Heat amelioration

Adaptation Strategies for Climate Change in the Urban Environment: the ASCCUE project

Introduction

Urban areas are usually warmer than surrounding rural areas due to the urban heat island (UHI) effect. The predicted effects of climate change will combine with those of the UHI to cause further significant warming in towns and cities. Trees and other vegetation are capable of cooling their immediate surroundings by direct shading and evapotranspiration. Green infrastructure (GI) can be used as part of a wider strategy for reducing the impact of heat in urban areas.

Background

The ASCCUE project looked at the impacts of climate change on two urban areas: Manchester and Lewes, East Sussex. Work was divided into a number of work packages (WPs), looking at:

- WP1 and WP2 - urban characterisation and risk/impact assessments in Lewes and Manchester, respectively
- WP3 - building integrity
- WP4 - human thermal comfort
- WP5 - urban green space
- WP6 - socio-economic impacts
- WP7 - strategies for development and testing the outcomes of WP6 and WP8
- WP8 - measures for climate change adaptation and mitigation.

This case study is concerned with the results of WP2 (characterisation of the urban surface of Manchester) and WP5 (urban green space). Information derived from these two WPs was used to look at the interaction between varying amounts of GI and levels of predicted warming under several climate change scenarios.

Objective

The main objective of the ASCCUE project was to look at the potential of GI as tool for climate change adaptation and mitigation.

Funding

The project was funded under the Building Knowledge for a Changing Climate Programme, which was run jointly by the Engineering and Physical Sciences Research Council and the UK Climate Impacts Programme.

Materials and Methods

Approach

- The city was classified into a number of urban morphology types (UMTs), based on aerial photography. The UMTs were based on a classification developed by the National Land Use Database. The surface cover within the different UMTs was quantified, again by using aerial photography, to look at the amount of evapotranspiring surface (both of vegetation and water) within each.
- An energy exchange model was used to provide information on maximum surface temperatures. The UMTs, with their varying amounts of evapotranspiring surfaces, were used as an input into this model.
- The researchers ran the model for the baseline 1961–1990 climate, and also for the UKCIP02 Low and High emissions scenarios for the 2020s, 2050s and 2080s.

Results

The researchers found that:

- Increasing greening by 10% in residential areas and town centres kept maximum surface temperatures at or below 1961–1990 baseline levels up to, but not including, the 2080s High UKCIP scenario.
- Green roofs can have a dramatic effect on maximum surface temperatures, particularly in town centres.
- The loss of evapotranspiring grass during periods of drought can have a serious effect on the cooling potential of an area of GI.

Future plans

The success of ASCCUE has led to the establishment of SCORCHIO (Sustainable Cities: Options for Responding to Climate cHange Impacts and Outcomes), another multi-disciplinary project looking at climate change risk and adaptation strategies for urban areas, and including quantifying the contribution of anthropogenic heat to the UHI.

Reference

Gill, S.E., Handley, J.F., Ennos, A.R. and Pauleit, S. (2007). Adapting cities for climate change: the role of green infrastructure. *Built Environment* **33** (1), 115-133.