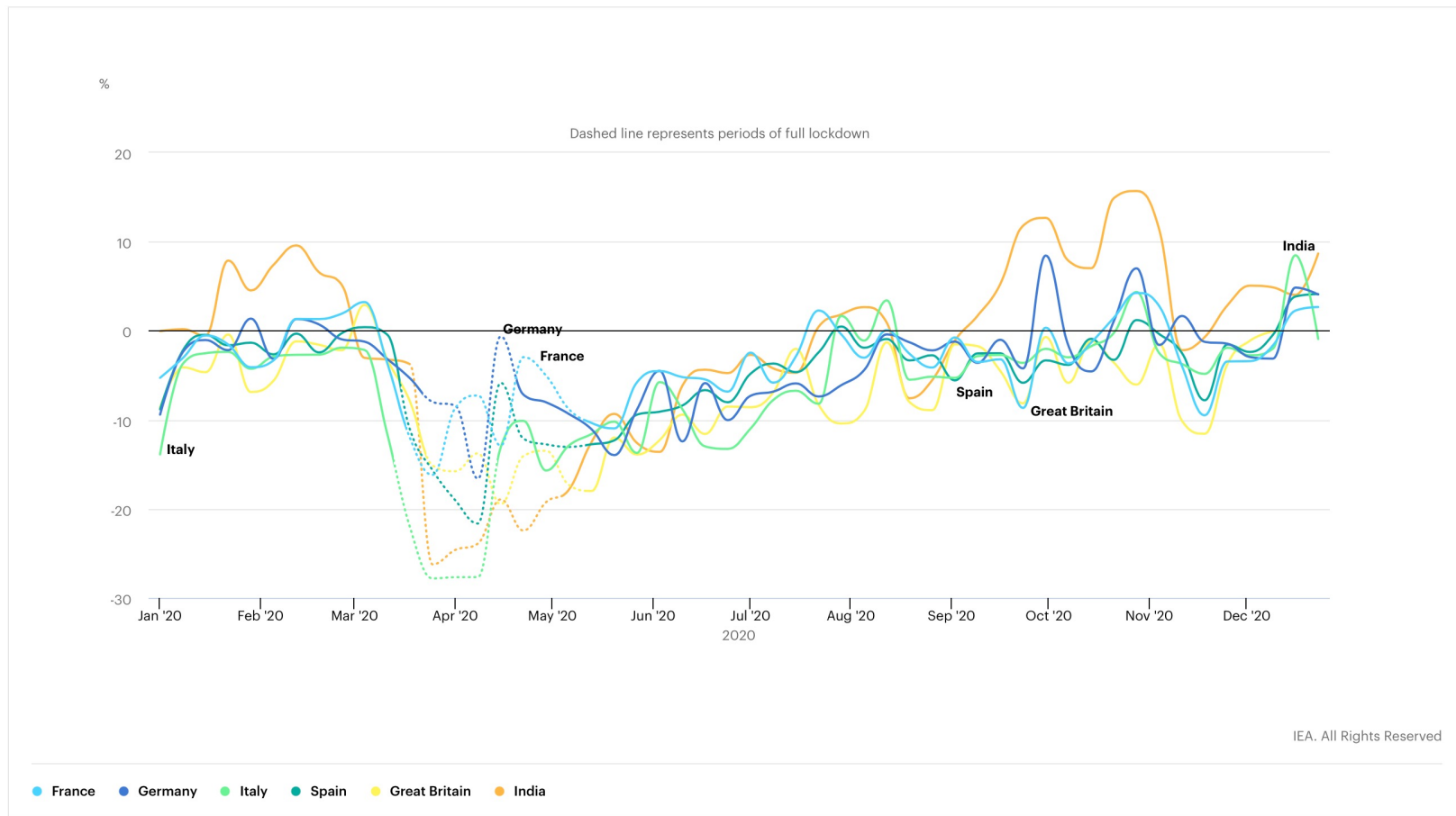
- Covid-19 has led to large changes in urban transport activities; public transport demand has declined dramatically while cycling, walking, and car use has been less impacted and sometimes higher than usual.



