

Kennis voor Klimaat Knowledge for Climate



Theme 8 Decision support tools

Assessing future urban heat island patterns following socio-economic and climate scenarios

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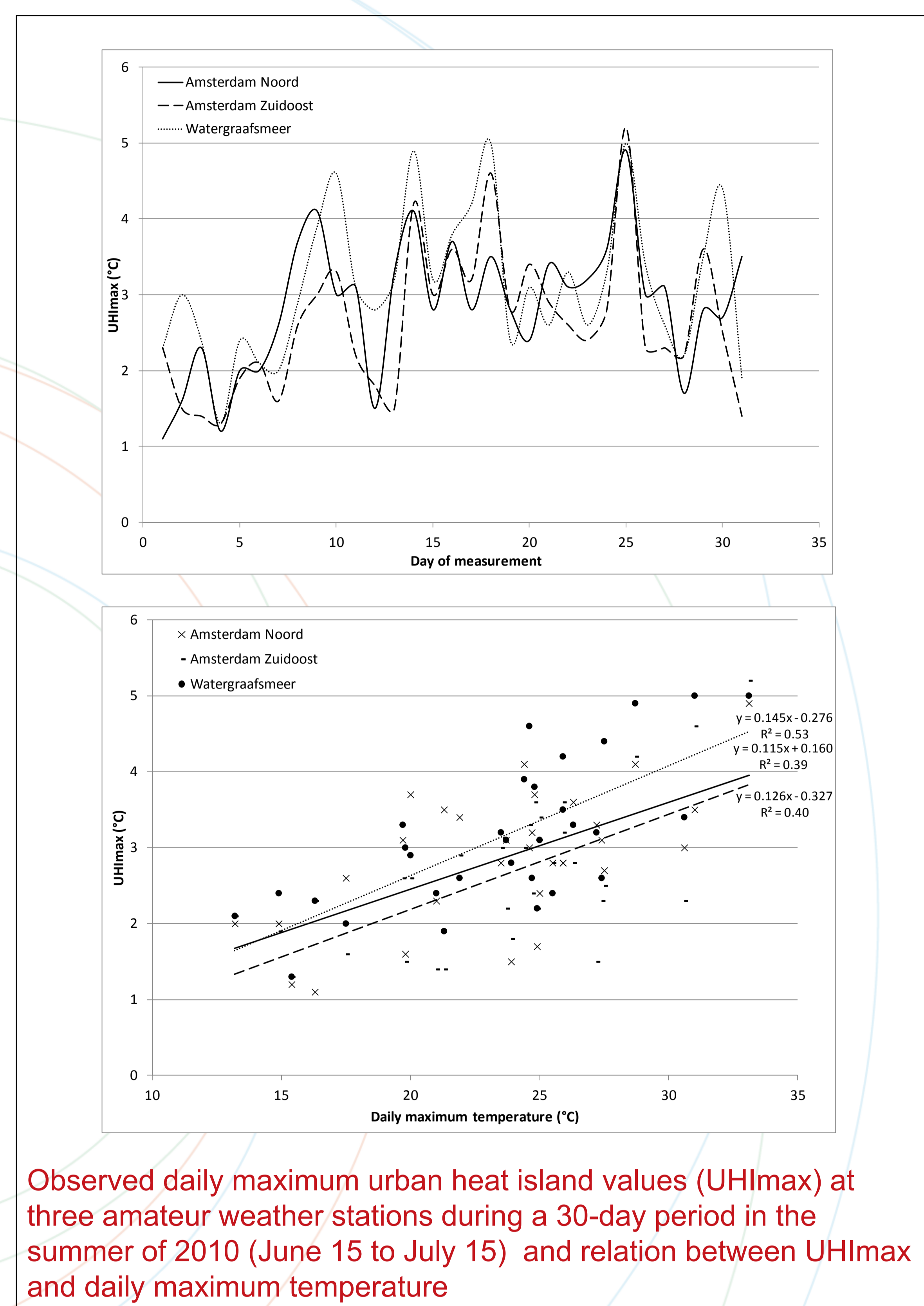
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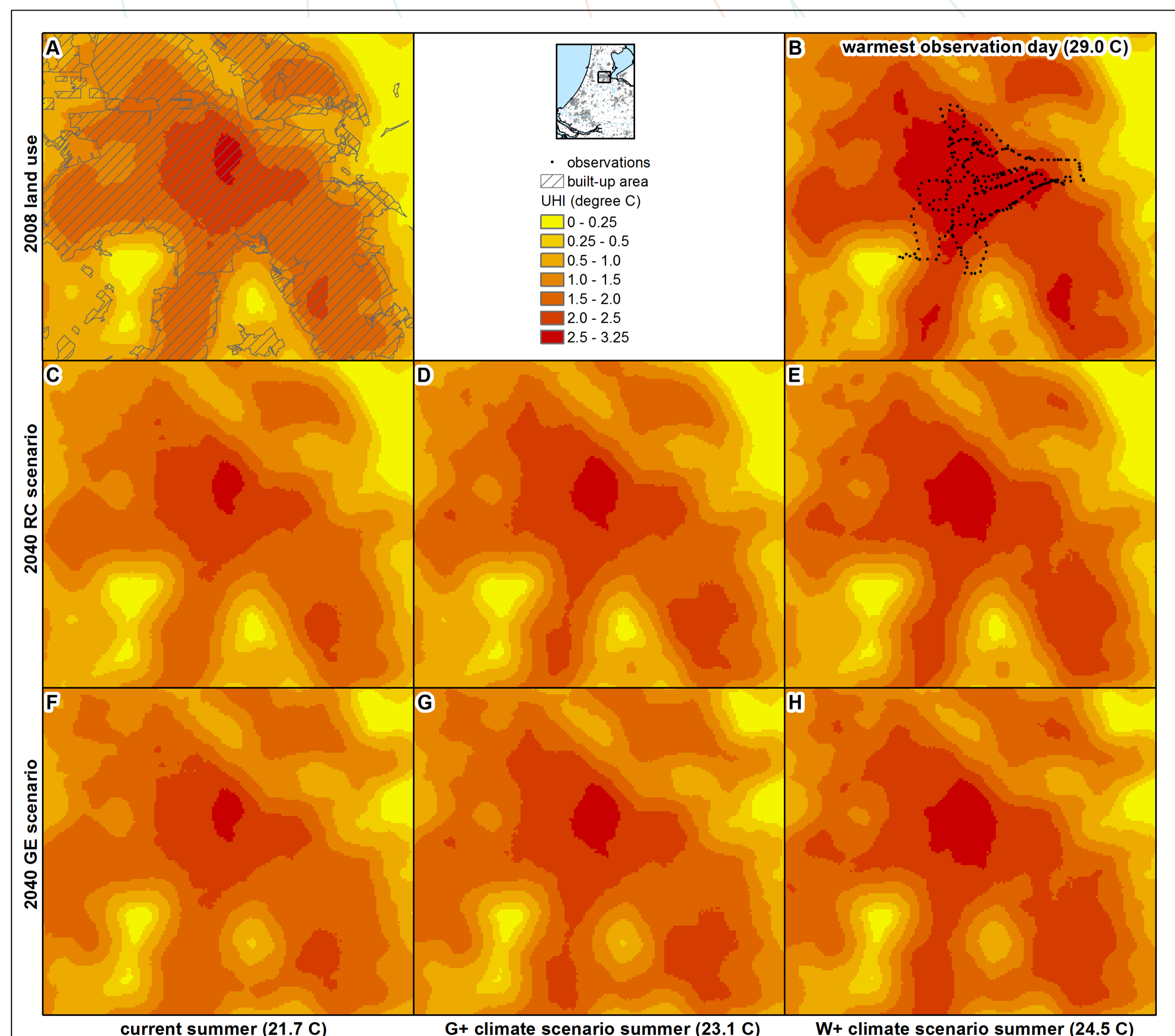
On average, urban areas are hotter than their surrounding rural areas, forming an urban heat island. Such differences in temperature are largely determined by the ability of the urban fabric and surface materials to capture, store and slowly release incoming solar radiation. Climate change and urban development are likely to exacerbate the current urban heat island effect. While most studies acknowledge the importance of projected temperature increases for raising urban temperatures, little attention is paid to the impacts of future changes in urbanisation patterns. Yet, steering urban development may be an effective strategy to further limit increases in the intensity and spreading of the urban heat island effect.

