

Heat amelioration

Turning the Chicago Urban Forest Climate Project into action on the ground

Introduction

In recent years, Chicago (Illinois, USA) has become well known for its efforts to adapt to the predicted effects of climate change. A range of mitigation and adaptation strategies have been outlined in the Chicago Climate Action Plan. A major part of this adaptation plan is the use of the cooling effects of trees and other green infrastructure (GI) to reduce the impact of higher average temperatures and heatwave events that are expected to occur in coming years.

Background

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. GI can be used as part of a wider strategy for reducing the impact of heat in urban areas.

The importance of Chicago's GI was emphasised by the Chicago Urban Forest Climate Project, the results of which were published in 1994. The 3-year project suggested that trees in the Chicago area provided a valuable range of ecosystem services, one of which was the reduction (in 1991) of residential heating and cooling energy requirements, which in turn reduced the amount of carbon emitted by power stations by about 12 600 tons annually.

Chicago began to develop a strategic management plan for the city's GI, based on the results of this report. The project was given added impetus in 1995, when a heatwave caused an estimated 600 heat related deaths in the city.

The project team assembled to develop the city's urban forest was led by the City of Chicago Department of Planning and Development, and consisted of:

- Department of Streets and Sanitation
- Department of Environment
- Department of Transportation
- Chicago Park District (responsible for the city's parks, but independent of the City of Chicago)
- Openlands (a non-governmental conservation organisation).

Objectives

The main objectives for the project team were to:

- Quantify the amount of GI within the City of Chicago area, and look at its position in relation to areas known to be 'hotspots' within the city.
- Use this information to prioritise the creation of new GI in the areas where it could be most effective.
- Improve the management of existing trees and new plantings.

Approach

The first task for the project team was a mapping exercise: a geographic information system was used to assess the amount and distribution of GI within the city. These maps were then combined with information on surface temperature and land use. As well as mapping, the team also looked at how improved management of existing tree stocks could help communities cope with the impacts of higher heat levels.

More than half of the city's tree canopy cover was found in residential areas, and the city centre was found to be the area with the lowest tree cover. It was also the area where the recent heatwave had the biggest impact. This and other information from the mapping exercise was used to prioritise areas, both for tree planting and improved maintenance of existing stock, with the intention of reducing future localised temperature increases.

Results

- The Chicago Bureau of Forestry planted several thousand trees in areas determined by the mapping exercise (3000 in 2007 and 6000 in 2008).
- The Bureau has also published information on species choice and correct planting, much of which can now be found on the website of the Chicago Trees Initiative, a recent initiative from the Mayor's office drawing together a number of public and private organisations with the aim of increasing the tree cover of the city.
- The City of Chicago has transferred the responsibility for tree preservation regulations from the police department to the Bureau of Forestry, as part of a revision of some of their legal mechanisms for protecting trees.
- Partly to assess the effect of projects such as this one, the city is carrying a range of ongoing environmental measurements.

Discussion

The model used in Chicago was:

1. Quantifying and mapping both the extent of existing GI and warmer areas of the city to identify areas that may be vulnerable to higher levels of urban heat.
2. Enacting suitable management to either create or encourage the creation of new GI, and to improve the management of existing GI.

This model could be used as a basis for managing urban vegetation to combat the effects of UHI and climate change in any urban area.

Future plans

The role of GI in urban heat management has been formalised within the adaptation strategies of the Chicago Climate Action Plan.

Reference

CABE Space. *Chicago case study*. CABE Space, London. <http://www.cabe.org.uk/case-studies/chicago-urbanforest>. Accessed 23/03/10.