Modelling extreme heat events and its potential impacts on vulnerable population in Prague

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The climate change projections for the upcoming 30 years in the Czech Republic expect increasing frequency and magnitude of extreme weather events such as droughts, storms, heatwaves and floods. In the urban structures, summer-time climate indices (e.g. number of tropical days and tropical nights) are also expected to grow. Given the trends of increasing share of inhabitants living in urban areas and vulnerable (particularly aging) population, climate change could have significant impacts in cities if effective adaptation response is not planned and implemented in adequate way. In this contribution, we particularly focus on extreme heat events and its impacts on vulnerable population of Prague - the capital city of the Czech Republic.

We used MUKLIMO_3 urban climate model to simulate and analyse spatial as well as temporal patterns of heatwave period in the city of Prague. The model simulates the daily cycle of air temperature, relative humidity, wind speed and direction, and the energy fluxes in an urban area in 100 m resolution (Geletič et al., 2018). In case of Prague, 45 land cover classes were identified of which 11 classes most typical for Prague were analysed in detail. Outputs were further analysed from the perspective of the exposure of vulnerable population (children up to 14 yrs and elderly population 65+ yrs) for the respective heatwave period.

The results suggested that statistically significant differences exist in air temperature in the majority of cases between different selected classes. The most built-up types (LC01 – densely built-up city centre; LC10 – brown-fields and older industrial zones; and LC12 – new industrial zones and shopping centres) were disclosed as the most uncomfortable areas of the city. At the same time, the highest proportion of the population is exposed between 16.00 and 19.00 CET, particularly in the city centre, where urban heat island (UHI) is substantially developed. The high exposure correlates with the high proportion of built-up areas in the city, where typically larger density of vulnerable population is concentrated. The exposure of vulnerable population is an important input for the identification of areas, where the implementation of adaptation measures responding to the heat extremes is needed and the analysis is to be used for design of the Adaptation Action Plan of the City of Prague.

References:
Geletič, J., Lehnert, M., Savić, S., Milošević, D., 2018. Modelled spatiotemporal variability of outdoor thermal comfort in local climate zones of the city of Brno, Czech Republic. Science of Total Environment, 624, 385–395.