Summary

This project aims at modelling the interrelations of urban patterns and heat stress. Heat stress risk within a city is a function of urban climate, the vulnerability of city dwellers and the detailed physical urban structure. The building density, structure and form as well as the availability of green spaces influence heat storage in urban neighbourhoods in great measure as recent studies proof. Mitigation concepts by planning are starting to face heat stress risks currently. However, little is known about the effectiveness of those measures. Complex individual measures of adaptation to heat stress risks in form of behavioural change regarding housing decisions are barely understood and need to be addressed. RM 5.2 focuses on utilizing different model techniques to simulate the interaction of urban patterns, heat stress risk and measures of adaptation and mitigation on different spatial scales. (1) For the citywide model we combine system dynamics and cellular automaton to incorporate household dynamics, residential choice, land-use change and mitigation measures in terms of planning. Urban patterns are simulated to analyze shifts of heat stress probability. Further, we close the feedback describing effects on urban patterns and heat stress risks as a consequence of involved mitigation measures. (2) On the building scale an agent-based model is applied to learn from changing housing decisions due to complex individual interactions. Consequences on the spatial distribution are mapped and analyzed regarding spatial patterns and heat stress risk adaptation. The research results will provide insights in complex decision-making and system understanding. Simulations of future scenarios deliver directions of urban patterns as a consequence of mitigation of and adaptation to future heat stress risks and vice versa by what the effectiveness of mitigation and adaptation measures can be determined. By the combination of different model techniques a new methodological approach will be implemented.