Re-thinking “Smart City” – transferring urban climate research into city planning processes

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With more and more people residing in cities globally, urban areas are particularly vulnerable to climate change. It is therefore important, that the principles of climate-resilient city planning are reflected in the planning phase already. A discussion of adaptation measures requires a holistic understanding of the complex urban environment, and necessarily has to involve cross-scale interactions, both spatially and temporally. This work examines the term “Smart City” with regard to its suitability for the definition of sustainable urban planning based on urban climate studies over the past decade and own modelling work. Existing literature is assessed from a meteorological perspective in order to answer the question how results from these studies can be linked to architectural design of future urban areas. It has been long understood that measures such as urban greening, or so-called "Nature Based Solutions", are able to dampen excess heat and help reducing energetic costs. As numerous studies show however, integrating vegetation in the urban landscape shares a double role in regional adaptation to climate change due to both cooling effect and air pollution control. Using the state-of-the-art chemical transport model MECO(n) coupled to the urban canopy parametrisation TERRA_URB, we simulated a case study for the Rhine-Main metropolitan region in Germany, highlighting mutual unwanted relationships in modern city planning. Hence, we oppose the so-called compact city approach to an urban greening scenario with regard to the potential for both heat island mitigation and air quality.