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Modelling the effects of implementing green infrastructure to support urban climate change adaptation and resilient urban planning

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Urban growth and densification, combined with adverse effects of climate change and urban heat islands, have several negative impacts on the wellbeing of city residents due to an increased urban heat load. Therefore, it is of high importance to support urban planning strategies to foster climate resilience through the implementation of well-founded climate adaptation measures. The project green.resilient.city, funded by the Austrian Federal Ministry for Transport, Innovation and Technology (BMVIT), aims at the development of strategies for regulating, optimizing and evaluating climate sensitive and resilient urban planning with the main objective of reducing urban heat stress in both existing and developing settlement areas. A sequence of different climate models and tools is used to obtain the effects of implementing urban green infrastructure (UGI) and to establish a multiscale tool set that provides a scientific base for urban planning decisions on a political level. The added value of the project is that it is tested and demonstrated on two pilot sites in Vienna, Austria. To evaluate the effects of urban greenery on city and district scale, the dynamical urban climate model MUKLIMO_3, developed by DWD (German Meteorological Service), is used to investigate urban heat load (20 – 100 m spatial resolution) and to carry out sensitivity simulations of climate adaptation scenarios. The simulations are based on international Urban Standard Typologies (UST), developed by Green4Cities and GREENPASS®, that consider standardized city-specific morphological structures and various greening scenarios. Model simulations are performed for the entire city of Vienna as well as for the case study areas. Different greening scenarios (Worst Case, Moderate and Maximum) are tested with respect to their efficiency in reducing urban heat load. In this context, the effects of applying standardized urban typologies to urban climate simulations are evaluated to determine whether a simplified representation of urban structures leads to meaningful results. Furthermore, results are cross-validated and harmonised with regional (COSMO-CLM) and micro-scale (ENVImet) model simulations. The main findings obtained in this study are used to demonstrate how urban climate simulations, as part of a multiscale tool set, contribute to resilient urban planning and additionally, they help to examine the transferability of the concepts to other cities.