

Research questions

Data analysis 2000 – 2010:

- How can urban patterns be translated into goal-oriented land-use types?
- What are the main drivers of changing urban patterns?
- How is local urban climate (including local heat-stress risks) linked to urban patterns in terms of land use?

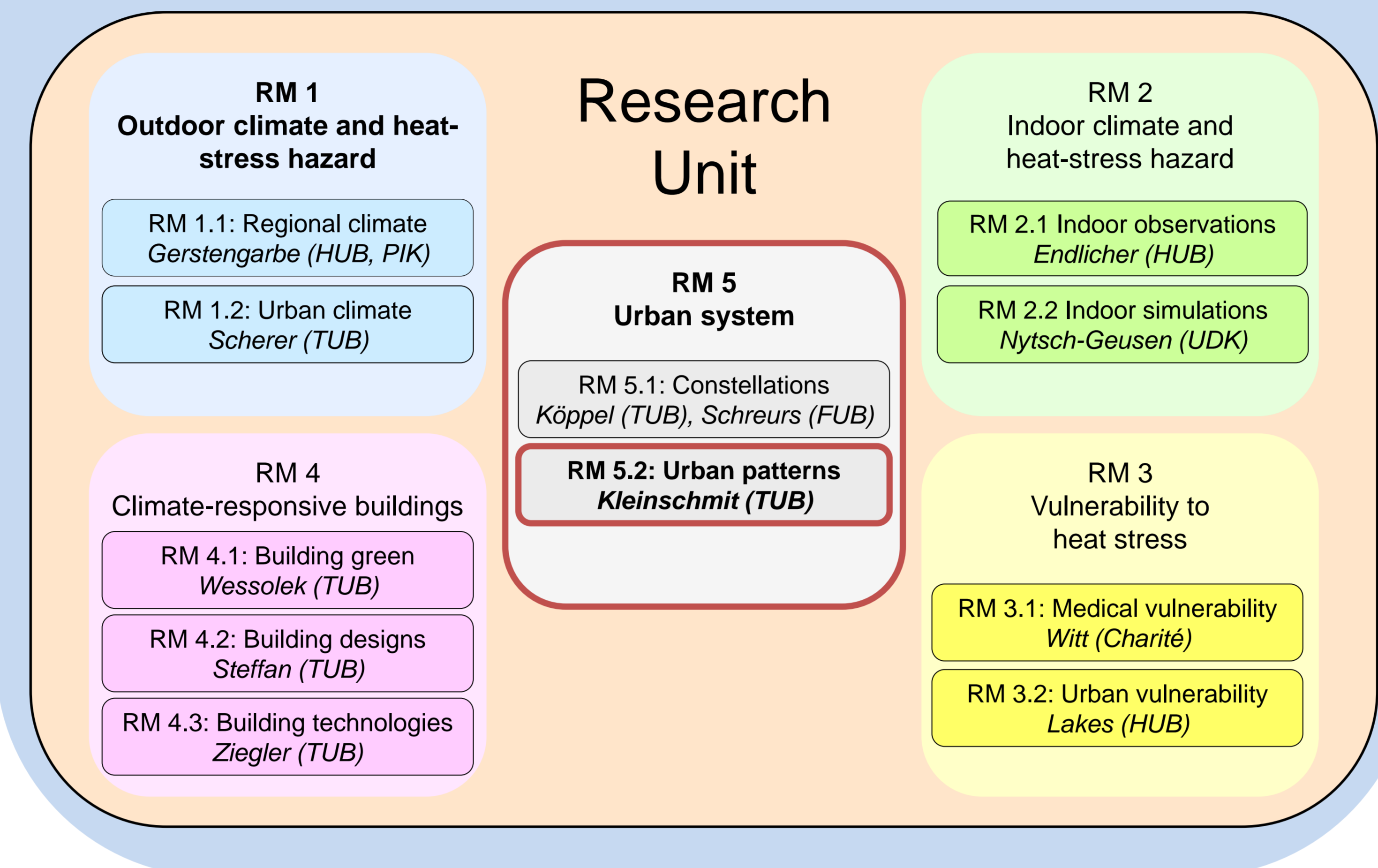
Scenario analysis 2010 – 2050:

- How do urban patterns and heat stress risk change under different urban development and climate scenarios within the study area?
- If climatic conditions influence individual or household decisions on residential choice, what are the effects of such adaptation measures on the urban form and consequently on the distribution of heat stress risk again?
- How do possible mitigation measures set by planning authorities affect the future urban form and consequently the local distribution of heat stress risks?

