

Impact of the urban heat island on thermal heat stress of pedestrians in middle European cities, evaluated with questionnaires and the multi-agent-system BOTWorld

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During summer, heat stress in cities is a common problem for pedestrians. Due to the effects of the urban heat island thermal stress is additionally increased. Different surface materials, lack of shadowed places and reduced vegetation as well as the orientation of buildings develop a highly differentiated microclimate to which pedestrians are exposed. This situation will be intensified through the global climate change in the future. To localise heat sensitive areas in cities which are highly frequented by pedestrians the approach was to quantify and visualise thermal heat stress and its spatial distribution. The questionnaires and the microclimate modeling were conducted on inner city squares where the effects of the urban heat island have the highest impact due to high solar irradiation and the blocking of the air flow by buildings around the square. This was investigated through on site-interviews during hot summer days (air temperature > 30 °C) and the results of simulations run with the microclimate model ENVI-met and the multi-agent-system model BOTworld. The results from the interviews, which reveal the subjective perception, were then compared to the results of the BOTworld simulations which are based on the microclimatic simulations of the model ENVI-met. This novel approach allowed defining heat sensitive areas with respect to the thermal history of humans. The data for this study was collected on two inner city squares in Kassel (Germany) which were highly frequented by pedestrians. One of these is only used for trespassing and the other one is also used for stopovers. The results of the questionnaires and the BOTWorld simulation showed a good correlation. This new approach allows testing the impacts of the urban heat island in future climate scenarios on the places regarded within this study.

