

Adaptability of urban (bio-)climate in a changing climate

Christina Endler¹⁾, Andreas Matzarakis¹⁾

1) Meteorological Institute, Albert-Ludwigs-University of Freiburg, Werthmannstr. 10, 79085 Freiburg, Germany, christina.endler@meteo.uni-freiburg.de

Due to global and regional warming urban heat islands (UHI) as well as urban (bio-)climate will be affected, especially in the south and southwest of Germany since the warming will be more pronounced in southern regions and for the southwest of Germany. Thus, the effect of an urban climate will be intensified. A strong heating by day and a limited cooling by night advance the UHI as well as urban bioclimatic conditions. In order to maintain a comfortable urban climate some adaptation measures are required because of the climate change.

To assess the urban climate in a physiological significant manner it requires the use of methods of modern human-biometeorology that considers the effects of UV radiation, meteorological parameters such as air temperature, wind and precipitation, air quality etc. on human organism. Therefore, we use in our study the physiologically equivalent temperature and perform simulations with varying wind speed, humidity and radiation. We use two regional climate models, the REMO and CLM model, to simulate the future climate until the end of the 21st century. Thereby, the model data has a spatial resolution of 10 km and 18 km, respectively and a temporal resolution of hours. For the region of Freiburg, we consider the reference period 1971-2000 and the future projections 2021-2050 as well as 2071-2100 based on the A1B scenario.

The objective is to show what thermal bioclimatic and climatic conditions can be expected and which adaptation possibilities would be revealed based on regional climate model results for the region of Freiburg. We can summarize that heat stress will strongly increase whereas cold stress and thermal acceptability will more or less strongly decrease till 2100. Modifications of thermal bioclimate build an appropriate opportunity for the quantification of future climate conditions in urban areas and can show how small changes in infrastructure and behavior can reduce heat load on humans and produce better bioclimate, which is part of quality of life.