Methodological research questions:

- How can the complexity of the urban system be translated into a representative model to improve understanding, particularly in terms of interrelations between demography, economy, climate change, urban heat stress, policy and behaviour?
- Which model techniques are suitable to uncover these interrelations on different spatial scales?

Sub-project 5.2 Urban patterns



Methodology

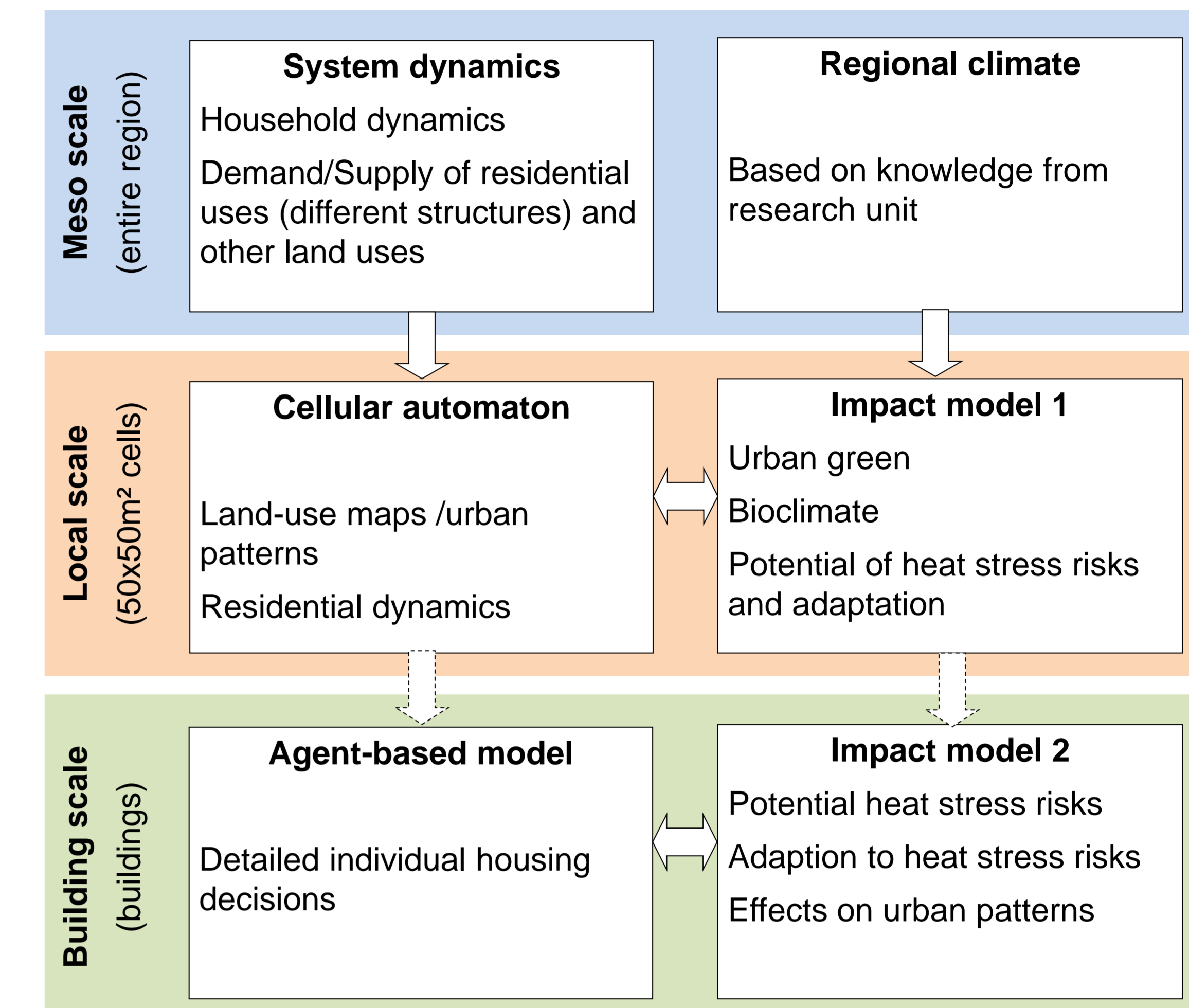


Figure 2: Model components and techniques on different spatial scales

Research approach

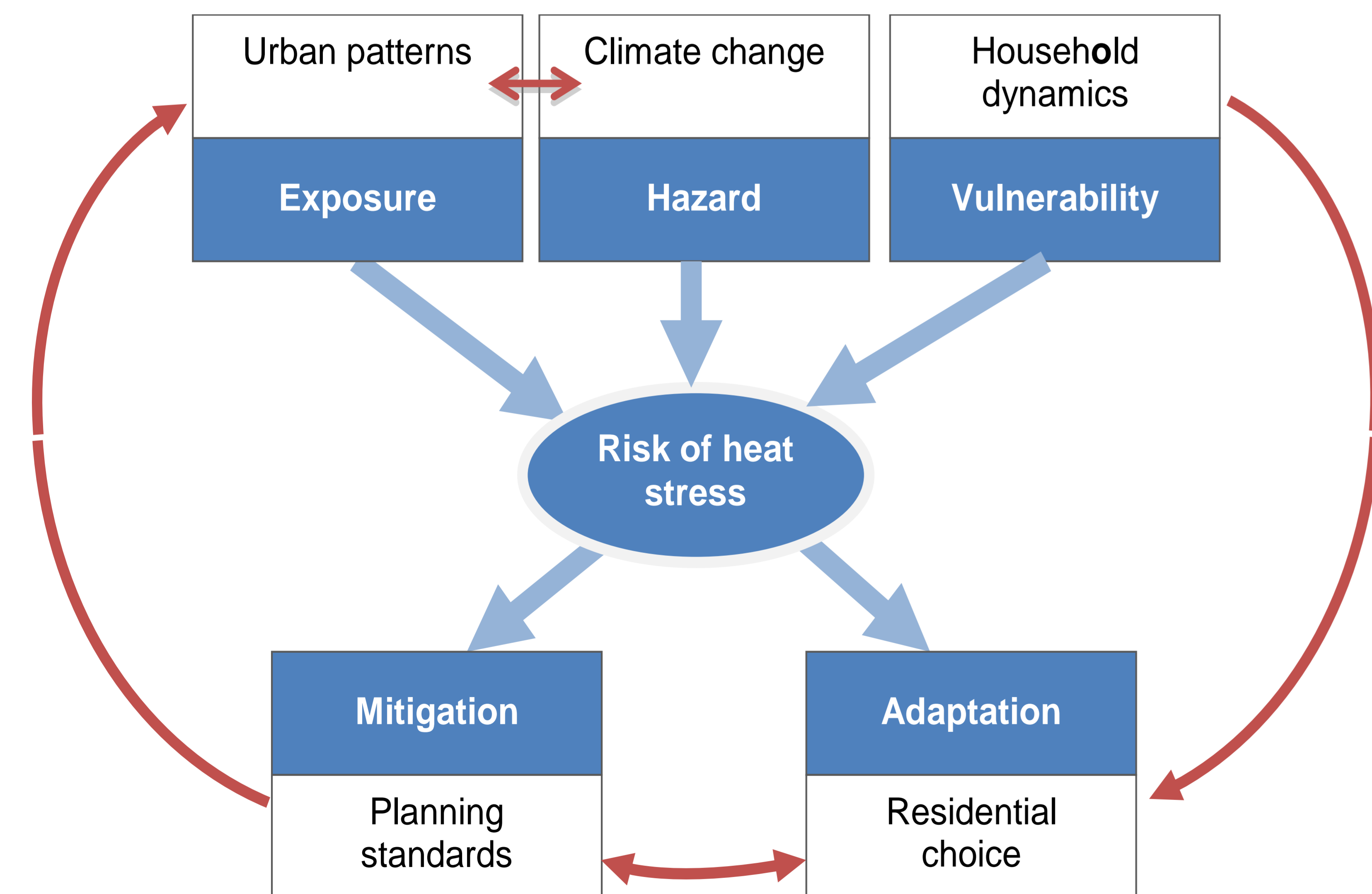


Figure 1: Conceptual model (blue arrows: central interrelations; red arrows: driving forces of urban patterns)

