



## Evaluation of Adaptation Options Across Sectors: a discussion paper to the SKCC consortium

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### Introduction

The SKCC project is about capacity building for the scientific understanding of adaptive responses to climate change in the built environment. It draws on the pioneering work of the EPSRC/UKCIP programme of Building Knowledge for a Changing Climate (BKCC). A strong feature of BKCC was the engagement of stakeholders both in the development and management of the programme and in the individual projects within it. This process of mutual learning between the research community and the stakeholders (the key agents of change in climate adaptation) has carried through into SKCC.

A key task for SKCC is to identify emergent research priorities and to lay the foundations for a successor programme to BKCC. As the summary report of the BKCC programme demonstrates, we have made significant progress in understanding the challenge of adaptation to climate change in the built environment and infrastructure systems (Walsh et al, 2007). However, substantive research and practical challenges remain, including:

- the representation of uncertainty and use of probabilistic scenarios as a basis for adaptive decisions;
- integrating, where appropriate, adaptation with measures to reduce greenhouse gas emissions;
- engaging with the construction industry, particularly in relation to adaptation of the existing building stock;

- costing climate impacts and adaptation;
- assessment of adaptation options that may be applied across a range of sectors in the built environment and infrastructure systems, including methods for cross-sectoral evaluation of adaptation options.

Good progress has been made within SKCC in addressing the first three priorities; draft state of the art reviews have been written and key issues explored in a workshop setting (Walsh, 2007). The Stern Review (Stern, 2007) has greatly enhanced our understanding of the economics of climate change, whilst development work by UKCIP is helping to provide practical tools for costing adaptation options (Metroeconomica, 2004). Progress in dealing with ‘evaluation across sectors’ has been less satisfactory. This paper interprets the brief for this task and sets out a potential way forward for comment and discussion with SKCC research partners.

## **Evaluation Across Sectors: the project brief**

The project brief states that

*‘this task will examine the climate adaptation measures emerging across all BKCC projects, to develop an assessment of the inter-relationships between these measures, to evaluate their combined impacts and to identify any potential conflicts. We will begin by identifying measures that have potential benefits across multiple sectors and will then, through literature review and workshop activities, explore and rank the most promising options.’*

This implies the following objectives:

- to review emergent climate adaptation measures across all BKCC projects,
- to assess the inter-relationships between these measures, identifying both synergies and conflicts, and
- to evaluation and rank the most promising options.

## **Research methods**

**Objective (I) To review climate adaptation measures emerging across all BKCC projects.**

A systematic assessment will draw on data from:

- BKCC Programme Summary Report (Walsh et al, 2007);
- presentations at the BKCC dissemination conference in Manchester, March 2007;
- end of project reports to EPSRC;

- publications arising directly (and indirectly, e.g. Shaw et al, 2007) from the BKCC programme.

The focus will be on the sectoral projects, i.e. those projects within the BKCC programme, which are most likely to have identified adaptation measures (AUDACIOUS, ASCCUE, BIONICS, EHD, GENESIS) but also case study material within CRANIUM. A possible framework for characterising the measures is the two-way classification developed by UKCIP (Table 1) which has been found to be effective by Tompkins et al in their DEFRA funded project ‘to develop a systematic characterisation of observed adaptation in the UK in both the private and public sectors’ (Tompkins et al, 2005).

Having characterised their projects in this way, Tompkins and co-authors go on to interpret their findings within a socio-economic framework pioneered by Elinor and Vincent Ostrom at Indiana University (Ostrom, 1997) which further classifies the adaptation response into one of three categories: rules or regulations, organisational structure and behavioural norms. An example of how such an analytical framework is applied in practice is shown in Table 2.

The suggestion here is that whilst the primary classification into ‘building adaptive capacity’ and ‘implementing adaptation’ appears promising, the socio-economic categorisation is rather less informative in the SKCC context. An alternative would be to utilise the DPSIR (Driver, Pressure, State, Impact, Response) model of the European Environment Agency which provided a helpful framework for a review of climate change impacts in the urban environment carried out by CURE within the ASCCUE project, Figure 1 (Gill et al, 2004). The aim here would be to characterise adaptation measures (responses) according to where they impacted within the DPSIR systems.

