

Impact of urban planning decisions on urban energy use: An integrated simulation model for Vienna

Veronika Gaube, Alexander Remesch

IFF- Institute of Social Ecology, Klagenfurt University

Interest in sustainability assessment for urban areas has increased notably, with additional attention generated due to the fact that by now half the world's population lives in cities. In conceptualizing the biophysical inputs and outputs of a city, the analysis of urban metabolism provides valuable insights into the energy and resource requirements of a given urban area. Within the FP7 project on Sustainable Urban Metabolism for Europe (SUME), an urban metabolism model will be developed by focusing on the dynamics between stocks and flows of energy and combining this with agent-based modelling in order to enable scenario analysis and thus allow for the simulation of potential impacts of decisions made in urban planning. We have chosen the strategy of focusing on key urban processes and their metabolic consequences. In particular we model processes which involve both buildings and transport to determine their use of energy, material and land. To do this we have to understand the spatial distribution of activities within cities and how decisions concerning place of residence and transportation (e.g. destinations, modal split) are made. Currently, urban planning does not take into account the necessity of the reduction of energy and material throughput for sustainable urban development. The goal of the integrated model presented here is not to quantify exactly the change in energy and material throughput resulting from changes in urban structure, but to estimate the plausible differences that decisions in urban development can make. The specific goal of the agent-based model component is to generate a better understanding of the relevance of decisions taken by different actors with regard to stocks and flows defined in the urban metabolism model on the one hand and on the other hand the framework conditions (governance and institutions) which influence these decisions.

Veronika Gaube holds an MSc in ecology (2002) and a PhD in social ecology (2009) and was trained in environmental economics and ecology. After two years working as research fellow at the Institute of Environment and Economics (University of Economics, Vienna) she joined the Institute of Social Ecology (IFF Vienna, Klagenfurt University) in 2003. Her research interests and expertise comprise the interlinkages of decision processes and land use change on the local and regional level, with a focus on the role of institutions. She is experienced in the use of spatially explicit (GIS) models, dynamic system models and agent based models for integrating socioeconomic and ecological parameters in land use models, material, energy and substance flow assessments for agricultural and urban systems.