Development of mitigation measures for the metropolitan region of Hamburg (Germany)

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Downscaling of global climate to regions is relatively advanced, however, the manifestation of climate change in different areas of a metropolitan region and possible adaptation measures to reduce climate impacts within urban areas are not well investigated. On the other hand, urban climate, connected with the urban heat island and urban impacts on precipitation have intensely been studied. However, for many urban areas the relation of both impacts is not well known and therefore mitigation measures are difficult to derive. To understand the interaction of global climate change and urban climate impacts and to develop mitigation and adaptation measures, one of the research areas of the excellence cluster CliSAP (Integrated Climate System Analysis and Prediction) focuses on urban systems and addresses the following questions: To what degree is climate change in urban areas caused by global/regional climate change and to what extent is it 'home-made'? To what degree can urban climate change be mitigated or even manipulated by urban modifications? What are the implications for future town planning, local architecture, urban safety, and urban governance? The project has started in November 2007 and has to present first results on changes analyzed from measured data and to give an outline on the next research steps. For Hamburg, a very green metropolitan region with a population of about 4.3 million, situated in the north of Germany the urban heat island is well established. In the annual average the temperature is 1.2 K higher in the city centre than outside; this difference is more than doubled when focusing on nighttime values. Furthermore, the temperature in the region has increased in the past 100 years by about 0.07 K / decade with trends to an even larger increase in the past decades (+0.49 K / decade based on the recent 30 years). The temperature increases are accompanied by precipitation increases which are lowest in the summer months. It is also found that the tendency for larger precipitation events increases in the metropolitan region of Hamburg and that there are downwind precipitation increases in some regions around Hamburg (Schlünzen et al., 2008). For performing mitigation and developing adaptation measures it is a next step to separate global and local impacts on urban climate by the aid of numerical models. The local impacts on wind, temperature, humidity and concentration distribution are assessed by performing wind tunnel and numerical model studies with different, including natural, land-uses. The ideas on this and some very first results will be presented.

Reference:
Schlünzen K.H., Hoffmann P., Rosenhagen G., Riecke W. (2008): Regional differences in temperature and precipitation in the metropolitan area of Hamburg. In preparation for Internat. J. Climatology. values.