Table 1 – Proposed Classification of Adaptation

<p><b>1. Building adaptive capacity</b> (things that are done to encourage adaptation)</p> <p>Examples of possible steps to facilitate adaptation thinking and knowledge gathering:</p> <ul style="list-style-type: none"> <li>• Investigation/research</li> <li>• Legislation (enabling)</li> <li>• Direct guidance/instruction</li> <li>• Increase institutional capacity to adapt</li> <li>• Implementing no regrets</li> </ul> <p><b>2. Implementing adaptation actions</b> (responses to actual or expected impacts of climate change)</p> <ul style="list-style-type: none"> <li>• Manage physical hazard/change (physical resources /something to do with the environment e.g. flood embankment or irrigation)</li> <li>• Alter exposure to that aspect of the environment e.g. relocate / protect properties / reduce damage caused / change to crop.</li> <li>• Reduce vulnerability to impact (e.g. increase wealth and ability to recover) loss still happens but can cope better / insurance.</li> </ul>
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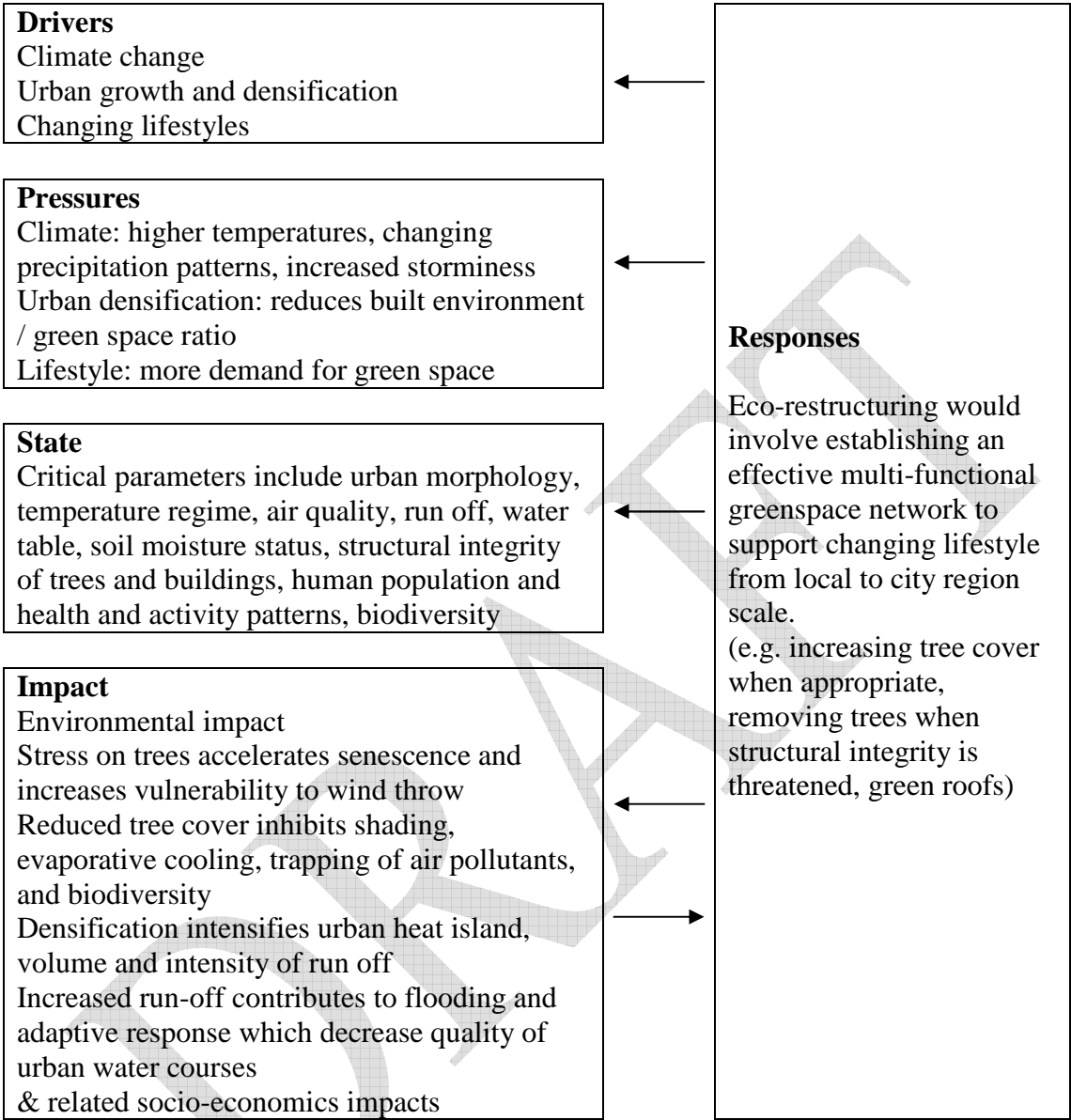
Willows and Connell (2003)

Table 2 Illustrative example of adaptation in practice

	<b>Rules or regulations</b>	<b>Organisational Structure</b>	<b>Behavioural Norms</b>
Building adaptive capacity	Minister creating a new policy that all government projects had to allow 'financial headroom' for the impacts of climate change.	Creation of the UK Climate Impacts Programme	Members of the Chamber of Commerce discussing how they will cope with increased levels of flooding.
Implementing adaptation	Trade association implementing policy changes that commit the industry to respond to climate change	Local architecture firm establishes technical and staff capacity in designing houses for adaptation to climate change.	A farmers' co-operative is changing farming methods as a result of water logged soils.