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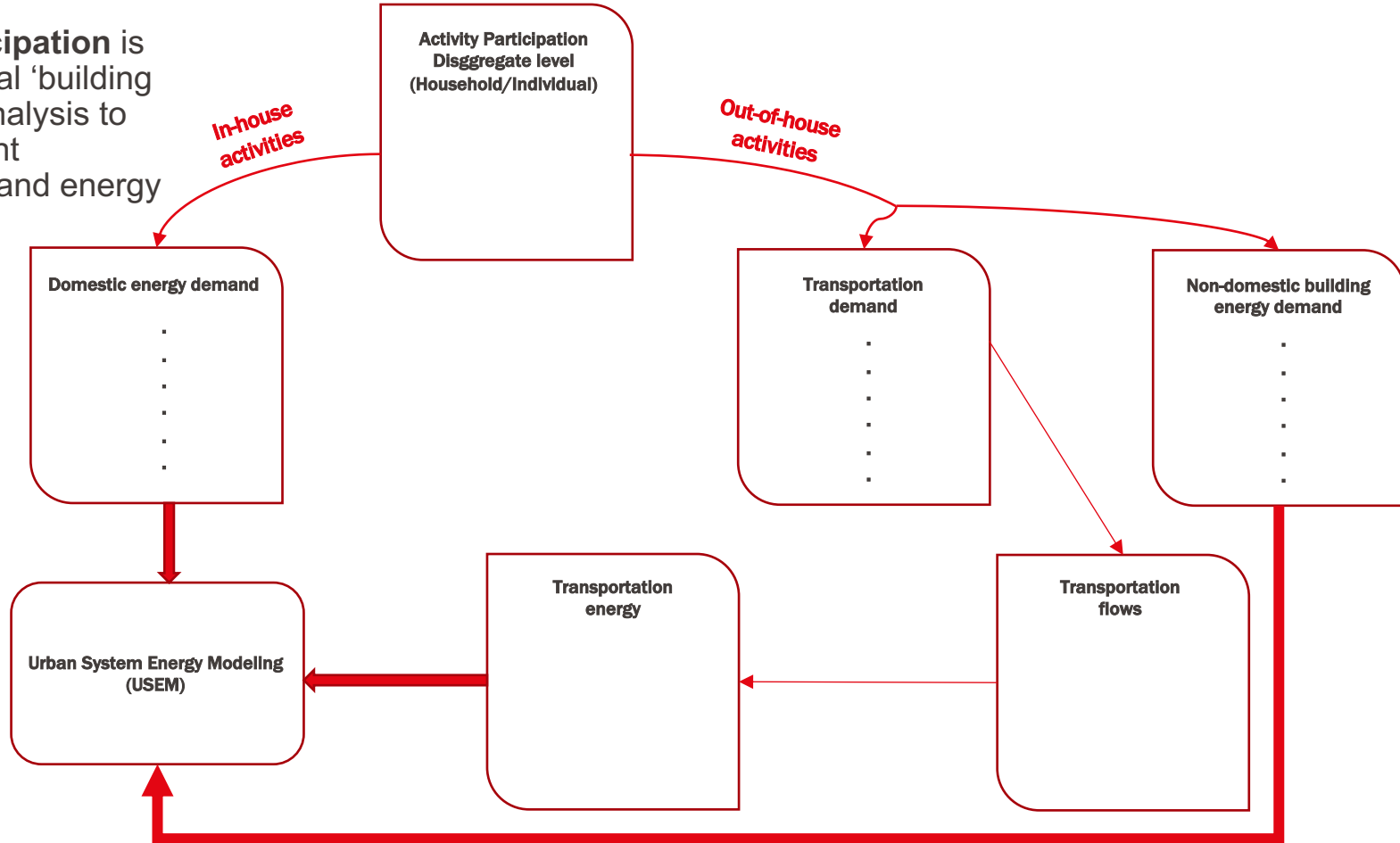


Research question

- How can we jointly model **energy** and **transportation** demand from **behavioral first principles**?

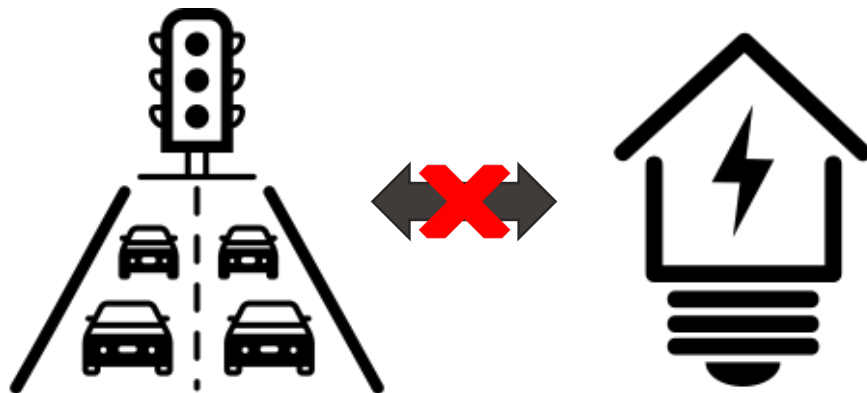
- **Activity-based** approach to model complex **individual** behaviors
 - Capture relationships between **participations in various activities**.
 - Model high-level demand as the result of the **interactions** of multiple agents.
 - Can represent **complex behaviors** within a city or region to test more flexible scenarios and policies.

