

# Adaptation Strategies for Climate Change in the Urban Environment (ASCCUE)

Consortium members: CURE (University of Manchester), CRiBE (Cardiff University),  
DCEE (University of Southampton), OCSD (Oxford Brookes University)



**EPSRC**

Engineering and Physical Sciences  
Research Council



UK Climate  
Impacts Programme

**Building Knowledge for a Changing Climate**

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Following the discovery that emissions resulting from human activity were contributing to a warming of the planet, we have begun to investigate how we can maintain our quality of life without destroying the very system that supports our existence. However, the long lifetime of some of the greenhouse gases in the atmosphere means that we, and our children, will need to prepare to live in a different climate.

Making our cities and neighbourhoods fit for climate change is a major challenge. The ASSCUE project, which brings together a multi-disciplinary team from a range of universities and other organisations, will improve our understanding of the key impacts that are likely to affect towns and cities in the future, and how to anticipate change and plan an appropriate response.

*“The knowledge gaps which exist with respect to how urban areas can adapt to climate change must be filled”*

Town and Country Planning Association

*“Understanding how climate change will impact on urban form and fabric and how we can adapt to climate change to ensure the continued liveability of our towns and cities is vital”*

Office of The Deputy Prime Minister

*“Climate change is one of the main themes in the Environment Agency’s Corporate Plan: we recognise that there are many fundamental questions to address in respect of the impacts on the urban environment which your project will start to tackle”*

Environment Agency

*“The Royal Town Planning Institute feels that this will be an important piece of research and will be keen to work with you and your partners”*

Royal Town Planning Institute

## Introduction

Greenhouse gas emissions from the twentieth century are now locked into the climate 'machine'. Human induced climate change is already with us and its impact will be most significant where people are concentrated - in our towns and cities. To help us understand the likely impacts and how we can best adapt to changed conditions a research initiative 'Building Knowledge for a Changing Climate' was launched jointly by EPSRC and UKCIP (2003). ASCCUE is one of six projects funded by the initiative, which seeks to promote 'solutions-driven' research. Other projects focus on: urban drainage, energy and telecoms, built heritage, risk management, and high resolution climate scenarios.

Results from the ASCCUE project will help us to understand the consequences of climate change for the urban environment and to prepare for them through strategic planning and urban design. The principal impact of climate change on cities are associated with sea level rise, flooding, ground stability and intensification of urban heat islands (WPS Environmental, 2002). The project will examine the consequences for buildings, urban greenspace, and human comfort (the exposure units in Fig 1) and develop and test appropriate adaptation strategies.

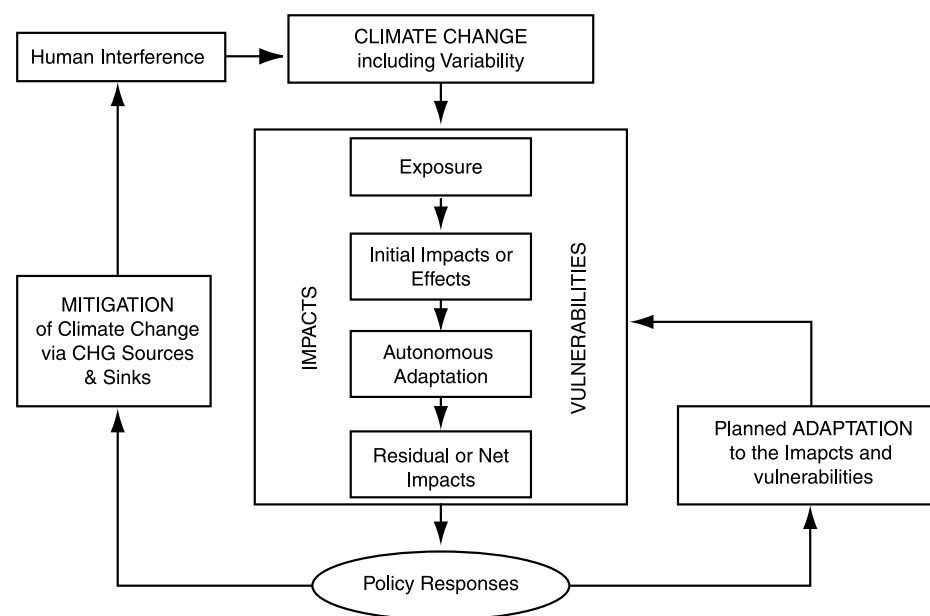


Figure 1: the place of adaption in the climate change agenda (Smit et al, 1999)