Our research analyses the strength of this effect in a temperate climate, aiming to explain spatial variation in the observed temperatures and quantify how the urban heat island effect may develop in the coming 30 years. We describe current urban heat island patterns based on two separate analyses. Temporal variation in urban temperatures is described based on local temperature measurements derived from amateur weather stations, while spatial variation is measured along a route using mobile measurement devices and then explained using regression analysis and spatially explicit explanatory variables. To assess potential future changes we build on existing scenarios of climatic and socio-economic changes and a land-use simulation model.



Our analysis of amateur weather data shows a strong relation between maximum daily temperatures and urban heat island values. Measurements for the Amsterdam region in the Netherlands indicate maximum temperature differences with the surrounding countryside of over 3 degrees Celsius on moderately warm summer days. The simulations of potential future changes indicate that strong local temperature increases are likely due to urban development. Climate change will, on average, have a limited impact on these changes. Large impacts can, however, be expected from the combination of urban development and potentially more frequent occurrences of extreme climatic events such as heat waves.

The presented simulation approach allows policy makers to explore the potential consequences of different urbanisation strategies. It is able to show the benefits of compact urbanisation in limiting the lateral extent of the urban heat island effect as well the trade-off with increasing urban temperatures that result from adding residences to the existing urban fabric instead of to open spaces around cities.



Overview of simulated urban heat island patterns for current land use (maps A and B) and scenario-based land-use simulations combined with different maximum temperatures associated with average summer conditions in current (C,F) and future climate scenarios (D,E,G,H):