- Activity participation is the fundamental 'building block/unit of analysis to understand joint transportation and energy

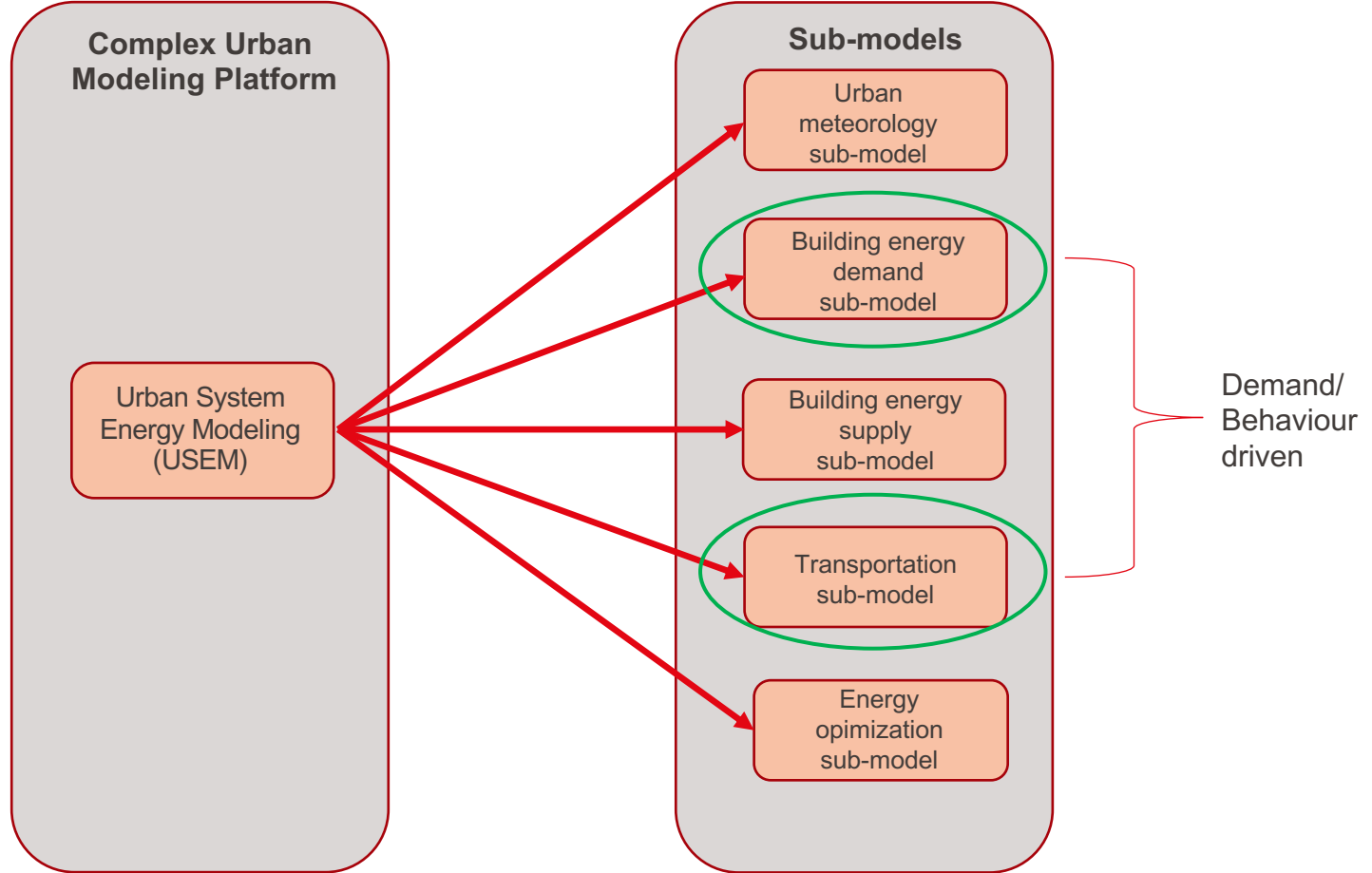


Modelling interdependencies of urban systems