Tompkins et al (2005) p15

Figure 1 – An example of the DPSIR framework for reporting on environmental issues (EEA, 2003) applied to climate change in the urban environment.



Rather than report on a project by project basis it may be helpful to group the ‘measures’ identified in BKCC into thematic areas which equate to climate related management challenges to the urban industrial system. Four such ‘management challenges’ have been identified by Shaw et al (2007) in their report for the TCPA, ‘Climate Change: Adaptation by Design’:

- managing high temperatures;
- managing flood risks;
- managing water resources and quality;
- managing ground conditions.

To this, drawing on the BKCC portfolio, we might add:

- managing Historic buildings;
- managing electricity supply.

**Objective (ii)                      To assess the inter-relationships between these measures, identifying both synergies and conflicts.**

The characterisation work under Objective (i) will have already gone some way to clarify the relationship between measures. From this it should be possible to draw out synergies and conflicts within a cross-impact matrix.

**Objective (iii)                      To evaluate and rank the most promising options.**

During this phase the most promising measures would be highlighted and issues pertaining to maladaptation identified. A framework for considering maladaptation has been provided by Willows and Connell (2003) in their report to UKCIP on ‘Risk, Uncertainty and Decision Making’ (see table 3).

Table 3: Maladaptation and other climate change decision errors

<b>Consequences of poor decision</b>	<b>Description of case of poor decision</b>
Under-adaptation-1	Where adaptation to climate change is or should be an essential component of the decision, but it is either ignored, or insufficient actions are taken to adapt.
Under-adaptation-2	Where non-climate factors are perceived as having greater importance to the decision than climate change factors, the result may be that insufficient <b>weight</b> is attached to the need for adaptation. This may tend to lead to under-adaptation.
Over-adaptation-1	Actions taken where climate change is considered to be a significant factor on the decision to be taken, but where it will have or should have little or no influence on that decision.
Over-adaptation-2	Actions taken where non-climate factors that should have a significant influence on the decision are ignored or given insufficient weight compared to climate change factors. This may lead to over-adaptation.
Maladaptation	Actions taken that reduce the options or ability of decision-makers now or in the future to manage the impacts of climate change. Such actions are sometimes described as reducing climate headroom.

There would need to be a strong connection here with the working paper on ‘Linking Adaptation and Mitigation Strategies’ (Walsh and Hall 2007) impacts of adaptive measures on greenhouse gas emissions (positive or negative) given special weight. Evaluation is a difficult and complex area and frequently involves the development of indicators. There has been important methodological development by AEA Technology, in a report to DEFRA, which sought to ‘develop a methodology and a set of “straw man” objectives, targets and indicators to inform the development of adaptation policy.’ (AEA Technology, 2005). We can also draw on the growing body of experience in evaluating sustainable development in the built environment e.g. Brandon and Lombardi (2005). These authors follow Francescato (1991) in emphasising the distinction between measurement and assessment:

*‘Measurement involves identification of variables related to sustainable development and the utilisation of technically appropriate data collection and data analysis methods. It mainly deals with sustainability indicators rather than with processes and methods. It mainly deals with sustainability indicators rather*

*than with processes and methods. On the other hand, assessment involves the evaluation of performance against a criterion or a set of criteria. Both performance and criteria can only be defined by a value-based judgement. They are not empirically verifiable. Indeed the term 'performance' must denote a goal-orientated behaviour, i.e. a behaviour rendered meaningful by existence of a criterion that specifies when a goal has been attained.'* (Brandon and Lombardi, 2005 p122)

The intention here would not be to develop indicators or apply measurement but the model developed by AEA Technology and illustrated by Lisa Horrocks in her contribution to the SKCC Workshop 'Adapting the Built Environment and Utilities to a Changing Climate: Enabling the Next Steps' may be helpful in developing an adaptation policy vision (figure 2).

