Decision support for building adaptation in a low carbon climate change future

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Summary

The next generation of climate change information will be presented in probabilistic terms, which are unfamiliar to the building services engineers who have to provide the comfortable conditions expected by building users in a sustainable way. This three-year project aims to produce a practical design method for adapting both existing and new buildings which uses the new probabilistic information without the need for sophisticated statistical understanding on the user's part. The multi-disciplinary programme will bring fundamental statistical methods, building thermal performance modelling and a qualitative investigation of the attitudes and beliefs of users together to produce a decision support tool. This tool will be in form of a set of case study buildings in various UK locations, which designers can interrogate in order to guide their design development.

The methodology for achieving the objectives of the project will encompass several stages. The first step is to obtain the probabilistic climate information from the Weather Generator (WG), which is based on the UK Climate Projection data (UPCP09). WG can produce 100 equally probable time series each of length 30 years, which are representative of the future climate for the user defined period of 30 years. This information then needs to be simplified for use with building model simulator tools (such as ESP-r), while maintaining the essential features that are important for defining the hourly climate conditions.

To serve this purpose an algorithm is prepared based on statistical methods. A year has been selected at random to get stratified sample of 100 years from each of these 100 time series. These 100 hourly climate data files further need to be analyzed with the help of ESPr in order to identify the summery statistics for the building performance and the responsible climate conditions causing a certain building to fail or survive. Based on this investigation a simple probabilistic model can be developed. This simple model should be capable of performing a quick and easy climate impact assessment for the building performance without requiring any further investigation of probabilistic information.

With the main objective of the project being to relate complex future climate projections to internal conditions of a building, the above procedure will be applied to a model of a case-study building. Modelled results, using dynamic building software, will be presented estimating the effect of probabilistic climate scenarios on internal temperatures.