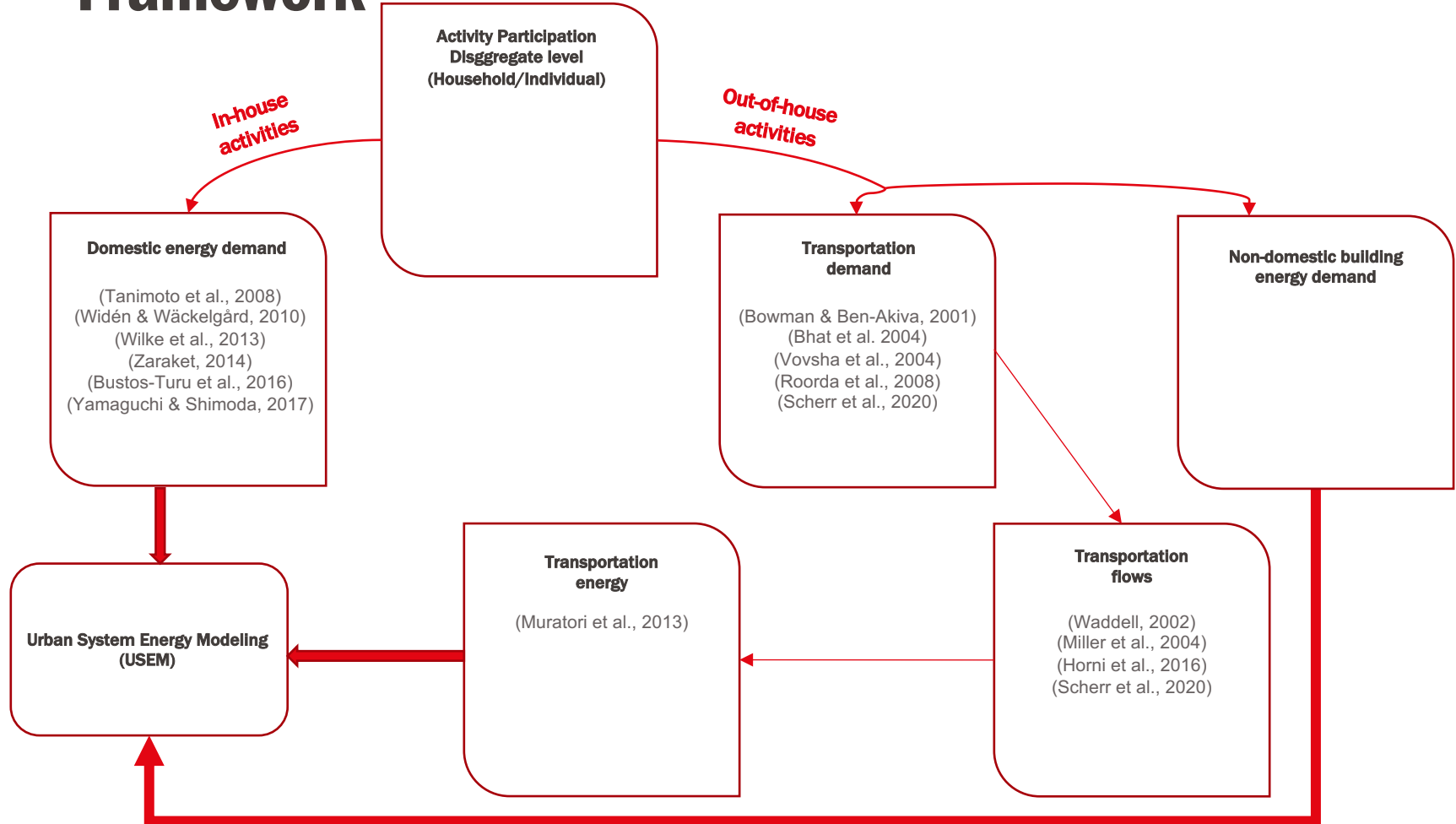
- requires co-simulating urban systems (e.g. buildings, transportation networks) including their co-dependencies (Hong et al., 2020)



