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Forecasting the weather
- ensemble techniques
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Climate Change Adaptation Strategies - Regional Climate Atlas as a basic for a vulnerability study in the Metropolitan Region Stuttgart –

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While climate change is taking place the necessary reduction of greenhouse gas emissions has not been achieved yet. Thus, in the last years the adaptation to climate change is increasingly under discussion. In Germany the Federal Cabinet had adopted the so called “German Strategy for Adaptation to Climate Change” in December 2008. This is one reason why more and more regions and cities seek for climate change adaptation strategies. With the support of the Federal Ministry of Transport, Building and Urban Development, a limited number of cities and regions (e.g. the region of Stuttgart) take part in a model project with the objective to develop ways how to work out climate change adaptation strategies.

As one basis of the new Regional Plan the metropolitan region of Stuttgart decided to produce a regional climate atlas with a lot of information about the local climate today and in the future based on GIS. The result of this regional climate atlas for the planning was used for a study about the vulnerability to climate change in the region, which allows to derive a climate change adaptation strategy.

In the metropolitan region of Stuttgart the number of days with heat stress is already high and an increase can be expected in the future. “Heat stress and health” was therefore one of the central issues of the study. The objective was to conduct a spatially explicit analysis of the vulnerability of the population and identify those areas where vulnerability is above average. In order to allow a spatially explicit assessment, a GIS-based model was developed which was linked with modeling results on current and projected future heat stress provided by the regional climate atlas as well as socioeconomic parameters, depicting the population’s health sensitivity and the degree of social disadvantage. For example, parameters like “share of persons older than 75”, “household size”, “purchase power” and “proportion of foreigners” have been integrated in the analysis. In addition, it was considered how much effort is needed to reach green areas and water surfaces, which provide heat stress relief. This was analyzed by using a cost surface raster in the GIS, which allowed quantifying the effort necessary for covering the distance based on the parameters “walking distance” and “topography”.

Usually, vulnerability assessments link the used indicators by an additive combination, in order to achieve aggregated results. A mere addition of attributes, however, is not able to depict the complex interrelations within the climate-sensitive system. The here presented approach therefore resorts to different linking algorithms such as pareto-rankings, assessment matrices etc., in order to represent the real interactions in the system adequately.

The vulnerability model allows an overall assessment of vulnerability to heat stress and also generates results on particular aspects which are of special interest to urban and regional planning. It is based on small scale raster with a grid size of 50 m, enabling aggregation on different spatial scales (quarter level, district level, community level). Further geostatistic analyses of the results (e.g. hot-spot analyses) illustrate spatial patterns of vulnerability and provide an important argument basis for a prioritization of adaptation measures.