Spatial scales and model techniques

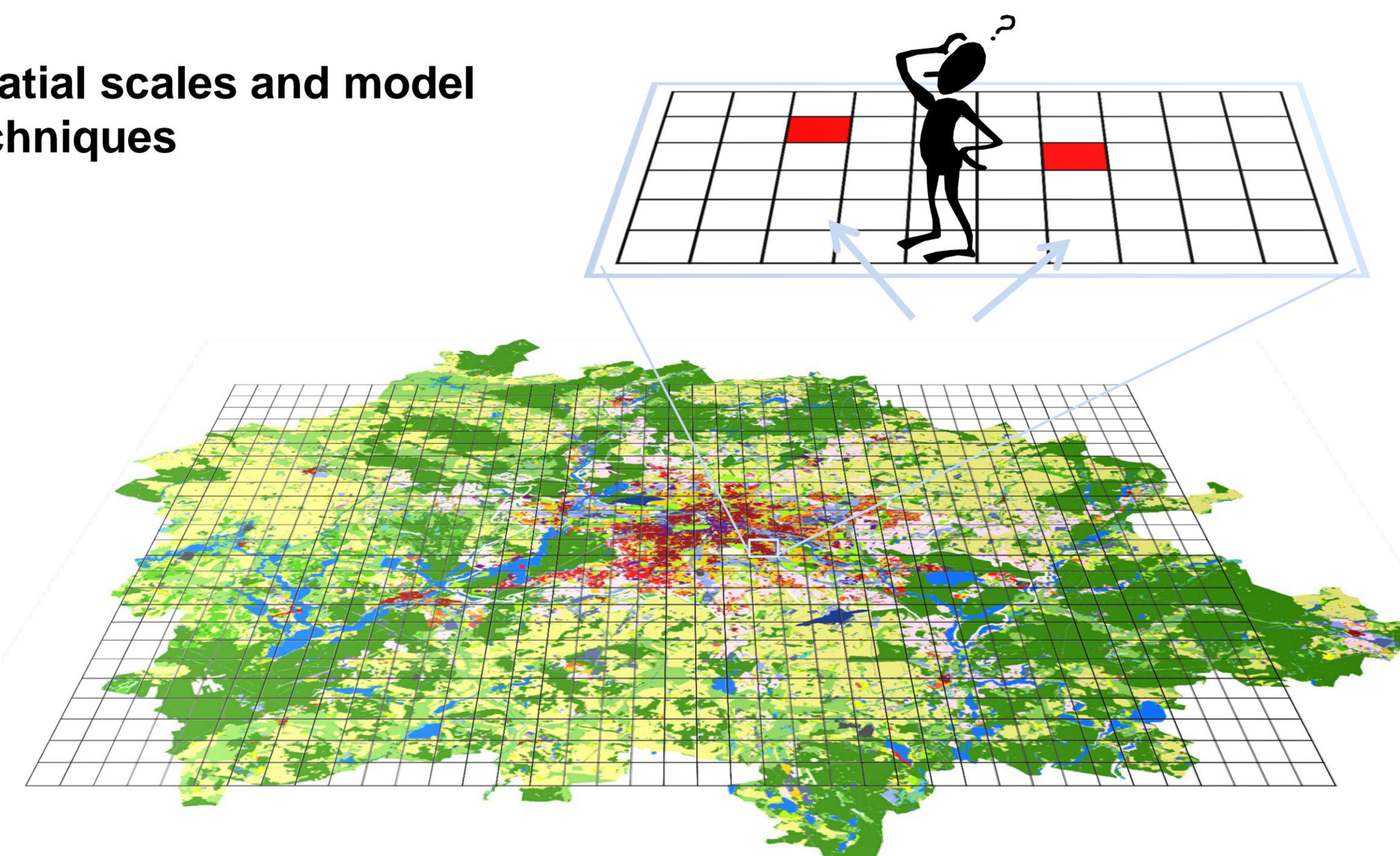


Figure 3: Cellular automaton to cover local dynamics for the entire study area and Agent-based modelling to cover dynamics on the building scale for representative neighbourhoods in the study area

Figure 4: Projections
Change of heat-stress (HS) hazard and risks as assessed from nine different projections of urban climate (UC) and urban development (UD)

	UD 1	UD 2	UD 3
UC 1	HS 1.1	HS 1.2	HS 1.3
UC 2	HS 2.1	HS 2.2	HS 2.3
UC 3	HS 3.1	HS 3.2	HS 3.3

Work schedule

Table 1: Work packages (WP) and associated work schedule (in half-yearly intervals)

WP	Description	Schedule
100	Project management	
110	Reporting	
120	Logistics and organisation	
200	Individual research (detailed WP description in 3.2.1)	
210	Data acquisition and pre-processing	
220	Storylines for land-use scenarios	
230	Spatial model building	
231	Urban pattern simulation and risk probabilities	
232	Agent-based simulation to formalise actions of adaptation to HS	
240	Report and Synthesis	
300	Collaboration within the Research Module 5 "Urban System"	
310	Promising planning and governance constellations to tackle heat stress	
400	Collaboration within Research Links (RL)	
480	Specific vulnerable groups	
490	Urban climate projections	
500	Collaboration within Research Clusters (RC)	
520	Present-day heat-stress hazards, vulnerabilities and risks	
530	Effectiveness of actions for reducing heat-stress risks	
540	Efficiency of actions for reducing heat-stress risks	
600	Collaboration within the Research Unit (RU)	
610	Projected heat-stress hazards, vulnerabilities and risks	
620	Transferability of the methodology to other mid-latitude cities	
630	Identification of future research and development activities	
640	Preparation of the follow-up proposal	