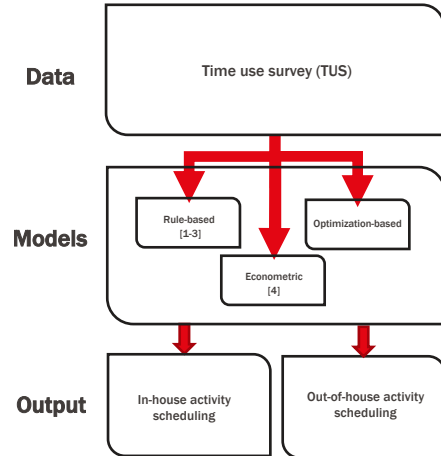
- What approaches have been used to (independently) model transportation and building energy demand?
- What is the relation between building energy demand and transportation?
- How have the links between building energy demand and transportation been analyzed in the literature?
- To what extent, the activity-based modeling has been applied to analyze urban-scale energy demand?



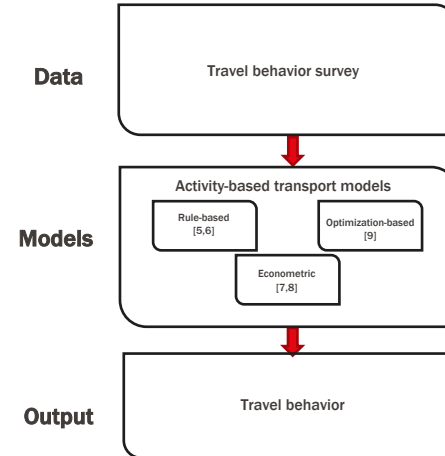
- USEM is *conceptual*
- **Behavioural elements** considered independently e.g. using ABM (among other techniques)
- High potential for integration of ABM in a full USEM (Keirstead et al., 2012, Sola et al., 2020)

