High resolution climatology
- towards climate change services

"CITY 2020+" – assessing climate change impacts for the City of Aachen related to demographic change and health

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This research initiative CITY 2020+ assesses the risks and opportunities for residents in urban built environments under projected demographic and climate change for the year 2020 and beyond, using the City of Aachen as a case study. CITY 2020+ develops scenarios, options and tools for planning and developing sustainable future city structures. We investigate how urban environment, political structure and residential behavior can best be adapted, with attention to the interactions among structural, political, and sociological configurations and with their consequences on human health. Demographers project that in the EU-25-States by 2050, approximately 30% of the population will be over age 65. Also by 2050, average tem¬peratures are projected to rise by 1 to 2 K. Combined, Europe can expect enhanced thermal stress and higher levels of particulate matter. CITY 2020+ amongst other sub-projects includes research project dealing with

(1) a micro-scale assessment of blockages to low-level cold-air drainage flow into the city centre by vegetation and building structures,
(2) a detailed analysis of the change of probability density functions related to the occurrence of heat waves during summer and the spatial and temporal structure of the urban heat island (UHI)
(3) a meso-scale analysis of particulate matter (PM) concentrations depending on topography, local meteorological conditions and synoptic-scale weather patterns.

First results will be presented specifically from sub-projects related to vegetation barriers within cold air drainage, the assessment of the UHI and the temporal and spatial pattern of PM loadings in the city centre. The analysis of the cold air drainage flow is investigated in two consecutive years with a clearing of vegetation stands in the beginning of the second year early in 2010. The spatial pattern of the UHI and its possible enhancement by climate change is addressed employing a unique setup using GPS devices and temperature probes fixed to several public transport units running all across the city. This is accompanied by an analysis of probability density functions (PDF) for heat waves based on recent climate data and climate projections. A dense net of 40 PM measurement sites is operated in order to obtain the spatial pattern of PM concentration as depending on meteorological condition and location.

It is lined out how this climate related sub-projects interact with investigations on social networks, governance issues, buildings structure development and health outcome. Related to the later the chemical composition of PM is analyzed in more detail and related to the spatial patterns of health deficiencies. At a later stage City2020+ will propose new strategies based on cooperation from the fields of medicine, geography, sociology, history, civil engineering, and architecture for adapting the city for future needs.