## Adaption Strategies for Climate Change in the Urban Environment

### **The principal aims of ASCCUE are:**

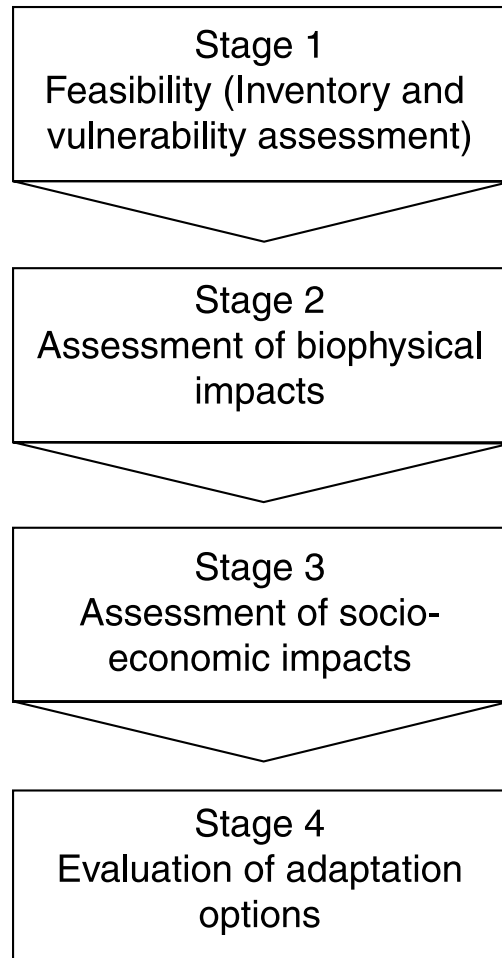
- To develop an improved understanding of the consequences of climate change for urban areas and how these, and the neighbourhoods within them, can be adapted to climate change;
- To explore policy options for urban planning in response to climate change, with emphasis on changes in urban form and urban management;
- To produce a tool-kit for climate-conscious planning and design at various scales from neighbourhood to the whole city level;
- To initiate demonstration projects (to be managed by the stakeholders involved) to make cities and urban neighbourhoods fit for climate change through planning, design and management.

### **Objectives:**

- To make a city-wide assessment of climate related risks to, and constraints on, development in two contrasting urban areas;
- To investigate climate change impacts on building integrity, human comfort and urban greenspace at the neighbourhood level;
- To explore the scope for climate change adaptation through strategic planning and urban design;
- To examine the interaction between adaptive strategies and measures to reduce greenhouse gas emissions;
- To involve local and national stakeholders in impact assessment, solution testing and dissemination of findings.

## Methodology

**The research involves the following stages:**



This framework will be applied to the urban environment, initially through impact assessment at the whole town or city level (Stage 1) and then the development and testing of methodologies for vulnerability assessment of building integrity, urban greenspace and human comfort (Stage 2). In conjunction with the stakeholder community socio-economic impacts will also be explored (Stage 3). Stage 4 involves planning and design workshops with our stakeholder partners to develop and test adaptation options. Screening, in Stage 4, will also identify interactions between adaptation proposals and mitigation.

The research will be based on and around two conurbations with contrasting size, vulnerability, and climate regime. They are at opposite ends of the SE/NW climate change gradient.

### **Lewes - a low lying coastal town in South East England (University of Southampton)**

This is an extreme case in terms of vulnerability, where sea level rise interacts with enhanced river flows to produce severe and repeated flooding, but is not untypical of many south coast towns. Here, where adaptation is urgently needed but may be difficult to achieve in practice, the research will broadly identify the scale of the threat and explore potential solutions.