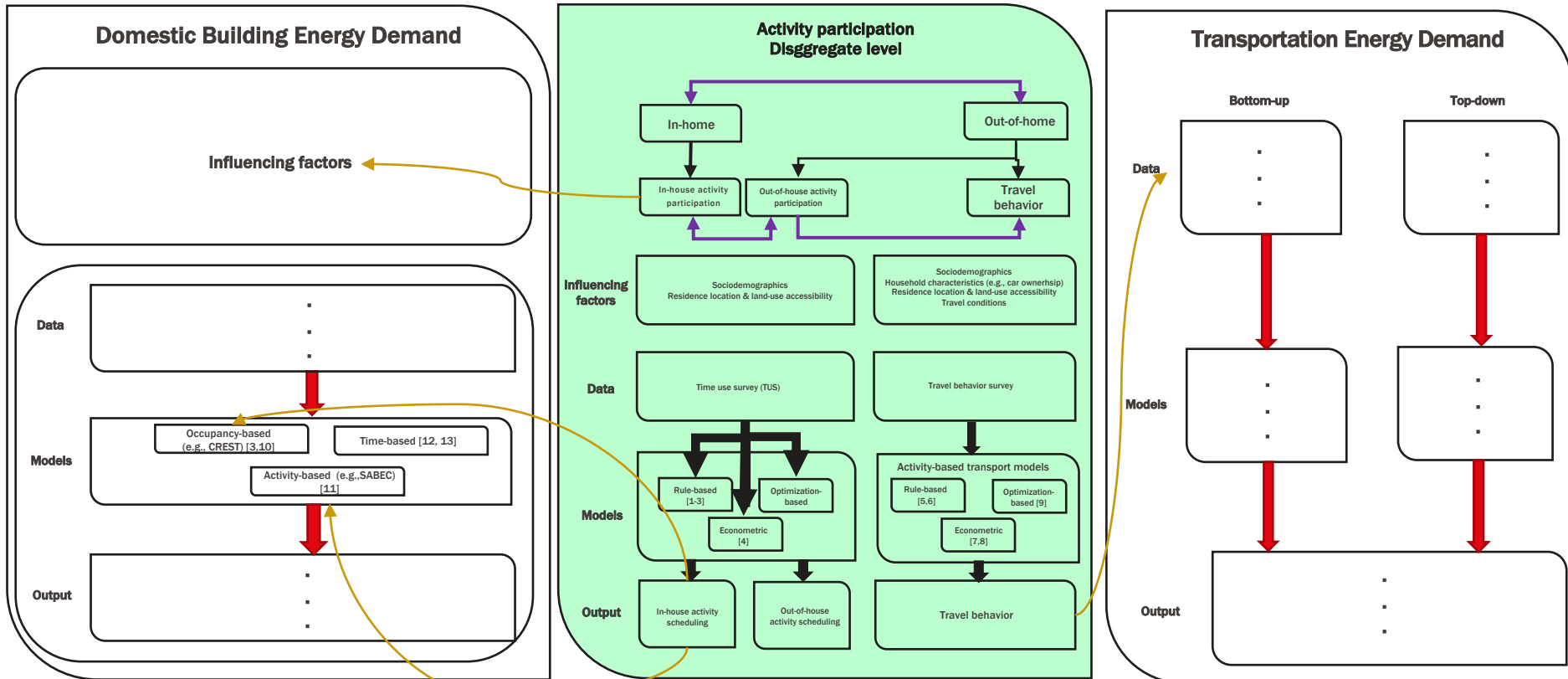


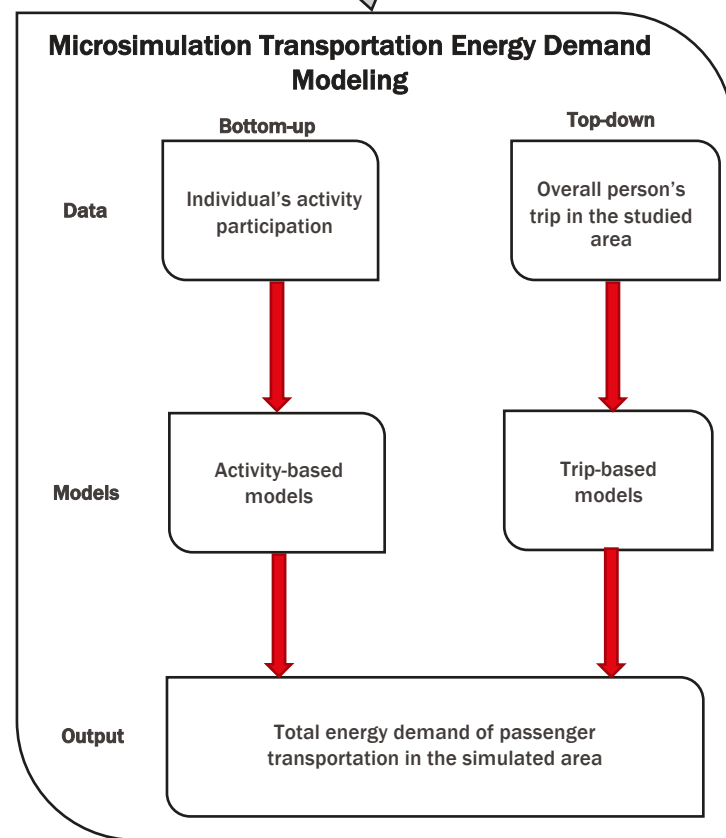
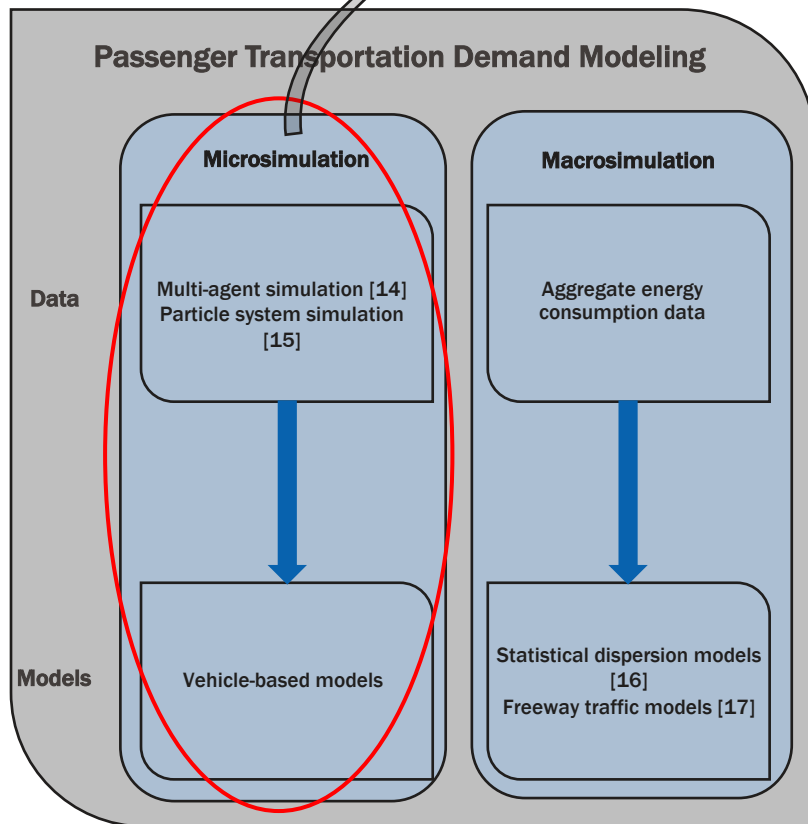
Energy modeling approaches

