Local Effects of Global Climate Change

Gwilym Pryce, Danny Mackay, Hayley Fowler, Keith Jones, Li Shao, Gavin Wood

February 2008 marked the launch of a major new research consortium looking at the local impacts of climate change. Funded by the EPSRC to explore *Community Resilience to Extreme Weather*, the CREW research team will span fourteen UK universities and draw together a wide spectrum of academic disciplines including geography, climatology, engineering, economics, statistics, sociology, and earth sciences. Why do we need another research consortium looking at climate change and what will be the relevance of its outputs to local decision makers?

The answer to the first question is twofold. First, there is the profoundly inter-disciplinary impact of climate change. It is, after all, difficult to think of a single topic that is *more* inter-disciplinary. Simulating future weather scenarios requires the skills of physicists, mathematicians and climatologists. But the effect of those scenarios touches on just about every aspect of human enquiry. Unfortunately, while there is a great deal of research going on in relation to climate change, very little of it is truly interdisciplinary. Researchers are typically ploughing their own furrow in their own field. So establishing the CREW consortium is itself, we hope, a major step in the right direction.

The second innovation of the consortium is its geographical focus. Quantitative work has been done on the impacts of climate change at global, regional and national levels (the Stern report and the BESEECH project, for example), but not at a neighbourhood or community level. There has been qualitative and case-study research at the local level but there is currently no integrated quantitative model that simulates future weather and the impacts on local housing, employment, crime, health and other determinants of neighbourhood well-being.

Joining together long-term climate predictions from the Met Office with socio-economic models of the effects on the local community seems spectacularly ambitious, yet this is our goal, motivated by three powerful factors: *psychology*, *scarcity* and *asymmetry*.

First, the *psychology* of household and institutional decision-making is such that no amount of gloomy statistics and doomsday prophecies will effect significant change in human behaviour unless the implications of those scenarios can be made real and tangible to the average Joe. Work by Zeckhauser and others on the economics of catastrophes suggests that households, firms and governments tend to underestimate risks that appear distant or global, or which others seem to accept without concern. *What are the implications of Climate Change for me and my neighbourhood? How will it affect the chances of me losing my job or my firm going bankrupt? What will be the impact on the value of my house or on the crime rate in my area?* These are the questions we need to be addressing because these are the kind of issues that people identify with.

Second, while we may have unlimited capacity to dream up ever more elaborate methods for climate mitigation and adaptation, the reality is that we live in a world of *scarce resources*. We have to face the fact that there will be limited public funds to assist with resilience and regeneration. Britain is an island with the majority of its major cities located on the coast or on fluvial inlets. If the estimated flood risk implications of climate change are correct, some difficult decisions lie ahead for the allocation of public funds. Research that helps us identify the optimal allocation of limited funds will be more important than ever. Quantifying the complex socio-economic impacts of future climate change scenarios at the

local level may seem a hopelessly difficult task but it is an essential one nonetheless. In the words of the great nineteenth century scientist Lord Kelvin, "… when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind" (1883). To put it more crudely, *what gets measured, gets addressed.* If we want to avoid potentially catastrophic oversights and major spatial inequalities emerging in our plans for coping with climate change, we need to quantify not only the incidence of extreme weather but also its consequences.

Third, anticipating the effects of flooding and other extreme weather events is complicated by potential *asymmetries*. The same event will devastate one area, but be only a temporary blip for another. This is because the socio-economic impact of extreme weather events depends crucially on local social-cohesion and economic robustness. The UK already has one of the highest levels of economic spatial inequality in Western Europe. How climate change will affect existing patterns of spatial inequality and its differential economic impacts, could profoundly alter how we prioritise the future use of public funds. The asymmetry of climate change impacts adds a layer of complexity that demands a systematic simulation approach – the gut feeling of well-meaning policy makers won't do on this one.

So how will the CREW consortium deliver on the conflicting requirements of complex modelling and the need to engage with households and decision-makers at the local level? Our aim is to channel the scientific outputs of weather simulation and socio-economic models into a set of web-based tools for mapping likely future extreme weather events and their socio-economic impacts. This output will embody three years of research spread across a series of five inter-linked Programme Packages:

1. **Community hazards (SWERVE)** – computer simulation of local extreme weather events for current and future climates.
2. **Community impacts (EWESEM)** – a suite of statistical models that quantify and simulate the socio-economic impacts of current and future extreme weather events (particularly flooding) at a neighbourhood level.
3. **Community coping (capacity for resilience) –** stakeholder-led research to understand better how community groups respond to extreme weather events.
4. **Community coping (people and buildings)** – identification and assessment of existing coping measures, from passive personal options to active engineering solutions
5. **Community tools (WISP) –** a web-based toolkit for mapping likely future extreme weather events and their neighbourhood impacts.

Whilst the current project will be limited in its geographical scope to a few boroughs in the South East of England, we hope that the integrated, inter-disciplinary research framework and interactive web-based tools that emerge from the CREW consortium will provide a template for gauging and communicating the neighbourhood effects of climate change in other parts of the UK and abroad.

In trying to understand and simulate the neighbourhood implications of future weather events, we have set ourselves a truly onerous task. To quote Lord Kelvin again, "Science is bound, by the everlasting vow of honour, to face fearlessly every problem which can be fairly presented to it." Even if we are not inspired by Kelvin's spirit of scientific inquiry, the practical imperative to regenerate neighbourhoods in the face of the growing threat of climate change, necessitates this research.