## Policy-setting cycle for adaptation

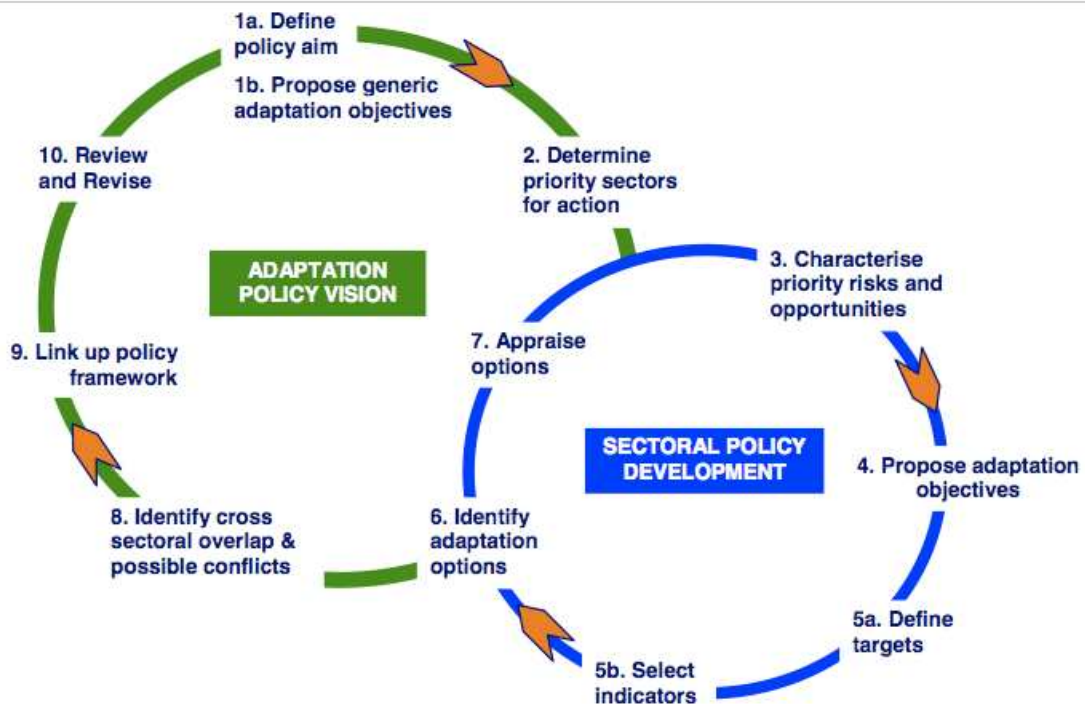


figure 2 – from Horrocks (2007)

## Evaluation Across Sectors: A Critique

The policy importance of evaluation across sectors has been emphasised in the UK Climate Action Plan:

*Much of the research to date has been carried out to inform specific individual sectors about the implications of climate change. However, there may be more surprises in store as climate-related impacts on one bring with them indirect effects for another. Many of these cross-sectoral issues are much less studied, yet*

*robust adaptation decisions in sectoral policy areas will need to take into account the implications of those decisions for facilitating or preventing effective adaptation in related sectors. (DEFRA, 2006 p140)*

However, the approach set out here, whilst it does focus on cross-sectoral interactions, in accordance with the project brief, has a number of shortcomings. In particular it is reductionist in a world where the call is for integration and holism. The recently published EC Green Paper on 'Adapting to Climate Change in Europe – options for EU action' (EC 2007) specifically calls for 'an integrated, cross-sectoral and holistic approach' with the need to develop 'comprehensive and integrated methodologies for the assessment of impacts, vulnerabilities and cost-effective adaptation.' This will require integration across different scales and over time and this section of the paper will need to make this clear. We should also consider wider questions such as the relationship between adaptation policy and practice and the sustainable development agenda (Tschakut and Olsson, 2005).

## **The Way Forward**

I attach a draft format for the discussion paper as Annex 1. I would very much welcome comment on the approach set out here and the draft framework for the paper. In the meantime I will continue to work on this and to discuss with Jim how we can bring this work in phase with other parts of the programme, ahead of the stakeholder meetings in October.

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# Climate Change and the Built Environment – a Cross Sectoral Analysis

John Handley and Graeme Sherriff

## DRAFT CONTENTS

Executive Summary	
Introduction	Climate change impacts and the built environment – the case for adaptation. European and UK policy context. Call for a cross-sectoral analysis of adaptation within the UK Climate Change Programme. Research context – BKCC/SKCC. Aims and objectives of the research.
Research Methods	Brief explanation of research methodology and justification for choice of methods used to meet objectives.
Research Findings	Classification and analysis of adaptation measures within the BKCC portfolio. Thematic analysis of management responses within the DPSIR framework. Cross impact assessment to identify synergy and conflicts between adaptation measures.
Discussion	Recognition of the inherent complexity of the urban-industrial system and the need for an integrated and holistic approach – on different scales in space and time. Learning from experience of sustainable development in devising criteria for effectiveness of management interventions. Commenting on research findings with examples of adaptation which appear promising (i.e. effective), contrasted, perhaps, with less effective measures which may verge on maladaptation. Application of the AEA Technology cycle model to develop a vision for the well adapted city. Opportunities for realising the vision and barriers which may prevent it.
Conclusion	
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Postscript: I realise that this is very ambitious and that time is not on our side.