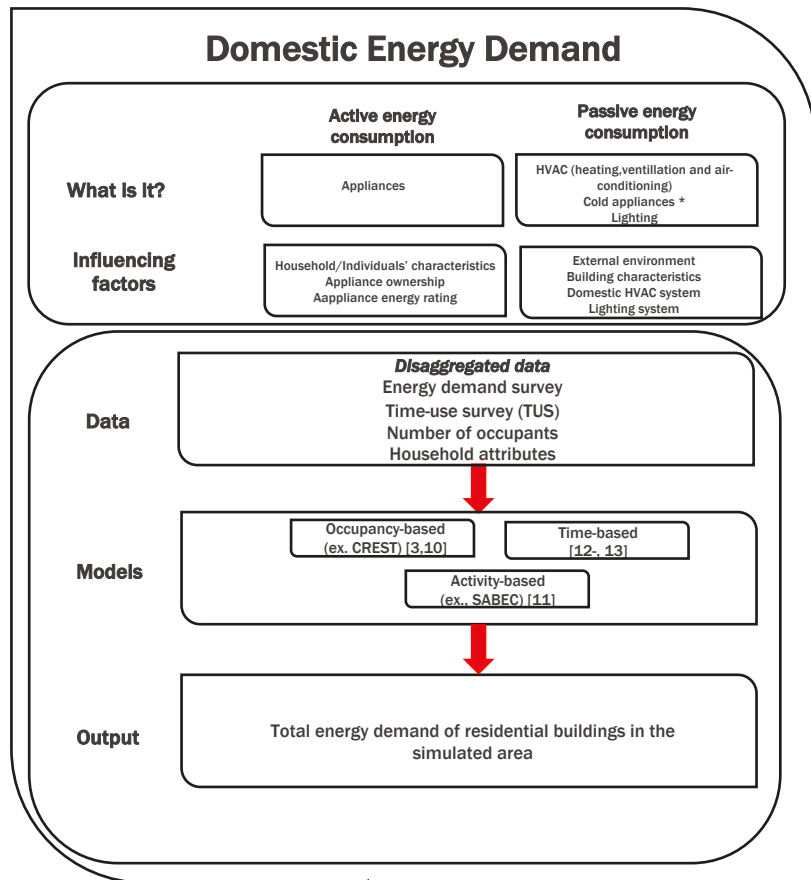
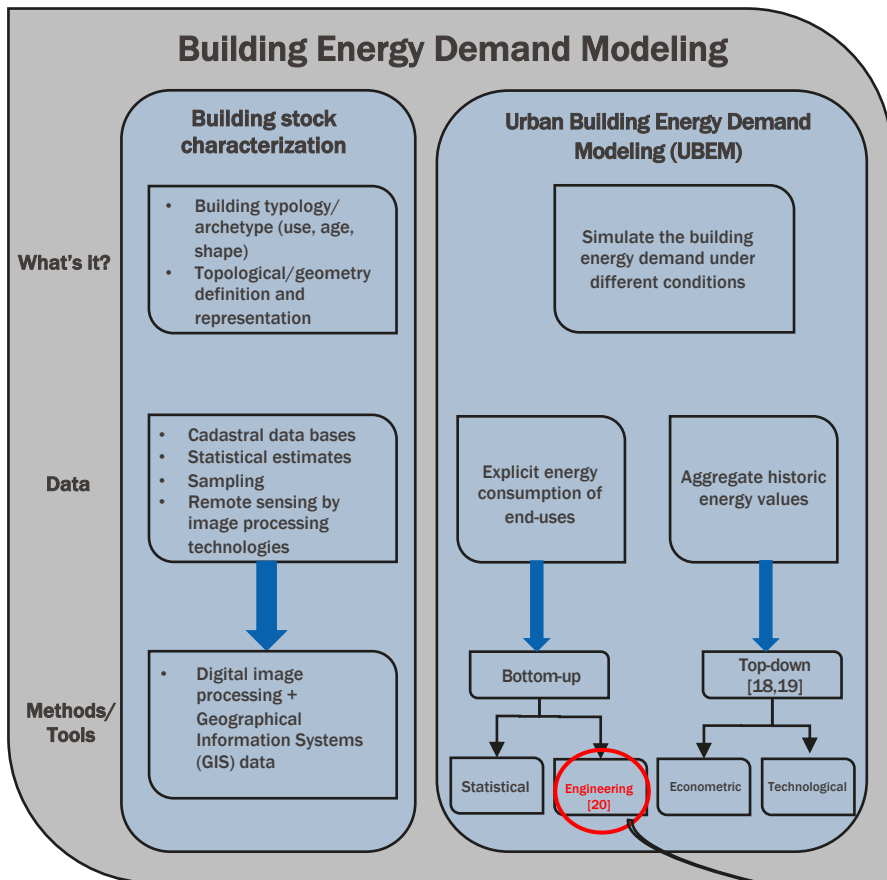