Lewes under water: The floods of 2000 (courtesy The Argus)

## Case Studies

### **Greater Manchester - a large and complex conurbation in North West England (University of Manchester)**

To complement the work being carried out on Lewes and to enable the team to draw out generic research findings to help inform wider adaptation strategies for other urban areas in the UK. The conurbation of Greater Manchester offers:

- Sufficient size for full expression of urban environmental character;
- Contrasting soil types;
- Full range of neighbourhood, land use and building types;
- Existing data sets for characterisation and analysis.



Inner City of Manchester  
(copyright Gten, University of Manchester)



### Building integrity (Cardiff University)

This work package focuses on two key processes affecting building integrity: the direct effects of flooding and the indirect effects of water table variations on soil conditions. The study will translate these risks into estimates of the vulnerability of the building stock (including the road network and building structures).



Inner City of Manchester  
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### Human Comfort (Oxford Brookes Univ.)

One important consequence of climate change for the urban environment is intensification of the urban heat island and its related effects e.g. air quality. This work package will explore the implications for human comfort in the external environment both in work and at leisure. It will involve field measurements, perception studies and modelling.



## Exposure Units

### Urban greenspace (Univ. Of Manchester)

Little is known about how climate change may affect greenspace structure and function and how this, in turn, will impact back on the urban environment. The objectives of this work package are:

- To determine the extent and spatial patterning of greenspace in the case study areas.
- To provide quantitative estimates of surface/air temperatures, air quality, surface run-off and rainwater infiltration in relation to greenspace.
- To clarify the vulnerability of urban greenspace to climate change based on analogous studies.
- To investigate the potential of greenspace to adapt cities to climate change. We will test options for soft engineering to utilise the moderating influence of greenspace to reduce climate change impacts on people and buildings.



Greater Manchester (NW): Density of trees per hectare

### Socio-economic impact

A scoping study to identify socio-economic impacts will be led by CURE working closely with all team members. Although only scoping in nature, the socio-economic dimension of climate change impact cuts across each of the exposure units and is an important research consideration. An understanding of the likely socio-economic impacts will need to be fully integrated within any adaptation strategy. The objective here is to identify potential strategies at citywide and neighbourhood levels. Stakeholder groups at national and local levels will be consulted and will also assist with strategy development.

### Strategy development & evaluation

The Project Manager will co-ordinate development and testing of integrated adaptation strategies by the research team. Feasibility of adaptation strategies will be tested at workshops involving all collaborators together with local and national stakeholders. A scoping study will also identify potential interactions between preferred adaptation strategies and climate change mitigation i.e. measures to reduce greenhouse gas emissions.

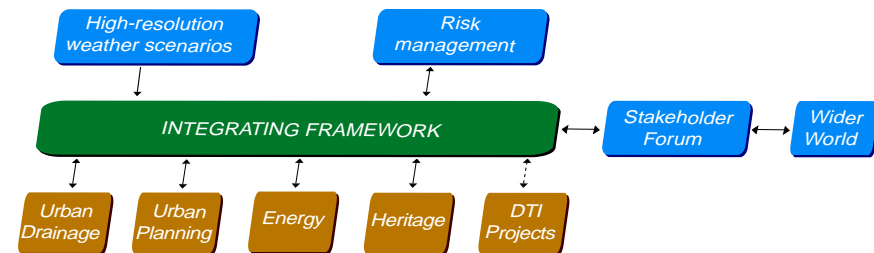


## Stakeholder Involvement

The research demands close interaction both with national policy makers and with those responsible for shaping towns and cities at the local level. The Town and Country Planning Association (TCPA) have played a key role in project development and they will continue to lead a national project steering group comprising enablers, policy makers, realisers and end-users. The group will reflect a variety of competencies including: insurance, construction, engineering, developers, social impact, health, planning, greenspace, and core members. Local advisory groups along similar lines will cover each case study area.

Findings from the ASCCUE project will feed into the wider Building Knowledge programme via their 'Integrating Framework'.

From the outset, the stakeholder representatives and the research teams will work together to ensure that research findings are communicated effectively, and translated into practice through publications, demonstration projects and development of a toolkit for climate conscious planning.



The Integrating Framework for the current EPSRC/UKCIP initiative

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Picture on page 4 kindly supplied by *The Argus*.

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