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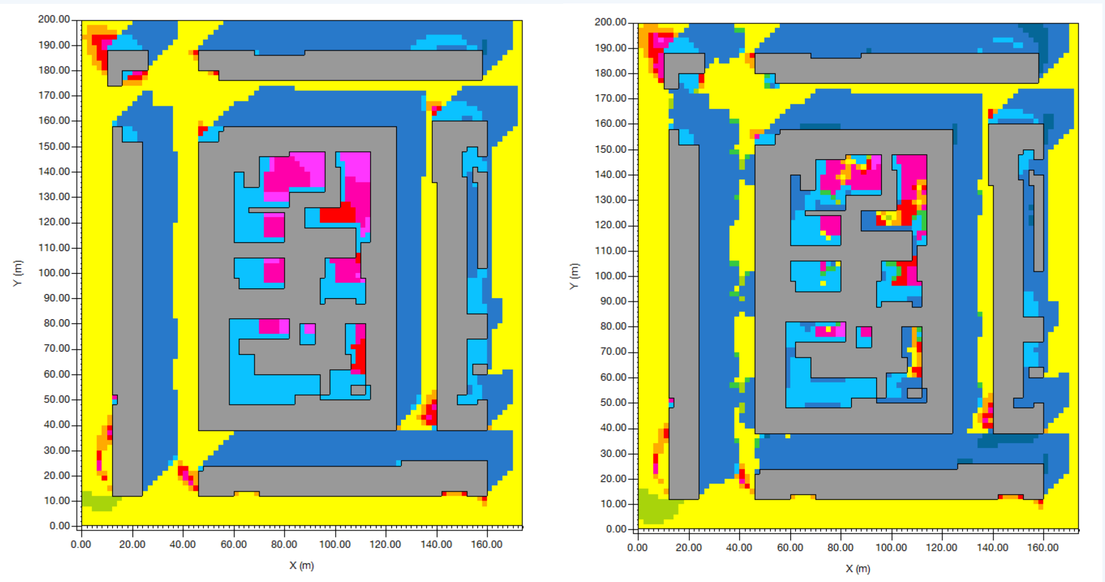
Implementing urban green infrastructure for local climate regulation: What is actually needed?

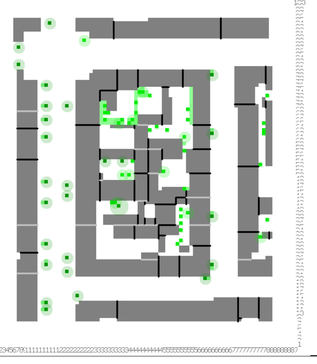
Introduction

Local actions in climate change adaptation are strongly needed for reducing the impacts of climate change on urban areas. Urban green infrastructure can contribute to adapting cities by providing regulating ecosystem services such as reducing air temperatures. In municipal planning consequently policies and activities for so-called nature-based solutions to local climate adaption are fostered. Nevertheless, it remains unclear to what extent and with what type of measures municipalities should implement as green infrastructure to reduce the adverse effects of climate change. Against this background, this study has the objective to increase knowledge on the regulating effects of different green infrastructure settings under current climate and a future climate change scenario.



Reference scenario without vegetation (left) and current greening situation (right) in the case area: PET at 3 pm in 1.4 m height on a typical tropical day

Case area in Munich Max-vorstadt (© Microsoft Cooperation)



Scenario of greening intervention	Average PET values at 3 pm in 1.4 m height
Reference	43.4
Current greening	42.2
Maximum roof greening	42.3
Maximum façade greening	39.2
Maximum tree plantings	38.3
Reference under future climate	45.5
Current greening under future climate	44.3

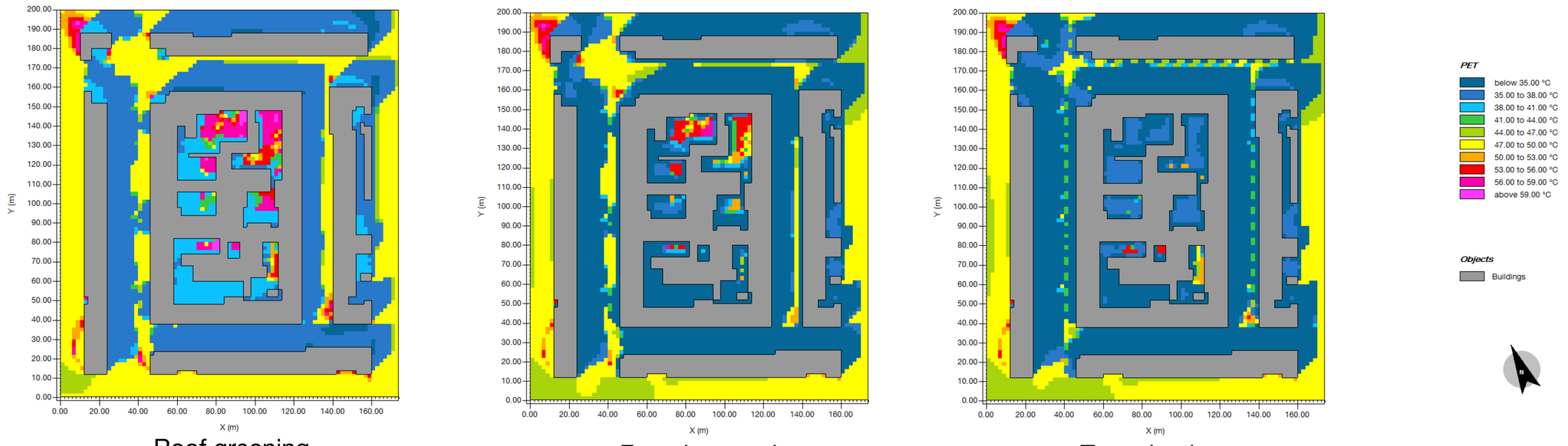
Overview about average PET values in different greening scenarios under current and future climate conditions

Approach and Results

Based on a scenario modelling approach with the microclimate model ENVI-met V4, the regulating potentials of green roofs, green facades and tree plantings are assessed for varying shares of green volume as well as current and future climate conditions. The case study is located in central Munich, Germany, representing a typical urban fabric of perimeter blocks, which can be found in both German and European cities. The results show that the greening interventions have different effects on reducing outdoor thermal comfort (expressed by the PET index): tree plantings can reduce the average afternoon PET of a tropical day up to 5 K, façade greening up to 4 K. Only green roofs show almost no effect at pedestrian level (1.4 m height).

Outlook

Further scenarios of varying green volume and compositions will be modelled in the next step both under current and future climate change conditions. The importance of green infrastructure location and quality will be assessed by analysing the regulating functions of vegetation (shadowing and evapotranspiration). Following from this, a guideline for urban planners is developed to choose the most effective combination of green infrastructures suitable for their respective situation.



Roof greening | Façade greening | Tree plantings

Maximum greening scenarios for roof greening (left), façade greening (centre) and tree plantings (right) in the case area: PET at 3 pm in 1.4 m height on a typical tropical day