Travel behaviour modeling



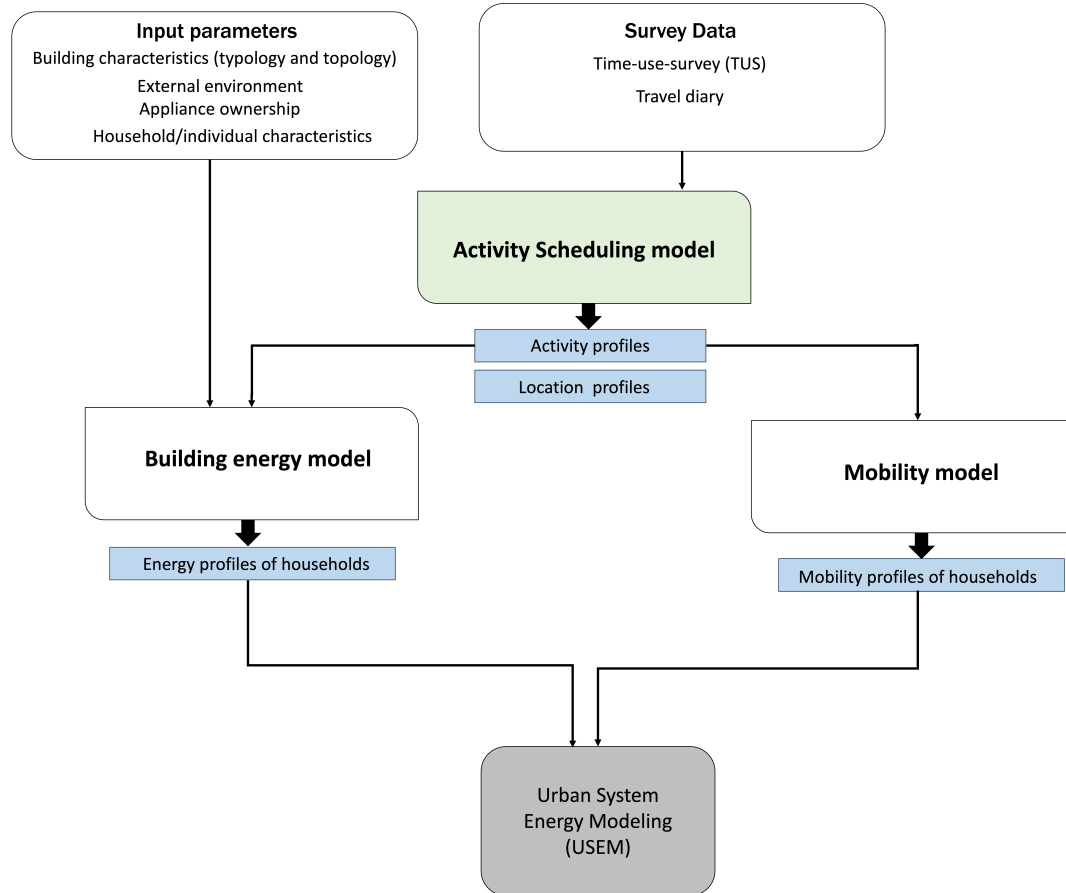






* Refrigerators and freezers

Scheduling-proposed solution



- How to re-implement the scheduling model from first principles to take into account both in-home and out-of-home activities?
 - Capture the **trade-offs** between decisions to do activities **in-** or **out of-home** which is a new behavioral modelling including decisions **where** to do an activity.
 - Capturing interaction between individuals in a household.



build on a current ongoing research at TRANSP-OR (Pougala et al., 2020)

+

incorporate time-use for activities in the home

+

calibrate based on TUS



Thank you!

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