

Influence of urban growth of the city Vienna on the thermal comfort of its habitants

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Until 2030, the population within the metropolitan area of Vienna is expected to increase by 10 % (ÖROK 2017). This will cause the living space to be expanded and densified. However, already now the population is suffering from heat stress during the summer months.

In the project URBANIA the influence of the projected urban development on the heat island in the city of Vienna and the thermal comfort is researched. The micro scale model Town Energy Balance (TEB) is coupled online and offline with the meso scale model WRF. Further, measurements are taken in selected districts of Vienna and are used to validate the coupled model. Then this coupled model is used to simulate selected scenarios of urban growth with regard to a changing climate in the future. The thermal comfort of the population is estimated by calculating the Universal Thermal Climate Index (UTCI).

The thermal conditions in Vienna already now show distinct spatial variation mainly caused by topography, vegetation structure and sealing levels. For example, the thermal stress on the scale of UTCI varies by up to 5 °C for between elevated highly vegetated and low spread out built urban structures, which corresponds to the span of almost one category on the comfort scale.

The simulations of the Vienna region show that urban growth mainly influences thermal comfort locally, where building activity takes place and can amount to an increase of air temperature by up to 0.5 °C locally. Those increases can be mitigated by choice of urban materials, which have a significant impact on thermal comfort. Simulations show that vegetation has a cooling effect on the urban climate. While, an increase in the roof albedo effectively reduces air temperature during the day, increases of road and wall albedo can increase the thermal stress at street level and have to be considered more thoughtfully. Decrease of thermal conductivity effectively helps to reduce tropical nights. Thus the active development phase of Vienna could be an opportunity to increase thermal comfort and mitigate climate change.